

The Cambridge Global Handbook of Financial Infrastructure

Financial infrastructures are the lifeblood of political economies and are consistently considered critical by governments. They encapsulate sociotechnical processes; not merely cables and computer servers, but the relationship of those in finance to these and other physical objects. *The Cambridge Global Handbook of Financial Infrastructure* consolidates the study of financial infrastructures by bridging political economy, humanities, sociology, and science and technology studies. It delves into the core questions of modern finance, from the effect of digitalization on financial functions to the intricate web of global power dynamics. Drawing together interdisciplinary research, it explores the nuances of inclusivity and exclusivity within financial systems, shedding light on historical inequalities and colonial legacies. Including fresh insights, compelling case studies, and conceptual advances, this essential volume offers invaluable perspectives for informing analysis of the past, present, and future of finance, and shaping policy debates. This title is also available as Open Access on Cambridge Core.

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*This volume is dedicated to the cherished memory of Beate Brandl and
Martha Westermeier, who passed away during the writing and production of this work.*

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CHAPTER 1

Infrastructural Gazing on Global Finance

*Carola Westermeyer, Malcolm Campbell-Verduyn,
and Barbara Brandl*

1 Infrastructural Gazing

The expansive and intricate world of global finance holds immense significance for socioeconomic processes worldwide, influencing everything from daily payments to geopolitics. Despite mainly operating behind the scenes, financial infrastructures have garnered attention in both public discourse and academic circles due to their growing politicization. In 2020 financial infrastructures came to the fore as COVID-19 pandemic lockdowns induced an even greater reliance on digital payments and disbursement of government aid. Two years later, as Western policymakers extended international financial sanctions on Russia while supporting Ukraine, the geopolitical dimensions of financial infrastructures became obvious not only to leading policymakers, but also to citizens and consumers. The development of central bank digital currencies (CBDCs) and attempts to disrupt established financial infrastructures by the likes of Facebook – with its failed Diem (formerly Libra) currency – have also attracted the attention of regulators and citizens alike to payment infrastructures that have

up to now remained out of the spotlight. Yet, despite the increased public and policy attention devoted to them, financial infrastructures and their scholarly analysis are not new. Infrastructures have underpinned finance since the origins of banking, insurance, and trading, as social scientists and historians have traced in detail.

This volume brings together scholars scrutinizing the socioeconomic, sociopolitical, and geopolitical dimensions of financial infrastructures across a range of academic disciplines. This is a guide for students, practitioners, and scholars alike on where the present underpinnings of global finance have come from and where they might be going in an uncertain future. The pages that follow bring together theoretical perspectives on financial infrastructures with empirical studies of infrastructures enabling finance to serve crucial societal functions across the world. This introductory chapter outlines the thread uniting all contributions to this volume: the infrastructural gazing heuristic that all contributors take in foregrounding the political stakes of what are typically backgrounded, merely technical, processes and actors underpinning global finance.

In developing this volume, the editors gathered scholars from different fields of study investigating varying corners of global finance from diverse theoretical and methodological approaches to explore the following central questions:

- What are financial infrastructures and how do they both reflect and shape wider socioeconomic and geopolitical relations?
- How do financial infrastructures change through digitalization?
- Which actors, objects, and processes are essential to shaping and maintaining, as well as challenging, financial infrastructures?
- How inclusive or exclusive are financial infrastructures? How do they relate to and act on (historical) socioeconomic inequalities and exploitations, including colonialism?
- How are financial infrastructures interlinked with global power structures and the “return” of geopolitics?

Infrastructural gazing links these broad questions and the technicalities of finance by making meso-level connections between interactions at the micro level and phenomena on the macro level. It foregrounds processes that typically lie in the background and shows that they are not merely technical methods, but entail profoundly sociopolitical stakes. Gazing at infrastructures injects a steadiness into the analysis of rapid developments in global finance, situating financial objects and practices in wider interdependencies across time and space. It links concerns of power and legitimacy with mundane technical systems that process transactions, market interactions, and monetary flows using distinct modes and rules of operation. Gazing on the interconnections of finance infrastructurally connects big-picture concerns to specific, technical questions and complex nuances. Its most powerful analysis is enabled when backgrounded interconnections are foregrounded to bring forth what are often analyzed separately: the materiality, politics, social inequalities, and technological innovations that enable

continuity and change within the local and global, the public and private, the collective and individual.

The type of gazing we advance, importantly, entails no single way of foregrounding financial infrastructures. Rather, it involves *various* meso-level approaches bringing together in different ways the macro and the micro. Some infrastructural gazing squints with a sharper eye at the micro-level details than at wider macro-level actors and processes. Big-picture concerns of power and authority always remain in sight, even if they are not as front and center as everyday sociotechnical complexities. Other infrastructural gazing focuses on big-picture processes yet nevertheless link these to underlying micro-level practices and objects.

2 What Are Financial Infrastructures?

Financial infrastructures have proven to be the lifeblood of political economies, ensuring continued circulation of money, value, and wealth as other processes evolve or even come to a halt (Langenohl and Westermeyer, 2022). They are critical to citizens and governments around the world, central to the maintenance of power but at the same time facilitating challenges to these power structures. In the minds of most policymakers and members of the general public, infrastructures are physical “things” such as railroads or transmission towers. They are important objects that require care, maintenance, and even protection in order to avoid the potentially catastrophic consequences of their failure. The framing of infrastructures as “critical” and “vital” objects that need to be secured to ensure continuation of key societal functions produces several distinctions that the contributions to this volume push back on (Collier and Lakoff, 2015). These separations include, amongst others, dichotomies between “hard” things and “soft” relations, between matter and meaning, and between the public and private.

To better understand the characteristic feature of infrastructures as “vital systems,”

this volume works to unravel such dichotomies. A first step toward our broadened understanding of infrastructures is to maintain that financial infrastructures always include objects. Finance would not be possible without fiber-optic cables and computer servers or, earlier, paper bills, coins, and other concrete material things. Yet financial infrastructures also importantly comprise the relations between such physical objects, as well as between things and financiers, along with other humans and interactions between them.

Financial infrastructures therefore are not merely static sets of objects. As emphasized in this volume, they are processes of sociotechnical interaction that enable the essential activities of banking, payments, insurance, and trading (Bernards and Campbell-Verduyn, 2019). An infrastructural gaze on finance traces how these relations (d)evolved in ways shaped by interactions amongst (1) humans, (2) objects, and (3) humans and objects. Often taken for granted and assumed, these sociotechnical relations only become visible when they fail, cease to function, or undergo profound changes. In identifying infrastructures as sociotechnical relations, this volume builds on their understanding as everyday, mundane, and “dense social, material, aesthetic, and political formations” (Anand, Gupta, and Appel, 2018, p. 3).

A key advantage to an expansive notion of infrastructures is that it enables exploration of who acts, when, and how. Understood as processes, financial infrastructures are comprised of actions by practitioners, citizens, governments, and international organizations, as well as relations amongst them and interactions with everyday objects on a daily basis, not just in times of crisis. Human organizations and nonhuman objects act to enable and disable certain financial flows in every millisecond of the trading day, across jurisdictions worldwide. A relational understanding of infrastructure politicizes the ways global circulation of currencies, credit, and debt, as well as the disbursement of government aid and loans, all unfold – ways that are not merely natural or neutral. Gazing at financial infrastructures opens them to

challenge and change. Tracing who acts, when, and how reveals the idiosyncratic and often unintended constructions of financial relations that tend to attract little attention when they work smoothly. As during crises when their underpinnings are subject to reform, financial infrastructures can also be challenged and recreated in “normal” times by making the politics of their (re) construction – by whom and how – clear to policymakers, citizens, and consumers alike (de Goede and Westermeier, 2022; Westermeier, 2023).

Prominent cases in point are developments like CBDCs, whose backers promise new, “disruptive,” and better relations between central bankers, banks, firms, citizens, and society (Kuehnlenz, Orsi, and Kaltenbrunner, 2023). The choices being made, or not made, as CBDC projects unfold in individual countries (e.g., the United Kingdom) and across regions (e.g., the European Union) are attracting attention to who acts and how (Brandl, Hengsbach, and Moreno, 2024). Yet in other places, such as Nigeria or the Eastern Caribbean, where CBDCs have been rolled out and piloted, these questions surfaced only after the fact: following the stalled takeup of Nigeria’s e-Naira in Africa’s most populous country or when DCash, the Eastern Caribbean regional project, went offline for months following a technical issue in early 2022. In these and other cases infrastructural (re) formation is presented as a *fait accompli*: Processes and outcomes are seen as irreversible, short of major crisis or failure. Yet they entail significant political stakes for societies and economies around the world. What relational conceptions of infrastructures bring to the fore, in short, are the multiple choices and possibilities that exist both in stable and unstable times alike.

Emphasizing infrastructural relations enables politics to not simply be set aside as part of the boring “plumbing” of routine construction and maintenance work that ought to remain far out of the spotlight (Maurer, 2012). Rather than just pipes or any physical object alone, infrastructures are sociotechnical relations. Casting a gaze on

the ever-present politics of the pipes, their relations with other key objects, with their developers and users, and so on stresses how infrastructures are political. Moreover, even if they might appear “hard-wired” and can persist over long periods of time, infrastructures can still be subject to change, challenge, and contestation (de Goede, 2021; Bernards, 2022; Campbell-Verduyn and Hütten, 2023).

As its starting point, this volume conceives infrastructures as sociotechnical relations dis- or enabling politics on varying, intersecting scales, from the micro to macro. Transitioning away from object-centric and fixed perspectives on infrastructures as mere “things,” the scrutiny of infrastructure in this volume injects politics into what is commonly depicted as purely technical, peripheral, and uninteresting “stuff.” Our approach thus goes beyond intuitive notions when making sense of the extensive interconnections between people, products, and patterns of action underpinning financial relations across the planet. Infrastructures are (d)evolving processes unfolding in multiple ways that, this volume argues, can productively be gazed upon not only in admiration and astonishment but critically, as illustrated by the two general approaches adopted by contributors to this volume.

3 Two Forms of Infrastructural Gazing

Infrastructural gazing generally consists of taking sharp, attentive, piercing, and multiple looks at finance. Gazing can be and is done in a plurality of ways, as highlighted by contributions to this volume as well as by existing literatures on financial infrastructures. This section highlights two broad approaches to gazing into financial infrastructures in ways that foreground the politics of seemingly technical underpinnings. Both forms of infrastructural gazing piece together and pierce through the complexities of finance by connecting big-picture concerns of power, authority, legitimacy, and inequality in finance with particular nuances in everyday socioeconomic relations and

seemingly mundane matters. This section shows how these two forms of infrastructural gazing are reflected in the existing literature to highlight the point from which the contributions to this volume take off.

A first general gaze cast on financial infrastructures zooms out on the wider sociopolitical, economic, and cultural origins and implications of key micro-level objects and practices. Here studies frequently invoke Michael Mann’s conception of “infrastructural power,” which describes the capacity to implement political projects through connections between social actors in order to transmit authority (Mann, 1984). Unlike other forms of power, infrastructural power works indirectly and diffusely. It entails control over the systemic properties that underlie all kinds of interactions. The concept of infrastructural power thus highlights how power is distributed. As it is still attuned to micro-level sociotechnical details, this first gaze, with its macro-level focus, helps to highlight meso-level interconnections by underlining the capacities of certain actors and objects to implement political projects and transmit authority. Such infrastructural analysis generally helps us understand changes that are also part of the “intractable principle of continuity across time and space” (Berlant, 2016, p. 394). Inspired by Mann’s work, international political economy (IPE) scholars in particular have explored longer-term historical dynamics in financial governance and regulation at varying scales within and beyond national borders (Schwartz, 2019; Walter and Wansleben, 2020; Coombs, 2022).

A second form of infrastructural gazing on finance investigates questions of how and where infrastructures change, as well as the agency in and of financial infrastructures. These perspectives on financial infrastructure have alternated between considering material technologies facilitating financial processes (Caliskan, 2020; Westermeyer, 2020) and as viewing financial processes, specifically in their economy-related aspect, as an infrastructure for the economy (Muellerleile, 2017). Inspired by the wider “new materialist” turn in the social

sciences generally and in social studies of finance (SSF) in particular, infrastructure here gains more of an agential role in tracing how sociotechnical relations are constraining and enabling what can be done (Campbell-Verduyn and Hütten, 2023). This second approach looks more than the first at the mundane technical objects that power and process financial transactions, market interactions, and monetary flows through distinct modes and rules of operations. This more micro-level focus, however, retains meso-level connections to macro-level analyses of power, authority, and legitimacy in finance across time and space (Muellerleile, 2017). Significantly, the diverse and contradictory nature of these infrastructures serves as a platform for observing power dynamics in the financial economy (Brandl and Dietrich, 2023). Historical analyses of financial infrastructures detail power struggles among different entities, such as exchanges, storages, telegraph companies, and courts (Pinzur, 2016, 2021). Approaching finance infrastructurally in this second way still connects to big-picture concerns of power, authority, legitimacy, and inequality, yet in ways that pay more attention to matter and to sociotechnical nuances.

Both infrastructural gazes counter tendencies toward reductionism in macroeconomics as well as wider neglect of materiality in studies of finance. Complexity made a comeback a decade after the 2007–2008 global financial crisis, as “macro-finance” emerged as a key lingua franca for analyzing finance, even amongst nonspecialists (Dutta et al., 2020). Macro-level views of finance are valuable yet can overlook the more mundane materials and social relations that enable global finance to come together – and that can tear it apart in times of crisis as well as shape financial relations in more minute ways in periods of “normality.” The infrastructural gazing into global finance by contributors to this volume builds on efforts to link SSF and fields such as IPE through meso-level approaches that foreground infrastructures in ways that avoid the pitfalls of oversimplification and further complexification (Bernards and Campbell-Verduyn, 2019). Broad questions

are asked about the seeming technicalities of finance. Specific answers to questions about how finance unfolds are provided by making meso-level connections between interactions at the micro level and phenomena at the macro level. Infrastructural gazing injects steadiness into the analysis of rapidly evolving sociotechnical relations while also avoiding tendencies to either dismiss novelty entirely or view everything as new. Novelty – in financial objects and practices – is thereby situated in wider interdependencies that come together as well as fall apart across time and space. Power and legitimacy concerns are tied to mundane technical systems that process transactions, market interactions, and monetary flows using distinct modes and rules of operations.

In short, examining the extensive interconnections of financial infrastructure enables linking overarching questions with particular, seemingly technical inquiries and intricate nuances. While emphasizing different aspects of micro and macro scales, all examinations of infrastructure highlight and connect elements often studied independently: materiality, power dynamics, inequalities, and technological advancements, crossing dichotomies of continuity and change, local and global perspectives, public and private domains, and collective and individual interests.

4 Overview of the Volume’s Contributions and Key Themes

Part I, “Conceptual Approaches,” begins by illustrating how infrastructures in finance are both distinguished from and overlap with institutions and devices (Chapter 3, Pinzur), platforms (Chapter 5, Roitman), and assets (Chapter 7, Golka). Chapters in this part expand on the relation between power and infrastructures via infrastructural power (Chapter 4, Coombs) and on payments as hegemony (Chapter 8, Westermeier and de Goede). Contributors vary in their views on the strengths of and limits to which varying ways of gazing at financial infrastructures illuminate agency, power, and legitimacy.

Arguing that the best way to understand a concept is through its critique (Chapter 2, Muellerleile), this part includes a critical take on emphasizing infrastructures in finance (Chapter 6, Langenohl).

Chapters in Part II, “Histories of Financial Infrastructures,” maintain the first part’s conceptual thrust yet inject a deeper empirical view across time and space in ways that all emphasize the *longue durée* of financial infrastructures. Contributions in this part connect infrastructural relations unfolding over past decades to contemporary developments, with a focus on post-socialist developments (Chapter 12, Ehlke) and stock exchanges (Chapter 10, Handel), as well as their colonial legacies, with a broad view on Africa (Chapter 9, Bernards) and more specifically on Lebanon (Chapter 13, Atme). As in other parts of the volume, contributors here use perspectives from various scholarly disciplines to trace the sociotechnical relations involved in the (re)construction of financial infrastructures over time; for instance, how finance was integrated into the built environment of cities like the key financial center of London (Chapter 11, Eagleton-Pierce).

Part III, “Organizations and Actors of Contemporary Financial Infrastructures,” foregrounds nonhuman objects and human practices in the (re)construction of financial markets, from foreign and securities exchanges to clearing counterparties (Chapter 14, Petry; Chapter 15, Datz; Chapter 16, Krarup; Chapter 21, Genito and Lagna) to enactments of international financial flows, with forays into correspondent banking (Chapter 18, Nance and Tsingou), international bank transfers (Chapter 17, Kaltenbrunner and Orsi; Chapter 19, Robinson, Dörry, and Derudder; Chapter 20, Nölke), and efforts to instigate green transitions (Chapter 22, Fichtner, Jaspert, and Petry; Chapter 23, Seabrooke and Stenström). These chapters collectively foreground the materials, practices, and sociotechnical connections typically assumed to be running in the background, yet whose smooth functioning is central to facilitating varying inclusions and exclusions of specific groups, individuals, and whole countries in global finance.

The chapters in Part IV, “Digital Technologies and the Future of Financial Infrastructures,” trace continuity and transformation in financial infrastructures confronted with technological “revolutions.” While all chapter authors were asked to incorporate contemporary trends and events into their analyses, it is in this final section that processes current to the time of writing inform contemplations of where finance may go in uncertain futures. The chapters of this section focus on the effects of growing experimentation with blockchains and CBDCs (Chapter 29, Salzer; Chapter 30, Zhang, Cui, and Yang), social trading platforms (Chapter 25, Tong and Preda), and artificial intelligence (Chapter 31, Paraná). The rise of digital finance more generally is linked to broader developments of digitalization and connects to social media (Chapter 24, Swartz), means of identification, and inclusion, with examples from South Asia (Chapter 27, Singh; Chapter 28, Jafri) and Africa (Chapter 26, Langevin and L’Heureux).

5 Failures, Inequalities, Continuities, and Changes

Three themes emerge across all chapters: failures, inequalities, as well as continuities and changes. A first intersecting process that the infrastructural gazing across the four sections of this volume helps to understand is failure. Finance is full of failures and glitches. Infrastructural perspectives draw attention to these in ways that enable us to think about how things might be done differently. This is not only in moments of crisis but also as the processes and relations of finance are continually (re)constructed. Foregrounding financial infrastructures, in other words, instigates the politicization of what is typically seen as technical, natural, and backgrounded. Infrastructural approaches enable us to think of geoeconomic alternatives (to SWIFT, as Nölke describes) to notions of disruption, connecting these macro-level trends to micro-level attempts to, for instance, enhance informational and market security (Ferrari, 2023). Yet, who is able to undertake

infrastructural inversion and politicize the technical is far from evenly distributed, both in the practical and scholarly sense, given the resources needed to wade through the technicalities of finance (Bowker, 1994). These inequalities link to a second theme permeating the volume.

Second, infrastructural gazing illustrates different inequalities in relations often thought to be, or acted upon in manners assumed to be, universal. Despite the general openness of infrastructures, the financial infrastructures traced in this volume are exclusionary. We know about digital divides, credit apartheid, and other hierarchies, but how these are (re)inscribed, embedded, and made real in and across national borders is often assumed rather than closely examined and explained (Roitman). Infrastructural approaches enable the tracing of colonial legacies in instruments and processes ostensibly seeking to foster inclusion as chapters trace in Africa (Bernards), Latin America (Datz), the Middle East (Atme), and South Asia (Jafri). Other forms of intersectional inequalities – race, class, and gender – surely deserve more attention in future research that connects the analysis of financial infrastructure to already existing literature (Gabor and Brooks, 2017; Guermond, 2023).

The third cross-cutting insight is how infrastructural gazing overcomes thinking about a dichotomy of continuity versus change in finance. Instead, infrastructural gazing enables an emphasis on how both processes tend to occur at once in any given place and at any given time. While infrastructures have profound path dependencies and tend to sediment relations into “installed bases,” they also shift in subtle (as well as not-so-subtle) ways (Star, 1999). Conceptually, thinking in terms of infrastructures helps to shift beyond the well-known inadequacies of seeing continuity or change in further dichotomized relations between the public and private, formal and informal, local and global. Infrastructural approaches reveal the various forms of entanglement between these often taken-for-granted analytical categories, such as how the public/private divide is in practice bridged by relations

between state and nonstate actors, technologies, and technical objects that amount more to hybrid interconnectivities than to separate spheres of activity. Analysis of financial infrastructures thereby advances studies of how nonstate actors fulfill “public” tasks traditionally undertaken by states and vice versa such as how state actors increasingly participate in spheres traditionally considered to form “private” spheres of financial activity (Best and Gheciu, 2015).

6 Conclusion

Infrastructural gazing, as outlined in this chapter, foregrounds infrastructures as sociotechnical relations disabling or enabling politics at varying, intersecting scales and spaces, from the micro to the macro. Shifting away from a focus solely on objects and fixed perspectives when examining infrastructures, the interdisciplinary scrutiny of various aspects of global finance by contributors serves to politicize what are commonly depicted as mundane technical background elements. As a whole, this volume goes beyond intuitive notions for making sense of the extensive interconnections of global finance. The infrastructural gaze piecing together and piercing through finance undertaken in this volume embraces the complexities of these sociotechnical relations without reducing them to simple things or single persons in understanding who acts and how.

In foregrounding infrastructures, this volume highlights the politics of their creation, maintenance, (re)design, and contestation. Contributions deepen and expand the growing policymaker, scholarly, and citizen attention paid to the underpinnings of global finance. The volume provides a foundation for discussions among academic, practitioner, and policy communities who often only talk among their own groups and focus only on their idiosyncratic understandings of financial infrastructures. As a resource embracing the interconnectedness of global finance, this volume also counters the reductionism of academia in

general and of macroeconomics in particular by embracing the complexity of finance. Retaining the benefits of foregrounding the big picture, macro views are linked and deepened in this volume, as macro and micro are connected via meso-level approaches. In so doing, the diversity and complexities of finance are embraced in ways that avoid the pitfalls of both oversimplification and overcomplexification.

While this volume provides a foundation for public and scholarly debates on the past, present, and future of financial infrastructures, there remain areas of activity – processes, people, and actors – that require exploration. At a time of seemingly continual growth in geopolitical tensions, the (inter) national security roles and implications of financial infrastructures are especially deserving of further research that does more than assume their passive “weaponization.” As this volume stresses, infrastructures are acted upon and harnessed by powerful actors, but not always in ways and with outcomes that are intended. Further explorations at the intersections of financial infrastructures and (geo)political security rationales should be attentive to these developments.

While several chapters foreground the inequalities and disconnection that are ingrained into financial infrastructures, the ways in which individuals, particular groups, and regions are excluded or privileged in their financial interactions need further unpacking (Alami et al., 2023). A growing strand of literature has foregrounded racialized, gendered, and other forms of inequalities within finance. This is an important furthering of attention to the various intersecting hegemonies in and between financial infrastructures (see Chapter 8; de Goede, 2021; Bernards, 2022).

There are also further connections to be explored between financial infrastructures and the underpinnings of trade and production, as well as leisure and entertainment in a digitizing world economy. As distinctions between structures and actors often considered separately become increasingly blurred, the very naming of infrastructures as “financial” comes into question. Given financialization,

but also gamification and other processes integrating finance in all aspects of life, it may no longer be necessary to qualify infrastructures as financial. This includes high politics but also the everyday politics of work and leisure that involve objects and practices either hailing from or overlapping with finance (Campbell-Verduyn, 2024).

The study of infrastructures, whether or not they continue to be qualified as financial, promises to continue enhancing the understanding not only of scholars, but of citizens, consumers, and policymakers for years to come.

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Part I

CONCEPTUAL APPROACHES



CHAPTER 2

Derivatives, Market Liquidity, and Infrastructural Finance

Chris Muellerleile

1 Introduction: Infrastructural Liquidity

Whatever one's theory of, or political stance on the proper role of finance, it is difficult to deny that financial liquidity is crucial to the reproduction of contemporary capitalism. Capitalist states are increasingly preoccupied with maintaining flows of money, credit, and capital investment, and financial markets are crucial to that circulation. Over recent years central banks have gone to great lengths to avoid another market freeze like what happened during the Global Financial Crisis (GFC) of 2008–2009. At the heart of that crisis was a collapse of liquidity (Nesvetailova, 2010), and we can only understand ongoing state support of financial markets by studying the state's preoccupation with maintaining liquidity (Langley, 2015). But what exactly is liquidity, who does it serve, and why? These questions are rarely asked, although some attention has recently been paid to uneven access to liquidity and how this relates to inequality (Adkins, Cooper, and Konings, 2020; Konings and Adkins, 2022). What is clear is that fifteen years after

the GFC, and despite widespread resentment of the financial sector, that sector is more deeply entangled with capitalist economies and states than ever before. This state support is the starting point for my argument that financial markets have become infrastructural.

This state–finance–liquidity entanglement can only be understood in the context of half a century of layered financialization. Innovations in securitization (Leyshon and Thrift, 2007) and assetization (Birch and Ward, 2022), combined with record levels of financial debt (Streeck, 2014), mean that financial stability has become increasingly dependent upon circulation through financial markets. Financial derivative contracts, which did not exist until the early 1970s, now constitute an enormous system of marketized financial risk management that is crucial for coping with uncertainty related to the future value of assets. They are deeply entangled with debt maintenance, portfolio management, currency exchange, and international trade, not to mention their privileged position in energy, raw material, and agricultural markets. The size of the global

derivatives market is typically (and crudely) measured at five or more times the size of world gross product.¹ Furthermore, marketized, short-term repurchase (repo) agreements between financial institutions, which are not derivatives but are typically coupled with derivatives trades, are now the main way central banks lend and thus influence macro-financial liquidity on a daily basis (Gabor and Ban, 2016) and are an important part of central banks' pivotal role in 'new' state capitalism (Sokol, 2023). Together, these developments contribute to the widespread marketization of financial relationships across socio-economic fields. As a result, capitalist states treat *financial markets* as a crucial underpinning of production, circulation, and consumption, and thus as a system that must be protected from both endogenous and exogenous threats. In other words, liquid financial markets are now treated as a *critical infrastructural system*.

The concept of liquidity is most recognizable as a defining characteristic of money. Money is considered liquid because it can be exchanged for other things with little friction or cost. As a liquid store of value then, money is a hedge against uncertainty. But in societies where markets are the dominant mode of distributing goods and services, including the basic necessities to sustain life, liquidity can be a matter of life and death. As such, the 'preference' for liquidity, as Keynes (1936) understood it, becomes a driving force of social organization in capitalism (Aglietta, 2018). This desire for liquidity, which we might think of as the option to exchange later, is institutionalized in the financial sector, and as such is one of the basic organizing principles of post-1970s financialized capitalism (Meister, 2021).

In the financial sector derivatives function in a similar way to money liquidity. They allow actors and institutions to put off decisions about their interest in specific commodities or assets. Meister (2021) calls this quality of derivatives 'optionality', which is the capacity to delay choices into the future, but at the same time continually calculate the costs of those delayed decisions.

On one hand then, finance capital has internalized optionality and the risk

management that goes with it. But like all attempts to profit in capitalism there is an imperative to keep value – or in this case money, financial instruments, and their valuation – in motion. As such, financial market liquidity has become the *sine qua non* for the reproduction of contemporary capitalism, and the market freeze of the GFC was the exception that proved the rule. This is why, on the other hand, capitalist states and civil societies have developed an 'infrastructural imaginary' (Langenohl, 2020). Because, just as risk management of individual assets has been internalized within the financial market system, the entire risk management system must, in the final instance, be backed up by the state. This chapter interrogates both the market systems that constitutes this financial infrastructure and the politics that are necessary to sustain it. In relation to the latter, the chapter asks how we might rethink politics in the age of financialization, and not least the politics of uneven access to liquidity across socio-economic classes.

The rest of the chapter is organized into four sections. Section 2 sets the scene by defining financial infrastructure in both socio-technical and political economic terms. Section 3 explores the development of financial interconnection since the 1970s, focusing on derivatives and their unique relationship with liquidity and the state. Section 4 dives deeper into the financial, temporal, and spatial functions of derivatives. Section 5 concludes the chapter by employing the concept of infrastructural inversion to rethink liquidity. It then offers an analytical path toward turning that politics of financial infrastructure on its head by questioning whether society really needs to rely so heavily on marketized optionality and liquidity.

2 Solidifying Infrastructural Politics

As this volume demonstrates, there are socio-technical (Pinzur, this volume) and political economic (Coombs, this volume) reasons that contemporary finance appears to be infrastructural. But rather than making a strong ontological argument about

the infrastructural nature of financial systems, I am interested in the effects of capitalist states treating finance, and specifically financial markets, as infrastructure. While money, finance, and the state have a long history of entanglement (Muellerleile, 2020), since the September 11, 2001 terrorist attacks on the USA and then to a greater extent after the 2008–2009 GFC, capitalist states have cast their infrastructural gaze upon financial markets, not least because they have become more vulnerable to breakdown. In this section I will offer three explanations of how this has happened, related to socio-technical dynamics, securitization, and state infrastructural power.

First are socio-technical dynamics that can be further sub-divided into three categories related to circulation, ordinariness, and capacity. To begin with, infrastructural systems tend to be enabling rather than directly productive, and the things they enable usually relate to movement, connectivity, and circulation through space (Larkin, 2013). Transportation, energy, and water systems are emblematic. Because they are connective, and, further, because they tend to connect to a wide variety of socio-economic sectors, they normally require ‘rights of way’ (O’Neill, 2013) through public and private space and across territorial or jurisdictional boundaries. Consider for instance the ways railways or oil pipelines criss-cross political territory. Furthermore, even though some infrastructural systems are privatized, they almost always serve both public and private purposes. Consider transport infrastructure, for instance.

Financial markets have many of the same circulatory characteristics. Rather than producing new economic value, they mostly assist in circulation of existing value,² the flows of which frequently cross political borders and produce novel financial geographies. Further, even though financial exchanges are now largely private enterprises (see Petry, 2021), they are heavily regulated by the state and endowed with quasi-public purpose, even if the vast majority of the benefits accrue to already existing wealth (Piketty, 2014).

Secondly, for those who have access to them infrastructural systems are often mundane and technical, typically operating in the background. As a result, at least for the everyday user, infrastructural systems tend to blend into everyday life, only drawing serious attention when they break down (Bowker and Star, 2000). Financial systems have a similar quality. Despite the growing integration of things like payment systems into everyday life, most financial operations are obscured from public view. Even when their inner workings are on display, during a financial crisis for instance, most people struggle to make sense of them. Like most infrastructure then, finance is a field of technical expertise.

Thirdly, because infrastructure is circulatory, but also technical, it also tends to have limited capacity. Whether vehicles, people, water, energy, or data, the systems that move these things have limits, and when they are pushed beyond their capacity they lock up or break down. A seemingly sensible solution is to increase the capacity of infrastructural systems. However, in a paradox originally identified by William Stanley Jevons (Alcott, 2005), and what traffic engineers call *induced demand*, increasing the technological efficiency and thus capacity of a technical system often incentivizes more use, which, rather than enhancing resilience, may just cause more dramatic breakdowns.

Financial markets have a similar finite capacity to process transactions in an orderly or liquid fashion (Langenohl, 2024). At the same time, digital technologies continue to expand the capacity of the market system to process trades. Regardless, when markets are pushed beyond their capacity, so-called fault lines can form (Campbell-Verduyn, Goguen, and Porter, 2019, pp. 923–926) and markets can break. These socio-technical breakdowns take different form in different historical or geographic contexts. It happened during the infamous 1987 US stock market crash, where telephone lines between New York and Chicago were overloaded and traders and other market actors could not access market prices fast enough (Muellerleile, 2018). So-called flash crashes are another instance, although at an accelerated pace

(Campbell-Verduyn, Goguen, and Porter, 2019, pp. 923–926). The bottom line is that financial markets are fragile, and technologically driven efforts to speed them up make them more, not less, vulnerable.

To summarize then, the first infrastructural quality of financial markets is that they are socio-technical in nature and this helps us understand their complexity and fragility, but also their relative ordinariness for everyday life. As such, it is perhaps unsurprising that states take an interest in ensuring that they function, and an interest in repairing them when they break down. This state interest has been evident since at least the dawn of capitalism, but the relationship between financial markets and capitalist states has deepened since the early 1970s, and this brings me to the second way that financial markets are infrastructural.

Since the September 11, 2001 attacks on the USA, and intensifying during and after the GFC, financial markets have become *securitized*, meaning they are treated as crucial for securing socio-economic futures (de Goede, 2010; Westermeier, 2019). Financial security, in other words, is not only important for capitalist accumulation, but also for the basic health and reproduction of capitalist society. As the USA in particular has become more focused on preparedness for emergency and crisis, financial markets are now subject to ‘vital system security’ apparatuses similar to government approaches to other interconnected systems like energy, transportation, and water (see Collier and Lakoff, 2015).

Langley (2015), for instance, has demonstrated that the state’s reaction to the GFC was a matter of financialized bio-politics. In the wake of a market breakdown, the state was mainly concerned with securing financialized well-being for the population, which began with rescue and repair of the financial market system. It is important to note, however, that the state chose to rescue banks, brokers, and insurance companies or, in other words, the institutionalized market system, rather than step around the market and provide direct financial assistance to the holders of mortgages who

were at risk of losing their homes. The priority was restoration of circulation through the vital infrastructural system rather than direct intervention to assist the end users of that system.

The third way financial markets resemble infrastructure relates to the ways states integrate with financial institutions to exert power over and through their populations. Mann (1984) called this infrastructural power (see Coombs, this volume), in contrast to despotic power, which is more direct, uninhibited, and often enforced through violence. Infrastructural power, which is associated with capitalist and democratic states, explains how states depend upon infrastructural systems for the distribution of power and influence through civil society (Mann, 1984). One example of this is the way the USA has intervened in mortgage markets to encourage single-family home ownership since the 1930s. These interventions have taken different forms, including iterative redefinition of mortgages, but with the common goal of (re)constructing a national market for mortgage finance (Ashton and Christophers, 2018). This exertion of state power via financial markets to encourage home ownership is not unique to the USA. While it took different forms, the basic strategy of encouraging middle-class home ownership in an effort to produce social stability was a common strategy among states in the Global North in the twentieth century (Forrest and Hirayama, 2015).

Perhaps a more profound example is the various ways that central banks depend upon private banks and financial markets to implement their policy goals and monetary governance strategies. Not unlike the USA, which began earlier in the 1970s, from the 1990s the EU attempted to develop a single, interconnected capital market system to encourage continent-wide and securitization-led capital investment (Braun, Gabor, and Hubner, 2018). Technocratic reformists within the Italian state, for instance, encouraged derivatives-based arbitrage between Italian and German state debt as a way to ease Italy’s entry into the Economic and Monetary Union (Lagna,

2016). Broader efforts to construct a single capital market stalled in the wake of the GFC, but since then, the European Central Bank (ECB) has actively employed financial markets to achieve its monetary policy goals (Braun, 2020). While post-GFC there was initially significant resistance to reintegration of a European repo market and serious proposals to implement a repo transaction tax, the banking industry successfully lobbied against this, and the repo market has rapidly expanded in size (Gabor and Ban, 2016). The ECB also directly assisted in the expansion of the asset-backed security market in Europe, changing its rules to accept the securities as collateral. As Braun explains (2020), all of this translates into a state–finance nexus of infrastructural power, ‘market-based central banking’, and, generally, the increasing influence of the financial sector over European economic policy.

3 Optional Entanglements

Financial derivatives have only existed since the early 1970s, and yet they now sit at the core of financial market systems. Derivatives create interdependencies between exchanges, asset classes, and national currencies, and thus contribute to the systemic or infrastructural nature of contemporary finance. In Section 4 I will explain this in more theoretical terms, but, first, in this section I offer some background on what financial derivatives are, and how they relate to risk management, marketization, and liquidity.

Derivatives enabled new marketized spaces long before anyone referred to financialization. In the middle of the nineteenth century, the development of agricultural futures markets (the direct ancestors of financial derivatives) in Chicago were co-constitutive with the emergence of telegraphs and railways and new semiotic systems for grading commodities (Carey, 1992, pp. 201–230; Pinzur, 2016, 2021). These systems converged on the Chicago Board of Trade (CBOT) where, after the US Civil War, the trade in grain futures contracts quickly outpaced the spot trade in physical grain. The futures market

allowed the exchange of the potential costs and benefits of uncertainty related to grain before it was harvested from the soil. Whilst insurance contracts had existed for centuries by this time, this was one of the first examples of marketized risk management. In addition to allowing hedging and speculation on either side of the contract, the futures market also improved the quality of the underlying collateral for agricultural credit because it could be risk managed (Levy, 2012). Another effect was an increase in liquidity by speeding up of the turnover time of agricultural capital (Henderson, 1999).

All of this led to a significant increase in speculative trading at the CBOT and other formal futures markets, and it was an important part of transforming the city of Chicago, along with its vast agricultural hinterland, into a capitalist commodification engine (Cronon, 1991). Along with the railways and telegraphs, the futures markets became crucial nineteenth-century infrastructure for an increasingly interconnected agro-capitalist national economy.

For the next hundred years formal derivatives trading was isolated within the agricultural, raw material, and energy sectors. But with the delinking of the US dollar from gold in 1971 the various market technologies and state regulatory apparatuses that were originally developed to trade agricultural derivatives were applied to financial instruments (Muellerleile, 2015). As the relatively ‘integrated monetary world space’ of Bretton Woods fell apart (Swyngedouw, 1996, p. 150), banks and corporations found it more difficult to predict the future value of money. Increasing financial uncertainty then produced new demand for risk management instruments, and new opportunities for innovators who might develop them. During the 1970s and 1980s markets were developed for derivatives trading on foreign currencies, corporate and government debt, and corporate share indexes, to name just a few.

In 1975 the US Congress mandated that that the US stock market regulatory agency, the Securities and Exchange Commission, develop a ‘National Market System’ for

the trading of securities. While there were competing motivations for the legislation in Congress and competing visions of the end product, almost everyone involved agreed that the securities markets were crucial for the ongoing development of the US economy, and that a key goal should be widening access to these markets for a broader array of American consumer-investors. Pardo-Guerra (2019, p. 268) characterizes this legislative-turned-socio-technical attempt to develop a national market society as *infra-structural*. In his telling, it was an attempt to construct a national scale ‘form of financialized kinship that established relations through a common infrastructure of participation’. Crucially though, this infrastructural market-making project was not limited to stock and bond markets, but soon included derivatives.

Derivatives markets differ in several ways from markets for underlying assets. The most obvious is that unlike asset markets, derivatives allow investors to realize gains and losses based on the fluctuating value of an asset without taking ownership of that asset. More importantly for this discussion, derivatives can usually be traded with much higher levels of leverage than the underlying assets. Whereas one is able to buy many financial securities, such as equities or highly rated bonds, with an initial investment of 50%, it is common in derivatives markets to be allowed to hedge or speculate on the same assets by investing only 5% of their value (Muellerleile, 2015). This was the case in the 1980s when Chicagoans developed futures markets on corporate share indexes that were mainly traded on New York ‘spot’ markets. There was an extended regulatory struggle over the amount of leverage allowed in these early financial derivatives markets, but the high leverage argument won the day, as it did in most early derivatives markets.

In October of 1987 the US equity markets dramatically crashed and much of the blame was directed at the highly leveraged derivatives markets in Chicago. While this was strongly contested by the Chicago derivatives traders, there is not space here

to examine this in detail. I have argued elsewhere (Muellerleile, 2018), however, that the metaphor of roads and traffic, as an infrastructural system, is a useful way to understand how the highly leveraged Chicago-based derivatives markets built at first slow and clunky telephone connections to the New York securities spot markets in the early 1980s. In the aftermath of the crash – the markets were repaired with expanded capacity for information exchange between the two, in no small part as a result of direct intervention by US government regulators. Where there was once two separate but related markets, the rebuilding of those connections with the aid of much faster ‘info-structures’ (see Campbell-Verduyn, Goguen, and Porter, 2019) created a newly integrated market system with an aggregate higher rate of leverage. As a result, this system became more, rather than less, dependent on maintaining market liquidity. This process of repair after 1987 was heavily influenced by the ongoing attempt to construct the US national market system.

Over the next twenty years, financial innovators developed both bespoke and standardized exchange-traded derivatives contracts on an endless assortment of financial assets. Not all of these developed into highly liquid markets, but what they all have in common is the capacity to draw risk management instruments, which are usually leveraged at a much higher rate, into direct relation with underlying asset markets.

The 2007–2009 GFC can be explained in many ways, but an important part of that explanation is the construction of new financial and informational interconnections based on turning relatively illiquid assets (homes) into liquid securities (Gotham, 2009). Through this came the production of new socio-technical time-spaces highly reliant upon the complicated but nevertheless systematic securitization of mortgages, derivatives on those mortgages, and derivatives of derivatives on those mortgages. The causal chain that led to the breakdown is not easily parsed, but a significant factor was the

unsustainable amount of leverage produced in a now deeply interconnected system of layered and marketized optionality, all of which was based on an illusion that money and market liquidity would never run dry (Nesvetailova, 2010).

This is not the place for a deep analysis of the GFC or the many fixes that were implemented in its wake. But it is worth considering that, similar to 1987, much of the discourse that framed the ‘problem’ of the GFC was one of liquidity, its lack, and its restoration (Langley 2015). More radical solutions (e.g., prohibitions on derivatives) were pre-selected out because the terms of the debate were designed around restoring the techno-economic order of financial capitalist circulation and risk management. Put differently, the crisis was framed as a ‘socio-technical accident’, the solutions to which contributed to the ‘subordination of political calculation to financial power’ (Engelen et al, 2011, p. 228). As such, the solution to the socio-technical problem was to repair the infrastructural breakdown, rather than ask if the infrastructure was actually serving the purposes it might have in a more equitable and less marketized world.

4 Risky Prices

A deeper understanding of the relationship between liquidity, economic interdependency, and derivatives requires separating the core functionality of derivatives from the process of derivatives trading.³ In the simplest terms, a derivative contract enables the transfer of risk between parties. Futures, options, and swaps set up a contractual obligation, usually to exchange a commodity or asset, or the difference in value of an asset over time, at an agreed date and price in the future.⁴ Buyers and sellers of derivatives may or may not have an interest in the underlying asset, and they may be attempting to hedge an existing risk or speculating by taking on more risk. Whatever the circumstance, in this basic form derivatives contracts have become an important part of risk management processes for both financial

and non-financial actors and institutions. But this is only the beginning.

Derivatives have a second, more dynamic function related to their exchange, or when they enter into circulation. Because derivatives are based on the future value of an underlying asset, the prices that derivatives exchange at allow financial modellers to *imply* the present value of that underlying asset. The exchange of a derivative contract always includes an element of guesswork about an uncertain future. As such, when a derivative price is agreed upon in a trade, this price becomes new information about the value of the underlying asset. In other words, it *makes a difference* in the future market value of an asset, and thus it also makes a difference in the present (Ayache, 2010). Financiers and economists call this effect price ‘discovery’, and it is often cited as one of the main benefits of derivatives trading. In effect, what derivatives trading does is isolate and codify the uncertainty over the future value of an underlying asset. It formalizes this uncertainty, converts it to quantifiable risk, and enables its exchange independently of the asset itself. The capacity to use derivatives prices to evaluate underlying assets is one of the basic implications of the Black–Scholes derivatives pricing model developed in the early 1970s, and it is no coincidence that the popularity of derivatives expanded rapidly in its wake (MacKenzie, 2006).

The formalization and marketization of uncertainty with derivatives is important for several reasons. First, increasingly more assets are held in institutional investment portfolios, and are thus subject to formal and continual evaluation and risk management processes. Derivatives allow portfolio managers to more effectively manage risk, and as such they enable portfolios to hold more risky assets. Secondly, by codifying and pricing risk, derivatives have made collateral (that which secures a loan) more liquid. There is a hierarchy of collateral with cash at the top because it is the most liquid asset. For non-cash collateral further down the hierarchy, a key measurement of quality is the option to sell it quickly at a known price (Krarup, 2019). Assets that

have associated derivatives markets thus make for better collateral because liquid derivative contracts both allow for direct risk management through trading, and also continually provide real-time information about the value of the asset.

Mirowski (2010) argues that the emergence of marketized financial derivatives has facilitated the construction of a system of market *computation*. The interconnected system of financial markets reduces the complexity of individual instances of uncertainty into legibly priced and tradable securities and derivatives contracts. The problem is that at the collective level these markets are *dissipative* systems, meaning that they enhance entropy or create irreversible complexity. Crucially, this is not a problem as long as the markets consistently function as price mechanisms. However, if for any reason the market system overwhelms the computational capacity of any particular market mechanism and that market suddenly loses its capacity to price risk, the entire market system loses its capacity to translate – or compute – the messy complexities of its financialized subjects into prices. In other words, the highly complex system of contemporary financial markets are subject to what Mirowski calls *inherent vice*, or, like most other infrastructural systems, the inherent tendency to fall apart. Left unrepaired, they leave economic worlds more uncertain and complicated than they were to begin with. This is not to say these worlds could not be made less liquid or *de-financialized*, but that is rarely considered in any serious way by state technocrats. Rather, the solution to breakdown, or the threat of breakdown, is almost always to increase the capacity of the system, to enable faster circulation, to make it more liquid.

Of course, price is only one kind of information that is crucial to financial markets. Financial modellers constantly seek new information about the qualities of assets and to predict future value. The production, transmission, and consumption of that information is complex, contingent, and reliant on ‘long chains’ of information that are vulnerable to breaking down and in constant need of translation (Campbell-Verduyn, Goguen,

and Porter, 2019). Making this more complicated, access to prices and other market-related information, as well as humans and machines that can translate data and information between contexts, is a field of intense capitalist competition (Grote and Zook, 2017; Grindsted, 2022).

This competition becomes more consequential when we consider that at the same time that financial markets are in a constant state of calculation, price-making, breakdown, and repair, so is financialized time-space itself. Put differently, capitalist competition in the financial sphere both maps onto existing urban, regional, national, and international spaces, and produces *new* financialized time-space (Pryke, 2017). Financial markets produce these new relational spaces, even though they are difficult to ‘see’. In fact, given the ‘unpredictable, intertwined, and relational’ nature of these space-times (Pryke, 2017, p. 108), they often only become legible when they break down or when financial crisis hits (French, Leyshon, and Thrift, 2009). But when the market transactions that are an integral part of this circulation slow down or stop, the interconnections begin to change. In 2007, when US housing prices began to slump, the supply of mortgage-backed securities slowed and the future became more uncertain. The derivatives markets that were entangled with mortgage markets became more volatile, and eventually it became more difficult if not impossible to model the most complex contracts. Market liquidity then dried up. At that point, rather than a global space of capital flows, liquidity, risk management, and accumulation, these connections transformed into relations of localized place, illiquidity, incommensurability, foreclosure, and bankruptcy. This is how a group of small towns in northern Norway, who, under advisement of an Oslo-based firm, had invested (and lost) USD 78 million in a highly complex, New York-based mortgage securitization fund, could suddenly find itself unable to build the school and nursing home it planned because indebted home owners in Florida or Nevada could no longer make their mortgage payments (Aalbers, 2009).

I am quickly skimming over the surface of highly complex relationships. Perhaps the town councils of northern Norway were defrauded. Perhaps they should have known better. The point I am making is that these global connections were enabled by the search for profit in the financial sector as well as the capacity of an integrated market system to simplify highly contingent and complicated economic relationships into relatively simple matters of prices, profits – and, eventually, losses. Making sense of this infrastructural system of finance, and ultimately developing alternative ways of organizing a post-financial capitalist economy, requires that we look closely at the socio-technical details of these systems, but it also requires a critical political economic lens, because what is increasingly apparent is that the ‘politics of liquidity is ... at the core of how capitalist finance works’ (Konings and Adkins, 2022, p. 52).

5 Inverting Liquidity

So far I have explained how the circulation of financial derivatives has engendered interconnection in the financial market system, and how this has contributed to capitalist states turning their infrastructural gaze towards the financial sector, especially at times of breakdown. In this final section I turn to a more radical way to understand liquidity, and its absence, in financial markets and socio-economic relations more broadly. This begins by turning liquidity on its head. It begins with the assumption that financial markets are always in a state of disrepair, or put differently, always in a state of illiquidity. In other words, it begins by appreciating that the interconnection both within the financial market system, and between it and the broader capitalist economy, is perpetually wavering. If this is the starting point, it is easier to see that the socio-technical maintenance of the financial market system is not the exception, but the rule.

While not specifically concerned with finance, Bowker and Star (2000, pp. 33–50) referred to this kind of approach as ‘infrastructural inversion’. To invert infrastructure

is to attend to the politics or economics of the opacity and technicity of infrastructure. It is to ask how the technical operation or mundanity of an infrastructural system is itself consequential. It is to take seriously the flaws of the infrastructural imaginary, or the assumption that infrastructural systems are by nature functionally neutral and fully operable for all of society, which, as many have pointed out, is rarely the case. The inversion foregrounds how infrastructure capitalizes on ‘porousness, incompleteness, and uneven accessibility’ (Langenohl, 2020, p. 15), and in the process obscures inequality built into the infrastructure from the start.

Returning to liquidity in finance, to invert is to appreciate that financial markets mainly benefit the financial sector and the investor class, even if the credit the financial system distributes is crucial for social reproduction across class divides. It is to invert the idea that liquidity is the normal, stability-producing, ‘functional’ state of a financial market system, that liquidity is a technical prerequisite for the functioning of markets, and finally that illiquidity is a state of disrepair that should always be corrected by the state. In the words of Meister, it is to ‘transform the concept of financial market liquidity from an assumed precondition of capitalism to an object of political contestation’ (2021, p. x).

In a financial market, one key measure of liquidity or ‘market depth’ is the relationship between offers to buy and sell. This is the *spread* between the bid and ask prices. The most liquid or ‘deepest’ markets have the smallest spreads, the most pending orders awaiting execution, and the smallest price changes in the face of (large) buy or sell orders. In other words, liquid and deep markets are relatively orderly and stable in the face of changes to supply or demand, while illiquid and shallow markets are more volatile. But while liquidity implies relative stability, dealers, market makers, and other market intermediaries benefit from spreads because they constitute opportunities for arbitrage (buying at one price and simultaneously selling at another, and taking the difference as profit), or opportunities to appropriate a

bit of the spread by facilitating an exchange between two other parties. As such, who benefits from the spread in various markets is an object of intense competition in finance.

Put differently, the spread represents the very necessity of the market to begin with. If there was no spread, supply and demand would be in equilibrium, there would be no need for negotiation, and no need for market makers. A condition of absolute liquidity is nonsensical in capitalism, as, amongst other things, it would mean that prices do not change over time or space, which implies zero market volatility and thus zero uncertainty. In this abstract condition there would be no need for derivatives because there would be no uncertainty regarding volatility or changing prices in the future.⁵

The more practical point is that liquidity is relative and relational, or in other words, market liquidity only matters in *relation to market illiquidity*. Market liquidity only matters in relation to what is exchanged, by whom, and at what speed. In terms of access to money, liquidity only matters in relation to a future where money can be exchanged for something less liquid.

Algorithmic and high-frequency trading (HFT) offer an extreme, but nevertheless helpful, example of this symbiosis of (il)liquidity. HFT is basically a method of high-speed arbitrage. Algorithms search for tiny spreads both within and between markets (e.g., a derivative and its underlying asset) and trade both sides to profit on the difference (see Grindsted, 2022). Space is an important dynamic in HFT strategies. Trading firms invest capital to position their hardware at optimal locations in proximity to market order-book computers to gain nanosecond advantages. One result is that HFT deepens markets by adding a large number of bid and ask orders, and it increases liquidity by narrowing spreads through constant arbitrage. At the same time, HFT is so fast that it can jump the queue by reading the order book of waiting trades and executing in advance of slower traders (perhaps everyday investors) who then suffer a higher or lower price than expected (Grindsted, 2022).

As such, HFT puts pressure on the capacity of the market system to process trades, which in the mundane can result in higher volatility and larger spreads, and in the extreme can result in a ‘flash crash’ like what happened in May of 2010 when the New York securities markets experienced about a 9% drop and recovery in value over a period of thirty minutes. Campbell-Verduyn, Goguen, and Porter (2019) explain this and other related crashes in terms of pressure on the capacity, and subsequent breakdown, of chains of information transmission, which is undoubtedly true. But we must also consider that the informational interconnection of financial actors, firms, and markets exemplified by HFT is part of a broader set of ‘relational spatial strategies’ that ‘convert distance and speed into trading advantage’ (Grindsted, 2022, pp. 1391, 1393). In other words, there are incentives and rewards in the financial market system for interrupting market liquidity and/or producing relative illiquidity. This was true in the age of face-to-face trading, the age of telegraphs, and now in the digital age.

The point of discussing HFT is to demonstrate that access to liquidity is itself subject to the competitive dynamics of capital. Another way to think about this is that the dominant mode of managing uncertainty in contemporary capitalism is by accessing money liquidity and derivative risk management, but access to this ‘service’ is itself a profit-seeking dynamic of financialized capitalism (Konings and Adkins, 2022). The highly technical system of interconnected markets that is necessary to reproduce both risk management services as well as financial sector profitability, is, as the capitalist state sees it, infrastructure. And when the state repairs this vital system, it necessarily repairs marketized finance capital, including its capacity to reproduce socioeconomic inequality.

This helps explain ongoing efforts to develop global-scale market infrastructures to manage climate-related uncertainty by converting it to financial risk (Bracking, 2019). The effects of climate change translate into a kind of radical uncertainty that modern institutions, including states, struggle to cope with. Within the bounds of capitalist ideology, the

existing financial infrastructure is perhaps the only system capable of converting this climate-related uncertainty into both manageable risk as well as a profit-making opportunity. But again, for financial calculation to function as an effective climate-risk coping mechanism will rely on maintaining (il)liquidity, which is unlikely to succeed without significant state support for finance capital writ large.

Despite what may appear as an argument of inevitability, it does not need to be this way. And it is worth examining by way of a brief conclusion what would be necessary to disentangle state support for truly vital systems from state support for finance capital. The more precise question in my view is what would be necessary for a situation where the state could allow the financial markets to crash and some significant portion of financial capital to be destroyed without also destroying the lives of millions if not billions of common people?

The answer is implied in the first question – disentanglement – or more precisely de-financialization. Specifically, it would require removing or separating the crucial commodities of basic, everyday life from finance capital. The most obvious example is houses, but similar arguments could be made for health care, education fees, not to mention many of the objects of more conventional infrastructure like the provision of water and public transportation. Currently, at least in the USA and UK, many of these things are only available to most people via massive quantities of private and public debt. Servicing of this debt requires access to liquidity, which has become, in the words of Minsky, a basic ‘survival constraint’ (see Konings and Adkins, 2022). But if we learned anything from the GFC, capitalist states are rarely inclined to rescue indebted homeowners even when they are subject to predatory lending by finance capital. Rather than offering a liquidity rescue to individual borrowers, the state preferred to repair the financial infrastructure, perhaps in the flawed hope that the infrastructure would serve everyone equally.

Other than the accumulation of financial profit, what, after all, is the purpose of

creating a market infrastructure of derivative optionality for homes? These are big questions, and there are no easy answers. Certainly, the politics of de-financialization will be messy to say the least. But if a larger proportion of homes, welfare services, and ‘real’ infrastructural systems like energy provision were ‘de-assetized’ and publicly owned, not only would there be less need for the perpetual option to convert them into cash, the financial sector would also shrink dramatically, making it less powerful and less dependent upon the state. Democratic society ought to have the power to provide some level of certainty for itself – a different kind of optionality – without relying on a financial sector that is both technically flawed and (infra)structurally dependent upon the state.

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Notes

1. At the time of writing (April 2023), the World Bank estimated the world gross product for 2021 at USD 96 trillion: <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD>. The Bank for International Settlements estimated the outstanding value of all over-the-counter derivatives at the end of 2021 to be USD 598 trillion. This does not include commodity contracts, credit default swaps, or exchange-traded derivatives, which together would add roughly another USD 50 trillion: www.bis.org/statistics/derstats.htm?m=2071.

2. There is an important, but complex debate over the productiveness of the financial sector that I cannot engage with in this chapter (cf. Lapavistas, 2013; Christophers, 2018). My basic assumption is that even if the production of risk is a source of surplus value, the vast majority of the profits in finance are a result of enclosure and rent.
3. This is an artificial separation and I do it here only for analytical purposes. In actuality, the two functions are dependent upon, and entangled with, each other.
4. When a derivative trader has an interest in the underlying asset, the contract is similar to insurance contract. The insurer takes on risk and is paid a fee (premium) as compensation. The insuree lays off risk and pays a fee to the insurer for this benefit.
5. One way to think about this is a system of price controls where markets still facilitate exchange, but do not function as price mechanisms.

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CHAPTER 3

Where Does Infrastructure Sit in the Callonian Perspective on Markets?

David Pinzur

Since at least the pioneering work of Michel Callon in the 1990s, social scientists have attempted to understand markets as emerging from hybrid, socio-material processes. A vast body of work, using concepts such as actor-networks, socio-material assemblages, market devices, and market *agencements* has utilized a Callonian framework. Recently, another term with roots in science and technology studies (though not *only* in STS – see Coombs’ chapter, this volume) has found favour in the study of markets: infrastructure. Scholars use the term to refer to socio-technical ‘systems through which basic but crucial enabling functions are carried out, but that tend to be taken for granted and assumed’ (Bernards and Campbell-Verduyn, 2019, p. 776). The concept has been applied to an array of elements – evidenced in the breadth of this volume – from barcode scanners and warehouses, to electronic order books and clearinghouses, payment systems and accounting schemes (Genito, 2019; Kjellberg, Hagberg, and Cochoy, 2019; Pardo-Guerra, 2019; Banoub and Martin, 2020; Martinez, Pflueger, and Palermo, 2022; Brandl and Dieterich, 2023).

Given their common roots in STS it is unsurprising to see similarities between the market infrastructure perspective and the Callonian view. Infrastructures, like devices and *agencements*, are held to be socio-materially hybrid assemblages or ecologies, featuring both ‘hardware’ and ‘software’: not just physical technologies, but organizational protocols, regulatory standards, and cultural ideas (Edwards, 2003). Also, they are similarly understood to ‘emerge’ or ‘occur’ through ongoing practice rather than to simply ‘exist’ as simple objects (Bernards and Campbell-Verduyn, 2019). Finally, like *agencements*, infrastructures format the character and agency of the people and things that they encounter in the market (Pardo-Guerra, 2019; Çalışkan, 2020). In the STS-inflected view, infrastructure, like *agencement*, is socio-material, performative, and locates ontology in a hybrid network.

These points of commonality have usefully allowed Callonian and infrastructural perspectives to develop in concert. But they have also made it possible to delay engagement with their differences. Beginning this

engagement is the aim of this chapter. The chapter asks: Where does infrastructure sit in the Callonian framework on markets? How does scholarship on infrastructures prompt us to re-evaluate actor-network theory (ANT)-inspired work on market *agencements*? Does the Callonian perspective encompass market infrastructures and, if so, what is gained from an approach that pulls them out for special attention?

I argue that the focus on infrastructure highlights a pragmatically and phenomenologically important boundary elided in the Callonian perspective between components of an *agencement* that are physically and cognitively present to actors and those which – though critical to action – are not. This boundary in terms of presence is occasionally recognized, but never explicitly theorized, in Callon's framework. Incorporating this boundary into a theoretical perspective on markets has two major benefits. First, it helps us to see a distinct form of 'infrastructural power' (Pinzur, 2021) at work within market *agencements*. This power stems from the asymmetric relations of dependency and discretion that exist between the operators of infrastructures and their users. This asymmetry produces unequal dynamics around the alignment of framings in a market *agencement* that remain unspecified in Callon's flat perspective. Secondly, this division draws attention to the unique features of the 'boundary objects' (Star and Griesemer, 1989) that flexibly connect components of *agencements*. These boundary objects, being vaguely structured at a general level yet adaptable to the particularities of local settings, help to resolve the ongoing struggle of holding together market *agencements* whose components are pulled in different directions. This concept, I argue, handles the problem of 'multi-framing' (Callon, 2021) better than the established duality of framing and overflowing (Callon, 1998a). By recognizing the boundary between infrastructures and other elements of *agencements* we thus become aware of underexplored dynamics within Callon's perspective and gain tools with which to conceptualize these.

1 Callon and the Sociomaterial Turn in the Sociology of Markets

Use of actor-network theory to study markets heralded a sea change in economic sociology. Prior sociological work had conceptualized markets as institutionalized spaces featuring actors 'embedded' within, shaped, and constrained by a social context of laws and regulations, organizational rules, relationally enforced norms, and status hierarchies. By contrast, Callon, inspired by work on distributed cognition and action (Hutchins, 1995), asked not how markets and economic actors were constrained, but how they were composed. The goal of his analysis was not 'giving a soul back' to *Homo economicus* (Callon, 1998b, p. 51) by situating economic behaviour within a social context, but rather de-naturalizing the individual and the market, tracing how both took form through coordinated, distributed, materially mediated practices.

Key to this analysis have been the concepts of market devices and market *agencements*. The language of devices, defined as 'material and discursive assemblages that intervene in the construction of markets' (Muniesa, Millo, and Callon, 2007, p. 2), featured in the earliest ANT-style economic analyses. The concept enabled scholars to look at the impact of distributed physical technologies and economic representations on market actors' day-to-day work. More recently Callon and others have favoured the closely related term *agencement* (Çalışkan and Callon, 2010; Callon, 2021). The move is more about emphasis than conceptual divergence. As opposed to the notion of a device with its suggestion of a thing to be picked up and used by a person, each distinct and whole, *agencement* emphasizes the ways that humans and material objects form unique, agentic networks. This highlights what Callon and others see as the ontological character of distributed action and cognition: distinct *agencements* do not just equip actors differently, they create hybrids with different loci and degrees of agency. It is in this sense that we can meaningfully talk about market actors that are individual, collective

(‘the firm’s employees’), or even anonymous (‘market forces’), which operate with different forms of calculativeness (Callon, 2008).

Critically, market *agencements* do not form simply by accident: they are formulated with the precise goal of orienting collective action towards bilateral transactions (Callon, 2021). *Agencements* organize five different ‘framings’ – producing active agencies, producing passive objects, arranging encounters between buyers and sellers, establishing prices, and maintaining the market – which together structure and coordinate economic action (Çalışkan and Callon, 2010; Callon, 2021). These framings are themselves performative outcomes of materially mediated, distributed procedures variously described as qualification, singularization, pacification, and activation (Callon, Méadel, and Rabeharisoa, 2002; Callon and Muniesa, 2005). They are the constitutive, socio-material processes by which markets and economic actors are built up across networked environments.

A market *agencement* thus consists of networked humans and non-humans enacting the five framings that underpin bilateral transactions. While these framings in pursuit of a strategic goal allow us to define and delimit *agencements* conceptually, doing so empirically is more challenging. The breadth of individuals, technologies, and texts involved in these five framings is extraordinary. Just consider how many are involved in a single piece of any one framing, for example, the creation of advertisements that attach consumers to goods, the construction of industry standards that establish a legible price, the regulation of consumer safety by the state, and so on. But, more significantly for the topic at hand, *agencements* have *depth*. Çalışkan and Callon (2010, p. 9) claim that ‘*agencements* denote socio-technical arrangements from the point view of their capacity to act’. But any given socio-technical arrangement’s ‘capacity to act’ is wrapped up in and dependent on further socio-technical arrangements: a trading desk in an investment bank, for example, operates in conjunction with organizational rules and processes, international law, undersea cables, and so

on. Any single actor (human or non-human) making a trade is designated and empowered to act by virtue of their position within a *agencement* that includes screens displaying prices, analyses drafted and circulated within an organization, computer programs that synthesize massive amounts of data, statistical networks that produce this data in the first place, and so on. It is in this sense, quite true that ‘nothing is left outside *agencements*’ (Çalışkan and Callon, 2010, p. 9).

This capaciousness helpfully demonstrates the massive effort behind every market transaction. But it also tends to efface an important pragmatic and phenomenological boundary between those actors, devices, and representations actively invoked, referenced, or manipulated in the everyday conduct of market action and those that – while crucial to the success of the *agencement* – remain hidden, inaccessible, and unmanipulated. This distinction and boundary, though unnamed and unspecified, is clear in prior ANT-inspired work. On one hand we see devices that gain value precisely through their components materially intervening in the strategy, calculation, and perception of transacting parties. Such devices are often appended with the particular actions they enhance or contribute to: they are ‘optical devices’ or ‘evaluative devices’ (Beunza and Stark, 2004), ‘calculative device[s]’ (Callon and Muniesa, 2005). They are actively and creatively engaged by individuals as aids in the market (Knorr Cetina, 2003; Preda, 2006). On the other hand are devices that support or prepare the ground for these: not the FICO (Fair Isaac Corporation) score, but the ‘scorecard’ that brings together the relevant data points; not the marketing materials, but the focus group that generates knowledge of consumers; not the derivative instrument, but the regulatory distinctions and accounting techniques that permit its construction (Muniesa, Millo, and Callon, 2007). These devices (which some scholars might later call infrastructures) come to matter in their ability to produce a taken-for-granted baseline from which actors can use *another* ready-to-hand set of objects to calculate, act, and trade. While Callon would

certainly recognize that market actors relate to these objects and processes in different ways – some with intense focus, others as a taken-for-granted background – the notion of *agencement* offers no way to theorize the importance of this difference. Conversely, this distinction is precisely what infrastructure makes visible and theorizes.

2 Infrastructure as Absence

I describe the distinction between the infrastructural and non-infrastructural components of an *agencement* as a difference in ‘presence’. Viewed phenomenologically from the angle of a transaction, infrastructures matter in a different way than ready-to-hand devices like screens, reports, or analytics: they are neither present nor accessible, cannot be manipulated, are not active and lively intervening components. Rather than remaining at the surface of action, they become deeply embedded in organizational routines and bureaucracies. Functioning infrastructures tend towards invisibility; they ‘seamlessly fade into the background as if natural elements of our human environments’ (Pardo-Guerra, 2019, p. 7). This backgroundedness – the possibility of forgetting that these technologies, organized practices, and rules even exist at all – is precisely what makes market infrastructures useful (Guseva and Rona-Tas, 2014). They allow actors to marshal ready-to-hand devices in pursuit of profit on the assumption that most, if not all, of the other components of a market *agencement* are properly aligned. Infrastructure’s cognitive absence to market actors is a crucial ingredient in producing a calculable and actionable environment.

The cognitive presence or absence of devices is often accompanied by their physical presence or absence as well. Those devices that are actively manipulated for calculation tend to be more contained in space and time, assembled by an organization for its own distinct purposes, affording market actors a greater plasticity. For instance, new market analyses are produced daily using proprietary software and trading algorithms are tweaked

constantly over the course of their short lives to reflect and accommodate changing market circumstances (Beunza and Stark, 2012; Borch and Lange, 2017). Similarly, the customizability of trading desks – with more or fewer screens, displaying different types of information – demonstrates the value of this device as a physical aid to local, embodied calculation and action (Beunza and Stark, 2004; Beunza, Hardie, and MacKenzie, 2006). The aim is precisely for these devices to differ from those being used by competitors, so as to manufacture unique profit-making opportunities (Erturk et al., 2013; Hardin and Rottinghaus, 2015).

By contrast, infrastructures tend to span multiple sites or events (Edwards, 2003; Silvast and Virtanen, 2019). This can be a physical spanning of distance via information and communication technologies (e.g., sub-marine cables or satellite networks) or an administrative harmonization via standards, classifications, and protocols (Bowker and Star, 2000; Guseva and Rona-Tas, 2014; Pinzur, 2016). This broader scope coordinates action across distant settings, creating a situation where ‘local practices are afforded by a larger-scale technology’ (Star and Ruhleder, 1996, p. 114). The politics and uneven impacts of this relation between the global and local is why payment, settlement, and clearing systems have attracted so much attention from infrastructural scholars. Infrastructures including the European interbank payment system (Jeffs, 2008), the European Union’s Target 2 securities settlement infrastructure (Krupar, this volume), and the SWIFT (Society for Worldwide Interbank Financial Telecommunications) financial messaging system (Robinson, Dörny, and Derudder, this volume) all show the tricky questions and tough relationships that characterize infrastructures that span these scales.

3 Issues at the Boundary

Summing up the previous section, we see that scholarship on market infrastructures distinguishes *within* market *agencements* between

elements that are physically and cognitively present to actors and those that – while critical to action – are not. This distinction is elided in Callon's presentation of market *agencements*. But why does this boundary matter? What does it help us to see or understand more clearly?

The following sections argue that this boundary helps us to recognize and theorize two important, understudied dynamics within *agencements*. First, this boundary aligns with an asymmetry in market *agencements*: local, ready-to-hand devices depend on the smooth operation of broader infrastructures, but the opposite is not true. That is, the impact of infrastructures in (mis)aligning the components of an *agencement* far exceeds that of local devices. This asymmetry translates into a distinct form of 'infrastructural power' (Pinzur, 2021) accruing to actors with discretion to enable or disrupt everyday routines for a wide swathe of the market. Secondly, this boundary draws attention to a different view of how to maintain cohesive *agencements* despite the inevitably multiple ways in which objects and activities are framed by distinct actors. Where Callon sees this 'multi-framing' as an ever-present source of overflowing to be contained and reframed, infrastructural scholarship suggests a more flexible approach. The concept of 'boundary objects' (Star and Griesemer, 1989) – artefacts, concepts, or methods that simultaneously retain a general, shared form and can be adapted to divergent particular applications – offers a tool with which to rethink the nature of alignment and misalignment, making ubiquitous multi-framing less of a threat to market action.

4 Asymmetry, Discretion, and Infrastructural Power

As discussed, Callon argues that market *agencements* are held together through the alignment of framings across actors and environments, collectively organizing action towards the single goal of bilateral transactions. In treating these myriad framings at the

level of the collective (i.e., what matters is that the whole *agencement* stays aligned) Callon does not discuss the differential roles that individual acts of framing might play. But, in fact, when we consider the divide between local devices and global infrastructures – the components that are cognitively and physically ready to hand in everyday action versus those that support action, but are not present in the same way – it becomes clear that not all framings performed by every component of an *agencement* are equal. In fact, the framings accomplished by infrastructures are asymmetrically more important.

This, of course, is not to say that changes or struggles over smaller components of an *agencement* are necessarily inconsequential. Any set of framings that breaks out of line – whether related to a focus group, a stock index, a computer screen, or any other market device – initiates a struggle to re-establish alignment. The result may be bringing the offending framing back in line or it may lead other components of an *agencement* to change themselves. Donald MacKenzie's analysis of high-frequency trading offers a fascinating version of just such an analysis. MacKenzie traces the back-and-forth development across the fields of trading, exchange, regulation, and politics, where alterations of the market *agencement* in one area (e.g., new rules around Nasdaq's Small Order Execution System) provoke responses in another (e.g., development of ATD's (Automated Trading Desk's) trading algorithms or Island's open order book), which redound on yet another (e.g., moving from fixed role to all-to-all markets), and so on (MacKenzie et al., 2012; MacKenzie and Pardo-Guerra, 2014; MacKenzie, 2018, 2021). This is a history of local instances of bricolage, innovation, and opportunism: a large-scale shift in *agencement* built up from successive breakdowns and realignments of framings.

But the case of HFT also shows us the limits of this symmetrical analysis. MacKenzie (2018) notes that the most important ongoing relation in this case is the mutuality established between exchanges and trading firms. Today the most important alterations in framing involve exchanges developing

HFT-friendly infrastructures – for example, co-location, ultrafast matching engines, rebates for market makers – in an effort to attract liquidity. There is a feedback effect: exchanges that offer the most enticing infrastructures attract more trading, which makes them more liquid, which makes them even more appealing sites for trading. The competition among exchanges to provide infrastructure has become the core of their business, extending beyond HFT to the provision of indexes, clearing services, trading platforms, and more (Petry, this volume). Critically, while exchanges and firms both rely on each other, this dynamic is not symmetrical. As access to top-notch infrastructure becomes a necessity for firms – both for the liquidity and the competitive advantage it provides – global exchange groups grow larger, wealthier, and more influential.

Drawing a distinction between infrastructures and ready-to-hand devices highlights an important divide in how alignment translates into power and influence. There is an asymmetry in dependency – devices need infrastructures to work, but not the other way around – which translates into an imbalance in the scale of disruption that would result from any changes to framings or stoppages of work. How many devices, or components of an *agencement*, would become inoperable – and thus quite radically ‘unaligned’ – if a particular infrastructure was not working as usual? How many things would become impossible to do or think as a result? Because of their global scope, their general invisibility, and their efficient handling of basic functions, infrastructures become enmeshed in and critical to vast numbers of market processes. A change in or breakdown of infrastructure thus means an immediate and profound misalignment across myriad market actors. This asymmetric interdependency offers a mechanism by which infrastructural actors, through their discretion to upset alignments of many framings at once, can exert outsized power and influence.

Elsewhere (Pinzur, 2021) I have referred to this as ‘infrastructural power’ (drawing out its connections to, but possibly also confusing with, the tradition from political

economy, see Coombs, this volume). This outsized power is held by actors with discretion to disturb the smooth functioning of a market infrastructure, in the process provoking leveraged misalignments with a large number of local, device-mediated calculations and actions. For instance, nineteenth-century American commodity exchanges used their positions within key infrastructural processes to exert influence over the form of crop-statistic and price-quotation networks – core aspects of the five framings (Pinzur, 2021). In other instances, we see that power comes from the discretion to control access to an infrastructure. This is the power of the global exchange group wielding exclusive control over a set of goods and services whose absence would cause a crisis of misalignment for traders (Petry, this volume). It is also the power, exceptionally applied, of saboteurs (e.g., protesters clogging the streets of Frankfurt to keep bank employees from reaching their desks) or natural disasters (e.g., Hurricane Sandy knocking out elements of global financial infrastructure) (Folkers, 2017).

As discussed, though Callon recognizes the diversity of relations between market actors and the various components of market *agencements* – for example, that focus groups are core work for marketers but simply one bit of information for executives planning a branding campaign – he does not theorize these distinct types of relations. This leaves his view of an undifferentiated, flat *agencement* ill-equipped to account for shifting scales of alignment and the imbalances of power these asymmetries create. By contrast, recognizing the boundary between hidden infrastructures and ready-to-hand devices highlights the unique form of ‘infrastructural power’ and leveraged misalignment that exist within a single market *agencement*.

5 Alignment, Multi-framing, and Boundary Objects

The previous section considered the issue of how to align multiple components – objects, practices, discourses, people – within a single

agencement. But Callon also notes the additional challenge that any single component may become entangled in several, distinct framings or *agencements* at once: Callon calls this being ‘multi-framed’ (Callon, 2021, p. 366). This multi-framing creates a local tension – keeping an *agencement* aligned even when many of its components are pulled in several directions at once – for which Callon, admittedly, has no general solution. I argue that an infrastructural perspective using the concept of ‘boundary objects’ (Star and Griesemer, 1989) offers traction on this issue.

Multi-framing occurs in settings where multiple *agencements* overlap. Take, for example, a university’s scientific research laboratories. In such an environment components may simultaneously be framed with a market *agencement* (e.g., making genetic material patentable intellectual property that can be bought and sold), a scientific *agencement* (e.g., making genetic material a resource to be made widely available for basic research through collaborative networks), or even a religious *agencement* (e.g., making genetic material a divine substance that ought not be manipulated). The economic challenge of a multi-framed object is ensuring that it is not pulled so far out of its framing within a market *agencement* that it becomes untradeable or disorders collective action in the market. For example, regulators can influence the format and framing of credit scores (e.g., banning the use of particular types of personal information), but *only* if they do not disturb the score’s role within the market *agencement* that promotes and sustains lending. This produces conflicts over framing that must be resolved locally.

Callon cautions against thinking that such conflicts are rare. Given the inherent openness of *agencements* and their components, multi-framing is, in fact, widespread. While we can certainly associate components to a market *agencement* by their participation in the five framings, ‘we should not forget that each site and activity is also caught up, at the same time, in other collective actions, in other types of *agencements*’ (Callon, 2021, p. 366). In each of their components and sites, market *agencements* grapple with other

modes of *agencement*. In fact, multi-framing is so pervasive that the work of ensuring objects, people, and activities maintain their roles in markets despite being caught up in various non-market *agencements* is the core of market maintenance. And yet, despite the near ubiquity of this phenomenon, *how* this resolution occurs is a mystery. In response to the question of how these opposed tendencies are made compatible, Callon admits that ‘there is, as far as I know, *no satisfying answer to this question*’ (Callon, 2021, p. 368, emphasis added).

I suggest that Callon and other economic sociologists can find one ‘satisfying answer’ in the literature on infrastructure, particularly in the concept of ‘boundary objects’ (Bowker et al., 2016). In contrast to Star’s concept of infrastructures, which has been eagerly adopted in the study of markets, this popular and closely related notion has not yet been taken up. The key feature of a boundary object is that it spans multiple groups and environments, both enabling collaboration and coordination across these *and* being adaptable to dissimilar uses in their various settings. Their defining feature is their ‘interpretive flexibility’, the ability to toggle between being vaguely structured at the general level and precisely structured in particular settings (Star, 2010). Boundary objects ‘are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. ... They have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation’ (Star and Griesemer, 1989, p. 393). They can take multiple forms: artefacts (e.g., repositories, indexes), concepts (e.g., ideal types, classes), or methods (e.g., standardized forms) (Star, 2010). For instance, Star and Griesemer (1989) show that animal and plant specimens, field notes, and maps served as boundary objects in the scientific practice of a natural history museum, allowing collaboration among academics, volunteer trackers, animal trappers, and donors despite their divergent concerns, practices, and conceptions.

While research on markets has not invoked boundary objects explicitly (Millo and MacKenzie, 2009, is an exception), I would argue that prior research has used the concept implicitly. Consider, for example, work on derivative-trading investment banks and clearinghouses, two organizations whose actions must be aligned so as to promote transactions, yet which frame these transactions' elements in starkly different ways. Scholars have identified several boundary objects at work in this coordination. The first of these is the derivative itself. While the derivative maintains a single, general identity in both environments (i.e., actors can agree on its identity, differentiate it from other derivatives), at the level of practice banks and clearinghouses decompose the same complex derivative transaction differently to suit their own local needs and purposes (Millo et al., 2005; Genito, 2019). Financial risk-management techniques are another boundary object, enabling communication and coordination among trading firms, clearinghouses, and regulatory bodies, yet being differentially incorporated into their particular workings. Financial theories operate as 'a "plastic" medium ... able to accommodate different practices while allowing awareness about the common elements of the practices to evolve and strengthen the connections among the actors' (Millo and MacKenzie, 2009, p. 651). This sort of relation between infrastructures, devices, and boundary objects can even be seen *within* investment banks. Front-office and back-office divisions may treat a given security as a single, general object in their communication with one another, yet handle it in dissimilar and sometimes incompatible ways in their day-to-day work (Muniesa et al., 2011). These boundary objects, sitting at the interface of different components within an *agencement*, enable distinct groups pursuing divergent concerns to nonetheless collaborate in pursuit of an overarching goal.

Boundary objects thus offer a way of understanding how cohesively aligned market *agencements* can be maintained despite the (possibly conflicting) multi-framings of their various components. Notably, the concept also offers greater flexibility than

the pairing of framing and overflowing, the current means by which Callon attempts to understand components' entanglement in different *agencements*. Framing and overflowing are metaphors of containment, struggle, and rigidity: one must ensure that one's own framings are not overflowed, prevent key elements of one's environment from being co-opted into other frames, and force alignment across the multiple components of a market *agencement* (Callon, 1998a). Boundary objects, by contrast, suggest a dynamic of flexible cooperation, where important elements are able not only to exist simultaneously within multiple framings but to be simultaneously *aligned* with multiple framings. Boundary objects thus are not only multi-framed, but can be 'multi-aligned'.

This discussion highlights the likely multitude of boundary objects mediating between local devices and infrastructures. An infrastructure is only an infrastructure when it seamlessly supports the use of more local tools: alignment is a requirement. But, given the physical and cognitive distance between actions in each setting, it is almost unavoidable that common objects and activities will be framed differently (e.g., as they are in investment banks and clearinghouses). In this case, the operation of market infrastructures would hinge on the mass mobilization of boundary objects. Identifying these, how they are used, the extent of their flexibility, and how they contribute to crises or breakdowns could be fruitful areas of future study. In fact, they are already the subject of some concern. Scholars warn that clearinghouses are increasingly becoming too tightly aligned with their clients, with key boundary objects losing some of their flexibility and thus increasing the potential for systemic crisis (Millo et al., 2005; Genito, 2019; Thiemann, 2022).

6 Conclusion

Where does this leave us on the central questions of this chapter? It is clear that the notion of infrastructure is broadly compatible with the Callonian framework on market *agencements*. The concepts share several

core principles. Additionally, infrastructure does not posit an empirical object that is outside of or in conflict with *agencements*, but rather posits a distinction and boundary in presence – between components that are physically and cognitively present to market actors and those that, while critical to action, are not – within it.

This boundary is useful for helping us to recognize and theorize dynamics that escape notice when our attention is on whole market *agencements* or even when we break them down according to the various framings they organize. First among these dynamics are the asymmetries attending alignment. Callon argues that the requirement to align framings within an *agencement* creates an environment of constant struggle as actors innovate and compete precisely by altering dominant framings. An infrastructural perspective does not dispute this point, but simply notes that this is not an even fight. Changes to the framings accomplished by infrastructures exert a far greater impact, causing ‘leveraged misalignment’ that disturbs the routines of myriad actors. The implications of this and the ‘infrastructural power’ it produces for how markets evolve, and their competitive and innovative dynamics, is a topic for further study. Secondly, Callon sees the multi-framed components of market *agencements* as a threat to the strategic goal of bilateral transaction; actors must constantly seek to keep these components aligned within a market framing in the face of unavoidable overflows. An infrastructural approach, drawing on the notion of ‘boundary objects’, offers a different view, one of flexibility rather than rigidity. Boundary objects, able to toggle between vaguely and precisely structured, accommodate these differently aligned components, permitting global coordination despite local differences. In fact, the notion of boundary objects suggests that Callon’s strict binary between alignment and misalignment may be too blunt and that, perhaps, alignment and misalignment co-exist in complex ways that require greater attention. In these ways, infrastructure as a concept and empirically

identifiable object enriches Callon’s framework on market *agencements* and opens new areas for research.

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CHAPTER 4

Infrastructural Power in Financial Governance

Its Meaning, Applications, and Varieties

Nathan Coombs

1 Widening the Infrastructural Gaze (Yet Further)

As Westermeier, Campbell-Verduyn, and Brandl (Chapter 1) propose in the introduction to this volume, social scientific studies of financial infrastructure come in two varieties. The common form of ‘infrastructural gazing’ locates agency within socio-technical relations. Orientated towards the technical details of markets and their materiality, this line of thought has its provenance in the social studies of finance and science and technology studies (Preda, 2001). Such infrastructural gazing keeps the big picture in sight when addressing power, authority, and legitimacy; but it does so by attending to the invisible background work performed by cables, market devices, and mathematical pricing models (Bernards and Campbell-Verduyn, 2019).

The other form of infrastructural gazing Westermeier, Campbell-Verduyn, and Brandl identify, and which this chapter focuses on, begins from the macro-political context. Rather than tracing innovations bottom-up, studies adhering to this approach

start with questions such as: How is state authority transmitted throughout society? What are the implications of the increasing centrality of financial markets in economic life? How do transformations in money and taxation challenge assumptions about the boundaries between public and private spheres? Standard fare for political economists and economic sociologists one might think. But it was not until historical sociologist Michael Mann’s (1984, 1993) concept of infrastructural power was introduced to interdisciplinary finance studies that a conceptual tool was available to bring financial infrastructure into the field’s engagements with these questions. Mann’s concept is now regularly invoked by scholars seeking to marry their interest in the fine details of financial infrastructure with macro-political debates about financialization (Walter and Wansleben, 2020; Wansleben, 2023), monetary hybridity (Braun, 2020), dollar hegemony (Schwartz, 2019), and central bank power (Coombs, 2022; Coombs and Thiemann, 2022; Wansleben, 2023).

This chapter contributes to the macro-political vein of scholarship on financial

infrastructure by seeking to widen its gaze (yet further). Section 2 presents Mann's argument that infrastructural power underpins the state's capacity to penetrate civil society. Section 3 surveys applications of the infrastructural power concept within interdisciplinary finance studies. Section 4 seeks to increase the analytical precision of work on infrastructural power by developing ideal types of its instrumental-, communicative-, and network-forming varieties, illustrated with historical and contemporary examples. The conclusion indicates limitations of the concept for evaluating whether public or private actors hold greater power in financial governance.

2 The Meaning of Infrastructural Power

The idea of infrastructural power will be intuitive for scholars who place financial infrastructure at the centre of their analyses. Infrastructure is not agency-free background matter, but critical for how financial relations are constituted and reproduced. However, to understand what Mann means by infrastructural power requires attending to his analysis of how states exercise political power. This section begins by outlining Mann's concept, before returning to the question of how Mann's concept aligns with the science and technology studies-inspired view of financial infrastructure.

Mann first proposed his concept of infrastructural power in response to the 'Marxified Weberianism' of scholars such as Theda Skocpol, which views state organization as determined by class and international state relations (Mann, 1984). Mann rejects this understanding as reductionist. Concerned with accounting for processes of change rather than developing a universal state theory, the question motivating Mann's theorization of infrastructural power is: How did modern states come to exercise such extraordinary power over populations within their territories compared to the despotic power wielded by rulers in the Middle Ages?

Mann observes that absolutist sovereigns had almost unlimited executive authority. Despotic power does not require 'routine negotiation with civil society groups' (Mann, 1993, p. 59). And yet, despotic power is limited in scope – ancient and medieval sovereigns could do little to influence their subjects' day-to-day behaviour. Vice versa, while modern states have a much greater 'capacity to actually penetrate civil society and to implement logistically political decisions' (Mann, 1986, p. 170), the autonomy of their executives is circumscribed. Liberal democratic states routinely intrude into the everyday lives of their citizens but are mostly impotent to change the rules of the game, relying on civil society to validate and implement their decisions. The state has always had some degree of infrastructural power, Mann argues, but it was decisively supplemented by the Industrial Revolution of the nineteenth century and the world wars of the early twentieth century (Mann, 2008).

While Mann considers infrastructural power an exclusive modality of state political power, it is important to recognize that Mann's categories are *ideal types* – analytical constructs meant to assist comparative work and the discernment of historical patterns, not to carve up the social world into metaphysical essences (Mann, 1986, p. 4). As such, his distinction between despotic and infrastructural power is not in most historical situations a question of either/or. The two types of power co-exist in dialectical tension, and increasing infrastructural power 'does not necessarily increase or reduce ... despotic power' (Mann, 1993, p. 59).

Another implication of Mann's Weberian methodology is that it requires situating the concept of infrastructural power within the 'promiscuous' architecture of power types developed in the Sources of Social Power quadrilogy (Mann, 1986, 1993), which intermingle, bisect, and fuse at historical junctures (Mann, 1986, p. 17). Social power has, Mann argues, four main sources: Ideological, Economic, Military, and Political (the IEMP model):

- *Ideological power.* Ideological power is the control of ‘ultimate meanings, values, norms, aesthetics and rituals’ achieved by religious and secular ideologies (Mann, 1993, p. 7). An example is the development of ‘infrastructures of discursive communication’ (Mann, 1993, p. 105) which gave rise to class and nation in the eighteenth century, first under the influence of organized religion and then with the development of printing presses in commercial capitalism. A more contemporary example would be the emergence of the ‘neoliberal thought collective’ in the twentieth century, which utilized think tanks and transnational networks of economists to spread their ideas (Mirowski and Plehwe, 2015).
- *Economic power.* Mann identifies economic power with an overall increase in ‘collective’ (positive-sum) capacities for organization as well as ‘distributive’ (zero-sum) power. While spreading in a diffuse fashion, economic power can augment the infrastructural power of states by increasing national production capacities and accentuating hegemonic structural advantages. Examples include when the British pound served as a global reserve currency under the nineteenth-century gold standard or when international currencies were pegged to the US dollar under the Breton Woods system in the twentieth century.
- *Military power.* Military power is ‘concentrated-coercive’ (Mann, 1986, p. 26, original emphasis) power. It refers not only to the ability to fight and win wars against adversaries, but also to coerce labour for agriculture, mining, and the building of physical infrastructure and city fortifications. Given the challenges involved in projecting military force over long distances, military power is fundamentally *logistical*: it resides in the organization required to sustain armies relying on long supply chains.
- *Political power.* Political power is the control exerted by states spatially over national territory. Infrastructural power is a key resource for political power in

the modern era. It derives from emergent developments in civil society which allow states to communicate their decisions and mobilize social and material resources to achieve their goals.

As should be clear, Mann’s notion of infrastructural power, though defined in contradistinction to despotic power and reserved for describing the logistical capacities of states to impose their political will (Mann, 2008, p. 358), is imbricated with the wider array of power types proposed by his IEMP model.¹

Stepping back from Mann’s theorization of infrastructural power, a relevant question for placing Mann’s analysis in dialogue with work on financial infrastructure (particularly Westermeier, Campbell-Verduyn, and Brandl’s micro-oriented ‘infrastructural gaze’) is: What does Mann mean by ‘infrastructure’ and how does it align with the use of the term in science and technology studies? These questions are surprisingly difficult to answer. Mann uses the term ‘infrastructure’ loosely. It is not obvious if what Mann means by infrastructure differs substantially from his understanding of a power network. For example, when referring to the weak infrastructural power of ancient empires, Mann identifies their infrastructure with the aristocratic classes (Mann, 1986, p. 170). Mann’s rare definitions of ‘infrastructure’, such as ‘routinised media through which information and commands are transmitted’ (Mann, 2008, p. 358), are suggestive but rather unsatisfactory. A contemporary reader expecting the agency of organizations and networks to be clearly delineated from the invisible background work of infrastructure might feel they are conflated in Mann’s work. Certainly, Pinzur’s (Chapter 3, this volume) distinction between institutions and infrastructures would be frustrated if applied to Mann’s comparatively indiscriminate use of the term.

The unclear alignment between Mann’s understanding of infrastructure and science and technology studies-inspired approaches does not mean that Mann’s concept of infrastructural power cannot shed light on

financial infrastructure.² Indeed, Mann's identification of markets as an infrastructure which states take advantage of to increase their power has been productively put to work by scholars to grapple with state-market hybridity and financialization processes. It is to this literature we now turn.

3 The Applications of Infrastructural Power

Mann's concept initially had little impact on the studies of financial markets which emerged with the new economic sociology and international political economy of the 1980s and 1990s; and it has only recently become a fixture of the conceptual landscape of the field of interdisciplinary finance studies (for an overview see Samman et al., 2022). In this section, I trace the imprint left by Mann's concept, noting how its reception within the field of interdisciplinary finance studies often treats infrastructural power as a synonym for financialized state action. This work is insightful but, if taken as definitional, risks excluding deeper historical dynamics and other modalities of infrastructural power in financial governance.

To this author's knowledge, Bruce Carruthers' *City of Capital* (1996) is the first example of Mann's notion of infrastructural power being put to work in scholarship on financial markets. Carruthers cites Mann when seeking to explain how the weak early modern English state was transformed between 1672 and 1712 into a political and war-making powerhouse (Carruthers, 1996, p. 37). The historical situation addressed by Carruthers tracks closely to Mann's distinction between 'despotic' and 'infrastructural' power. Carruthers observes that England's enemy at the time, absolutist France under Louis XIV, enjoyed almost four times the population and a strong centralized bureaucracy. England, on the other hand, remained a weak state throughout this period because the monarchy shared power with a fragmented set of institutions such as courts of law, Parliament, and local government (Carruthers, 1996, p. 15).

In an ironic twist, it was the difficulties Charles II encountered funding the Nine Years' War (1688–1697) against the French which encouraged innovations in public finances which increased the English state's infrastructural power. A shift to direct tax collection and the development of capital markets for long-term public debt allowed England (and, after the political union with Scotland in 1707, Britain) to emerge as a formidable rival to France. The development of joint-stock companies, such as the Bank of England, East India Company, and the South Sea Company, all heavily invested in government debt, allowed the construction of a powerful 'fiscal-military state' (Carruthers, 1996, p. 83) because these companies' shares could be easily traded in liquid, public markets. As a result, the English-cum-British state was able to increase its spending from £1.6 million per annum in 1662 to £7.9 million in 1712, funded at dramatically lower interest rates (Carruthers, 1996, p. 80). This is one reason why Adam Smith in *The Wealth of Nations* memorably described the Bank of England as a 'great engine of state' (Smith, 1970 [1776], p. 419). The role of the Bank in early modern English state formation did not lie just with printing the symbol of Britannia on its banknotes (Helleiner, 2003); financial markets and political power were intertwined in the development of new fiscal infrastructures which the English state successfully leveraged in its war efforts.

Moving forward a decade and a half, Martijn Konings' (2010) reflections on the 'pragmatic sources of modern power' was the first text situated within the new interdisciplinary field of finance studies to draw on Mann's concept of infrastructural power when addressing contemporary concerns. Konings asks why, despite repeated prophecies by political economists of the decline of US state power due to economic globalization, the power of the USA has proven so durable. He credits this to processes of institutionalization which unfold outside the boundaries of the formal state at the state-market nexus. Konings cautions that we should avoid a 'residual economism' (Konings, 2010, p. 83) predicated on the

belief that the forces unleashed by liberalized markets will eventually tame the exceptionalism of US state power. Konings notes that the financial crises of the neoliberal era have led to an unprecedented growth in the organizational reach of American regulatory agencies as they sought to manage the instabilities provoked by liberalized markets. In the process, the USA became regularly involved in the management of the financial system, from the bailouts of banks to the backstopping of stock markets to the emergence of the Fed as market maker of last resort during the 2008 crisis. The USA saw its infrastructural power blossom not wither in the face of market turmoil.

Konings' article was an important trailblazer, but Benjamin Braun's (2020) study of the European Central Bank's (ECB's) promotion of market-based banking in the aftermath of the 2008 crisis has done the most to popularize Mann's notion of infrastructural power in interdisciplinary finance studies. Whereas Konings seeks to show how state power is bolstered by liberalized financial markets, Braun highlights an ambivalent dynamic where state power becomes dependent on financial infrastructures, impeding public interest reforms.

Braun finds support for this dynamic not in the idea of regulatory capture, financial sector lobbying, or in the structural power of finance, but in Mann's depiction of the hybridity of state–society relations, where the extension of state power through private sector infrastructures is a 'two-way street' (Mann, 1993, p. 59) which allows private sector interests to exert power over the state. Taking seriously the bilateral nature of infrastructural power helps Braun to explain the opposition of the ECB to the European Commission's post-crisis financial reform projects, such as the ill-fated proposal for a financial transactions tax on run-prone repurchase agreement transactions (repos). Because monetary policy in the Eurozone relies upon shadow banking for its transmission, the ECB was defending its interests by opposing reforms which would impact the liquidity of repo markets. Braun and Gabor (2020) extend

the analysis transatlantically to the role played by the Federal Reserve in promoting shadow money in the late 1990s.

A final major study drawing on Mann's concept of infrastructural power is by Walter and Wansleben (2020). These authors close the loop between Greta Krippner's (2011) work on the origins of financialization and Braun's (2020) analysis of the entanglements between monetary policymaking and shadow banking. Walter and Wansleben credit Krippner as correctly pointing out that early 1980s monetarist experiments in targeting monetary aggregates led the Federal Reserve to realize that deregulated financial markets worked to their advantage. The Fed's decisions regarding interest rates were transmitted more quickly and with less friction through liberalized markets. Where Walter and Wansleben part ways with Krippner is in finding this not simply a fortuitous discovery by the Fed when it was using monetarism as a rhetorical shield for pursuing unpopular interest rate hikes. Instead, Walter and Wansleben detail how changing practices 'altered the very architecture of finance and redefined the sources of "infrastructural power"' (Walter and Wansleben, 2020, p. 627).

Walter and Wansleben identify central banks' infrastructural power with the new operational alignments central banks forged with market structures in the 1980s. This repositioned central banks' discount rate as an anchor for long-term refinancing costs, allowing central banks to target non-borrowed reserves in their open market operations. The change, however, came at the price of ceding control over credit growth in the economy. Citing Bourdieu's turn of phrase, Walter and Wansleben thus describe the Federal Reserve's and Bank of England's growing infrastructural power as in 'ontological complicity' with financialized capitalism (Walter and Wansleben, 2020, p. 629).

Other studies also draw on Mann's concept (e.g., Schwartz, 2019), but I focus on the Konings–Braun–Walter and Wansleben line of thought because it provides the common reference point for how infrastructural power is today understood within

interdisciplinary finance studies. To summarize, ‘infrastructure’ for these authors is the complex of deregulated money markets central banks work through to transmit policy decisions. The ‘power’ being exercised is a two-way relation of influence between market actors and the state (with central banks understood as extensions of the state despite their ostensibly independent status). These studies explain why financialization should not be seen as a progressive erosion of state power by market forces but as increasing the state’s infrastructural power. These thinkers also effectively utilize the bidirectional dynamics highlighted by Mann’s concept of infrastructural power when accounting for governing authorities’ increasing dependency on financial markets, which constrains the potential for public interest reforms.

These are significant accomplishments. Nevertheless, I want to argue that an exclusive focus on post-1970s financialization processes risks transforming Mann’s concept into a mere synonym for financialized state power. I consider this problematic because, first, there is no reason why infrastructural power in financial governance should be uniquely associated with developments in recent history. As noted, Carruthers’ (1996) study demonstrates that infrastructural power dynamics stretch back at least as far as the late seventeenth century with the formation of the English state’s fiscal apparatus.³ A second reason why it is problematic to associate infrastructural power exclusively with financialized state action is that this significantly narrows the range of applications of Mann’s concept. As I shall show in Section 4, the idea of infrastructural power can be used to theorize diverse devices, governance techniques, and markets.

To better engage these diverse sources of infrastructural power in financial governance, in Section 4 I develop a typology inspired by Mann’s Weberian IEMP model. For scholars engaged with the intricacies of technical practices, the typology is intended to help link the ‘macro’ to the ‘micro’ without loss of resolution. My examples are admittedly quite state-centric, in that they concern the power of public authorities over

financial markets. However, in the cases I examine, because they rely on public authorities enlisting private sector actors in governance processes, they also grant private sector actors power over these processes and limit the potential for reform.

4 The Varieties of Infrastructural Power

4.1 *Instrumental Infrastructural Power*

Studies of infrastructural power make the excellent point that states and regulatory authorities do not relate to markets simply as rule-makers and rule-enforcers (Braun, 2020). States are fully endogenous actors, whose interventions and governance techniques shape the evolution of markets by affecting the portfolios, asset allocation, and profits of financial firms. I term these interventions *instrumental infrastructural power*. By using the word ‘instrument’ I am inspired by the common definition of financial instruments as assets which can be bought and sold on markets. I am also including the ‘instruments’ which central banks and bank supervisors speak of when describing how they intervene into the management of financial firms. This power is ‘infrastructural’ in Michael Mann’s sense because it works through the same markets, calculative techniques, and asset classes which financial market actors themselves use.

An example of instrumental infrastructural power is the evolution of central banks’ open-market operations (OMOs). In brief, OMOs involve the buying and selling of short-dated government bonds to target a specific interest rate in the money market (such as, e.g., the Federal Funds Market). When the central bank buys bonds from the market it credits reserves to banks’ accounts and increases market liquidity; when the central bank sells bonds, banks are required to spend reserves to purchase them, which drains liquidity from the system. By modulating the availability of reserves, a central bank can affect the interest rate banks charge to lend to each other as well as

driving banks to the discount window where the central bank can directly determine the interest rate it charges for supplying liquidity. In this way, by manipulating the price of short-term liquidity, central banks can intervene countercyclically to deflate inflationary pressures or stave off deflationary pressures in an economic downturn.

The development of OMOs was decisive for increasing central banks' instrumental infrastructural power in the twentieth century. At the beginning of the century, there was little sense that central banks should be guided by social purpose (Özgöde and Jürgenmeyer, 2023). They had by this point recognized their responsibilities as lenders of last resort, but their primary goals remained the stabilization of the money market and protection of the gold reserve (Eichengreen, 2008, p. 35).⁴ The idea that central banks should seek to maximize employment, let alone lean into the winds of the business cycle, would have seemed implausible.

That would change in response to the US Depression of 1920–1921 (Mints, 1945, p. 271), which prompted the development of new state infrastructural capacities. After the depression, the Federal Reserve Banks found themselves with limited options to acquire business assets and invested heavily in treasury securities. In doing so, they discovered that their purchases could exert a tightening effect on money markets (Knodell, 1987). This innovation would be capitalized on by Fed Governor Benjamin Strong (1914–1928): first, by centralizing open market operations in the New York Fed and assembling a durable infrastructure of primary dealers as the conduits for the Fed's OMOs; secondly, by forging an alliance with the National Bureau of Economic Research, founded in 1920 (Özgöde and Jürgenmeyer, 2023). The alliance with this institution allowed Strong to re-envision OMOs as an instrument for countercyclical macroeconomic governance. Public policy goals would henceforth be pursued by enlisting the financial transactions of private sector actors. In tandem with the knowledge supplied by the payments system,

FedWire, and afterwards the National Income and Product Accounts (NIPA system, the basis for gross domestic product (GDP) calculations, see Özgöde, 2020), the Fed constructed a centralized infrastructure allowing them to govern the economy through OMOs and to monitor the effects of their interventions.

There forward OMOs have operated as instruments which bolster state infrastructural power by allowing the central bank to penetrate deep into the workings of financial markets and the economy. The boundary between state and economy would be accordingly shifted with every change to the rules and norms governing this infrastructure (Coombs and Thiemann, 2022). Fed Chair William McChesney Martin's decision to focus OMOs on the purchase and sale of short-term treasury bonds was arguably the most consequential such decision, proscribing state action in markets to the short term until the launch of quantitative easing programmes in the twenty-first century (Conti-Brown, 2016, p. 43; Coombs, 2022).

In the decades since, OMOs have diffused globally to become central banks' preferred approach to monetary policy. The technique has also attracted criticism. Some claim that despite their original intention OMOs encourage central banks to follow the market rather than to lean into it countercyclically (Blinder, 2004). Hyman Minsky argues that the embrace of OMOs led to central banks withdrawing from day-to-day involvement in the economy, blunting their ability to stabilize financial markets (Minsky, 1977, p. 14). Quantitative easing programmes continue to unsettle both left and the right of the political spectrum, either for the inequalities they promote or for involving the state in markets with increasing intensity.

The value of adopting an infrastructural power view on these developments is that it places a question mark over whether there is any reverse gear from the use of OMOs by central banks. OMOs have not only become a highly durable infrastructure for implementing interest rate policies – part of the nuts and bolts of global finance – but

are also deeply entwined with the power of states to control their economies and influence the terms of global trade. OMOs have helped make government debt the lubricant of global finance, with fiscal and societal implications which exceed the technical origins of the practice and which have reconfigured state–society relations in macroeconomic governance.

4.2 *Communicative Infrastructural Power*

The second variety of infrastructural power in financial governance works through what in Mann's IEMP model might be described as an ideological power network. I define *communicative infrastructural power* as the power central bankers exercise when they successfully enlist the public in the implementation of policies by shaping their expectations about the future. Differentiating between the communicative and instrumental varieties of infrastructural power helps to disentangle the confusing thicket of words, rhetoric, and action simultaneously at play in central bank interventions into markets.

Historically, communication was not a source of strength for central banks and regulatory authorities. For example, the nineteenth-century political economist David Ricardo once complained about the Bank of England's frustratingly gnomish responses to basic questions about their operations when questioned by parliamentary committees (Kynaston, 2017). Twentieth-century Bank of England Governor Montagu Norman (1920–1944) even coined a famous dictum which valorizes central bank evasiveness – ‘Never apologise, never explain.’

A decisive shift away from central bank secrecy began with the adoption of inflation targeting in the late 1980s and 1990s (Krippner, 2007). Inflation targeting is about instilling public confidence in the commitment of the central bank to price stability. It requires convincing the market that the central bank is serious about achieving a specific rate of inflation and providing guidance about the interest rates which will be necessary to hit that target in the future. As Braun (2015) describes, the central bank needs to

code its communications such that specific signal words will be interpreted as intended by their audience and result in predictable, performative effects.

Central bank communication has an infrastructural basis because it requires cultivating stable relationships with the media and market analysts and employing scientific techniques so that central banks' macroeconomic forecasts and policy commitments are deemed credible. To achieve this, central banks publish and disseminate regular monetary and financial stability reports; they publish their research in academic macroeconomics journals to demonstrate scientific expertise; and they make use of social media to spread their message as widely as possible. Furthermore, central banks' communicative power assumes the efficacy of their instrumental infrastructural power, such as the ability and willingness to conduct OMOs (and more recently, quantitative easing) to make good on their communicative promises.

If instrumental and communicative infrastructural power are so closely entangled, why differentiate between them? The advantages of maintaining an analytical distinction can be illustrated by reference to financial stability policymaking. After the 2008 financial crisis, the results of central bank stress tests of the banking sector were presented in a highly visible fashion for the first time, most famously with the 2009 Supervisory Capital Assessment Program conducted by the US Treasury and Federal Reserve. By rendering transparent the balance sheets of large bank-holding companies, the test helped to dissipate fear in the market and encouraged banks to begin lending to one another again (Langley, 2013).

It is tempting to understand the routine post-crisis stress tests conducted by central banks exclusively through a communicative lens: as exercises intended to shore up confidence in the banking system, persuade banks to raise more capital, and bolster the authority of regulatory supervisors. Certainly, stress tests have always had communicative and performative dimensions which keeps these goals in mind (Coombs,

2020). However, post-crisis stress tests have also gained an increasingly instrumental form of infrastructural power. Stress tests act as instruments for intervening into bank management because scenario design allows supervisors to affect banks' capital allocation and risk management processes (Coombs, 2022). Both the communicative and instrumental dimensions of stress tests exert infrastructural power, but without differentiating them, the varied applications of the technique in financial governance are difficult to disentangle.

4.3 *Network-Forming Infrastructural Power*

The final variety of infrastructural power I term *network forming*. In his influential theorization of the state 'effect', Timothy Mitchell (1991) argues that the thorny problem of determining the limits of the state can be resolved by considering the limit not as a hard boundary, nor as a subjective impression. Rather, Mitchell argues that the distinction between 'state' and 'non-state' is a line drawn internally within institutions that straddles the fuzzy boundary of the formal state.

Mitchell's key example is the relationship between central banks, treasuries, and commercial banks. Central banks and treasuries are usually grouped unproblematically as part of the public sphere, while commercial banks are considered part of the private sphere of non-state capitalist enterprises. Mitchell argues that in truth the line between these organizations is much less clear, since they are tied together in continuous 'networks of financial power and regulation' (Mitchell, 1991, p. 90). It is in this sense that network formation can be considered a variety of infrastructural power. The ability to form and sustain such networks allows the state to draw on the organizational resources of civil society, as can again be illustrated with the example of central banking.

A key task faced by central banks since at least the nineteenth century has been to hold together the organizational networks Mitchell alludes to when seeking to mitigate market turmoil. The economic historian

Anthony Hotson (2017) argues that the remarkable stability experienced in London's money markets from the late nineteenth century to the 1970s should not be attributed solely to greater willingness of the Bank of England to act as lender of last resort, the introduction of deposit insurance, or capital regulations. Hotson details how, unlike the current world of multipurpose bank-holding groups, the money markets of this period were segmented into functionally specialized institutions: acceptance houses, clearing banks, discount houses, and building societies. Through its routine discount market assistance, ability to corral elite accepting houses into bailing out their competitors, and its endorsement of committees and trade associations governing the liability management of different categories of lenders (e.g., clearing houses could not adjust the rates they paid on deposits), Hotson shows that the Bank of England played an important role in maintaining an institutionally resilient market structure.

The infrastructural power of central banks is not limited to preserving financial networks. Central banks also play an active role in reaching into civil society and promoting policy agendas through the construction of *new* networks. A recent example is in the emerging field of climate policy. In September 2015, Bank Governor Mark Carney (2015) delivered a speech on the 'Tragedy of the Horizon' at Lloyd's of London, which identified a new supervisory task for public authorities in bringing long-term climate-related planning to financial firms. The first initiative to stem from this was the Task Force for Climate-Related Financial Disclosures, which successfully pushed financial actors to disclose their climate risks. In 2017, eight central banks launched the Network for Greening the Financial System (NGFS) housed at the Banque de France. The network now links together 114 central banks and supervisory authorities, as well as international organizations such as the World Bank and International Monetary Fund. The network has become an important discursive site for developing ideas related to facilitating

a green transition and has developed climate scenarios which serve as the ‘baseline’ for regulatory authorities’ climate stress-testing initiatives (Thiemann, Büttner, and Kessler, 2023).

In the terms offered by Mann’s IEMP model, the NGFS is an ideological power network for global governance. The network increases state infrastructural power in the jurisdictions of its permanent members by developing new standards which shape the risk management apparatuses and balance sheets of financial firms in line with public policy goals. Successful network formation can therefore also lead to the exertion of new forms of instrumental and communicative infrastructural power.

5 Conclusion

This chapter has taken a macro-political perspective on financial infrastructure, examining the meaning, applications, and varieties of Michael Mann’s concept of infrastructural power. Unlike the micro-oriented ‘infrastructural gaze’ inspired by science and technology studies, Mann’s notion of infrastructural power foregrounds state–society relations. In interdisciplinary finance studies, the concept has been productively applied to make sense of state–market hybridity, providing an alternative to zero-sum perspectives which see state power as diminished by the increasing centrality of financial markets in economy and society.

At the same time, I have argued that in this literature Mann’s concept is at risk of being treated as a synonym for financialized state action. This should be avoided as it unnecessarily narrows the concept’s potential scope. By instead situating the idea of infrastructural power within Mann’s broader body of work on the evolution of social power, I have made the case for the infrastructural power concept having deeper historical applicability (back to early modern state formation) and for its relevance for theorizing the implications of diverse financial governance instruments and techniques for state–society relations

(from the development of capital markets to OMOs to stress testing of banking). The instrumental-, communicative-, and network-forming varieties of infrastructural power proposed by this chapter are intended to assist in categorizing and differentiating between the infrastructural media through which state power is exercised.

That said, despite this chapter advocating the analytical benefits of the infrastructural power concept, it is worth concluding by briefly acknowledging the concept’s analytical limitations. Precisely because the idea of infrastructural power breaks down the assumption of a zero-sum power balance between state and financial markets – instead emphasizing hybridity, interdependencies, and the state-governing capacities enabled by working through markets and private sector infrastructures – it has the potential to obfuscate hard questions concerning who has more power and agency. On the one hand, this could lead to an overemphasis on the power finance exerts over public authorities; on the other, it could lead to a view which overstates the power of states vis-à-vis the financial markets they work through (Coombs, 2024).

Another matter unresolved by this chapter concerns the relationship between Mann’s understanding of infrastructure and science and technology studies theorizations. To be sure, these two infrastructural gazes are not mutually exclusive. They address different ‘scales’ of reality and ask different questions but share a common interest in the pragmatic and logistical technologies of modern governance, whether exercised bureaucratically or through markets. Is a ‘unified theory’ necessary? Perhaps not. Mann’s Weberian methodology would treat these gazes not as falling on discrete aspects of reality but as alternative analytical constructs. A synoptical view may be unnecessary for making sense of a world where socio-technical constructions and state power are interwoven materially and organizationally but evolve somewhat autonomously. A stereoscopic view, which holds the ‘micro’ and the ‘macro’ in productive tension, might yield greater theoretical depth.

Notes

1. Finding these overlapping power networks analytically frustrating, Gorski (2006, p. 109) notes that it is not clear which power networks infrastructural power is supposed to be embodied in or where it comes from; as he puts it, the 'empirical reference remains vague' (p. 111).
2. Mann's favourite example of infrastructural power – the ability of states to collect income tax directly at source (Mann, 1984, p. 189; 1993, p. 61; 2008, p. 356) – involves a bureaucratic and technological infrastructure with a taken-for-granted quality consistent with science and technology studies theorizations.
3. Konings agrees, arguing that it is necessary to 'trace its [US financial power] lineages further back in time' (Konings, 2010, p. 87) to economic modernization processes in the early twentieth century. Coombs and Thiemann (2022) follow Carruthers back to the early modern era, identifying the emergence of infrastructural power in finance with the foundation of the first central banks.
4. The Byzantine, fragmented structure of the Federal Reserve System, founded in 1913, was in some part motivated by the desire to both prevent political control of the banks and bank control over politicians (Conti-Brown, 2016, p. 21), i.e., to prevent the emergence of centralized state infrastructural power.

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CHAPTER 5

Financial Platforms

Beyond the North–South Divide

Janet Roitman

Financial platforms are generally depicted as the basic infrastructure of the “digital platform economy” (Kenney and Zysman, 2016) or “platform capitalism” (Srnicek, 2016; Langley and Leyshon, 2017). However, as recent scholarship has shown, we gain conceptual rigor by specifying the distinction between digital platforms, on the one hand, and infrastructure, on the other (Plantin et al., 2018; Bernards and Campbell-Verduyn, 2019; Plantin and Punathambekar, 2019). A good example is the contrast between an applike Google Maps, which is a programmable platform, and the Google search engine, which is infrastructural (Plantin et al., 2018, p. 294). As Bernards and Campbell-Verduyn (2019) maintain, infrastructures are defined by their centrality, durability, and ubiquity while platforms are relatively closed systems that rely on and contribute to digital infrastructures. It is therefore worth considering how financial platforms are distinct from and yet constitutive of infrastructures.¹ This chapter illustrates the ways that specific platforms generate the conditions for the institutionalization of financial infrastructures. This chapter also indicates

that, with the “platformization of financial transactions” (Westermeyer, 2020), it is perhaps less important to focus on definitional distinctions (Is this a platform or an infrastructure?) than on the pragmatic practices that arise from the conjoined processes of computational power, data storage, data analytics, and application programming interfaces (APIs).

Why is this pragmatic focus important? Financial platforms are analyzed as instantiations of “infrastructural power” (Rethel, 2010; Hardie, 2012; Braun, 2020; Braun and Gabor, 2020; Pinzur, 2021; Coombs, this volume), which participate in processes of politico-economic subordination, or the creation and reproduction of structural inequalities. This research clearly demonstrates the propagation of hierarchies that constitute the “global political economy,” as reviewed later in this chapter. But assumptions that subtend this approach to financial infrastructures likewise reduce some practices to residual categories in that global hierarchy. For instance, financial platforms are taken to be vectors of financial subordination because processes of financialization

are depicted in terms of a prevailing global logic and directionality: from the Global North to Global South. Thus, while financial platforms are apprehended as vectors of financialization globally, they are reduced to processes of financial inclusion when referencing the so-called Global South. What we miss are the pragmatic practices of financial platforms, or how they function as sites of value production and conversion, and what is at stake for diverse actors. By focusing on the latter, we can better appreciate processes of both value subjugation and autonomization, evidence that the fault lines of value production generated by financial platforms are obscured by the Global North versus Global South frame.

This chapter reviews the pitfalls of this approach to financialization and illustrates an alternative view. It does so through a presentation of mobile money platforms, which are central to the elaboration of a specific financial infrastructure in sub-Saharan Africa. These financial infrastructures are constituted by a nexus of mobile telecommunications operators, mobile money issuers, remittance and payment services providers, and commercial banks. To date, mobile money platforms have been either celebrated as a means of financial inclusion or denounced as a cause of financialization. This chapter presents those two views and joins analyses that consider the variability, the limits, and responses to financialization (Christophers, 2015; Davis and Walsh, 2017; Bernards, 2022).

What follows is an illustration of how financial value is generated by the consolidation of a new financial infrastructure based on digital platforms in sub-Saharan Africa. With an eye to value creation, as opposed to another demonstration of subordination, I focus on a primary value form generated by the nexus of mobile money, remittance, and payment service provider platforms: the float. The float is the e-money/fiat money interface and a liquidity pool generated by these platforms: It contributes to the consolidation of existing financial relations and institutions, and yet it is the basis for new, contending financial relations and institutions.

The focus on value creation is important analytically: It makes visible the effective consequences of these financial platforms, or the ways that they generate both financial subordination and autonomization. This work thus documents emerging financial infrastructure, but it also underscores the need to problematize the notion of infrastructure. As Langenohl argues (this volume), a focus on “infrastructural reason” generates functionalist analyses that tend to reproduce a hegemonic “globalist view” of political economy. That view obscures, for instance, the financial platforms and associated infrastructures that are a distinct source of value production which did not originate in the halls of Euro-American finance.² Indeed, in depicting the Global North as the primary realm of high finance, which is disseminated to the Global South, the realm of “fringe finance,” we neglect the infrastructures of finance that are devised and developed in places outside of Euro-America.

1 Financial Platforms and the Failures of Financialization

Financial platforms pose a challenge to researchers because they are constituted by disparate digital and nondigital elements: data sets, algorithms, APIs, programming languages, networked computational systems, business models, and distributed storage facilities, as well as diverse stakeholders and participants. These digital arrangements include various computational forms (algorithms, APIs, data sets) and modalities for the production of value (multisided markets, monetary and nonmonetary units of value, governance rules). Financial platforms have been described as “market infrastructures” (Omarova, 2019; Beauvisage and Mellet, 2020) or “calculative infrastructures” (Aitken, 2017), which provide helpful correctives to the use of metaphors (“the cloud” or “algorithmic logic”) that obscure the materialization of operations and practices.³ This work also contributes to our understanding of the consequences of technological applications in global finance (Bernards and

Campbell-Verduyn, 2019; MacKenzie, 2017; Clarke, 2019; Haberly et al., 2019; Langevin, 2019; Pardo-Guerra, 2019; Petry, 2020) and purports to make visible the power relations that inhere in seemingly technical operations.

Financial platforms are said to instantiate and enact “infrastructural power,”⁴ which accounts for the rise of state agents’ increasing dependence on financial markets (Braun, 2020; Braun and Gabor, 2020), isomorphism toward Anglo-American finance capitalism (Rethel, 2010; Hardie, 2012), and the subordination of some national economies to others due to the structure of global monetary regimes (Bonizzi, Kaltenbrunner, and Powell, 2020). A general conclusion is that, through these forms of power, platforms are the basis for a new phase of capitalism (“platform capitalism”) that entails the financialization of both state agencies and citizens across the globe. But others have shown how this globalist view, which partakes in a teleological interpretation of financial capitalism, dissipates into a spectrum of myriad trajectories (Engelen, Konings, and Fernandez, 2010; Pitluck, Mattioli, and Souleles, 2018; Karwowski, Shabani, and Stockhammer, 2019; Petry, Koddensbrock, and Nölke, 2023). Indeed, it’s worth noting that different assumptions are made about the workings and effects of financial platforms depending on where you sit, geographically speaking. From the globalist, functionalist view, those residing on the African continent are deemed the endpoints of a teleology – the passive recipients of the technological innovations and infrastructural forces of financial platforms. Thus, for example, even though digital mobile money was developed in East Africa, the African continent is depicted as the endpoint of platform economization most often understood in terms of financialization. In sum, digital platforms are approached as inherent to processes of financialization in what is shorthand as “the Global South,” where financialization is invariably referred to as financial inclusion.

Generalizing, we can say that there are three ways of approaching – or explaining – financial inclusion, all of which are examples of financialization.⁵

1. Financial inclusion involves the more widespread use of formal financial services by local people. This is referred to as “banking the unbanked.” It entails the uptake of deposit accounts, savings accounts, and the extension of consumer credit (Rahman, 1999; Moodie, 2008; Roy, 2010; Karim, 2011; Guérin, Morvant-Roux and Villarreal, 2013; Schuster, 2014; James, 2015; Mader, 2015; Hayes, 2017).
2. Financial inclusion involves the “financialization of everyday life.” This also entails “banking the unbanked”; but even where people do not open commercial bank accounts, the claim is that they are subject to processes like credit scoring, which renders their unbanked lives legible to financial markets. In other words, their daily practices are structured by the entailments of financial logics (Aitken, 2013; Guérin, 2014; Kusimba, Yang, and Chawla, 2015; Wilkis, 2015; Pitluck, Mattioli, and Souleles, 2018; Radhakrishnan, 2018; Guermond, 2020a; Donovan and Park, 2022).
3. Financial inclusion involves incorporation into global capital markets. This approach focuses on the commercial banking sector, development banks, global development agencies, and private capital (institutional investors, private equity, venture capital). It illustrates the expansion of certain financial markets and practices into the national realm – typically from institutions of the “Global North” into those of the “Global South” (Rethel, 2010; Gabor, 2011; Powell, 2013; Bonizzi, Laskaridis, and Toporowski, 2019; and see Bonizzi, 2013).

These respective approaches obviously map onto one another (see Langley and Leyshon, 2022). They also all posit implicit vectors – from the West to the East and from the North to the South – and the efficacy of those vectors.

On a global scale, financialization is indexed as a process of financial inclusion, as documented by the World Bank Global Findex Database Report, which represents

financial inclusion in terms of bank account ownership at regulated institutions (e.g., commercial banks, microfinance institutions). By this accounting, somewhat surprisingly, Kenya figures higher on the scale than Turkey, Colombia, Argentina, and Saudi Arabia and is almost equivalent to India. Here, financial inclusion is attributed to the expansion of the microfinance sector. While there are many vectors for the extension of financial inclusion globally, including microfinance institutions (Elyachar, 2005), the extension of digital platforms as a feature of financial practice has led to what Daniela Gabor and Sally Brooks (2017) call the “fintech-philanthro-development” nexus, which has determinate effects:

- The extraction of rents from low-income populations in the Global South.
- Increasingly indebted populations in the Global South.
- The enforced subordination of financial institutions and national economies in the Global South to financial institutions located elsewhere.
- The extension of colonial relations; or, more aptly, neocolonial relations.

These effects are extremely well documented and substantiated.

However, financial inclusion has not been as effective as is claimed. There are limits to financialization (Engelen, 2008; Christophers, 2015; Davis and Walsh, 2017; Mader, 2018, Bernards, 2019a, 2019b, 2022; Aalbers, 2020). In most sub-Saharan countries, this is the case for the goal to “bank the unbanked.” Despite the focus on Kenya, most countries fall in the middle to low range on the World Bank Findex graph. This reflects their use of mobile money digital wallets, which don’t require bank accounts, as well as the fact that mass adoption varies across the continent – being quite limited in Nigeria, for example (Lepoutre and Oguntoye, 2018). At base, these are predominantly cash economies (Frost, 2020). Moreover, despite claims that the increasing use of mobile wallets are bringing people into the fold of

finance, those working in digital payment industries in Africa see this as an immense challenge, mostly due to nonstandardized data and consequent problems sharing data across institutions (banks, credit bureaus, money transfer operators). Likewise, there are extremely variable reporting practices and requirements, not to mention problems with enforcing those reporting requirements.⁶ Therefore, on the one hand, we see the extension of consumer credit, or unsecured short-term credit, that has led to cycles of indebtedness, as Donovan and Park (2022) have shown with reference to M-Shwari, a digital wallet microcredit service in Kenya. And, on the other hand, in these same contexts of mostly unbanked low-income communities we don’t see instances of financialization that take the form of accumulation of assets and potential associated revenue streams – for example, in the form of property, like housing, as noted by certain African scholars (Boamah, 2009, 2010; Teye, Teye, and Asiedu, 2015).

Most commentary on the financialization of the Global South concludes that formal credit products are now part of people’s everyday lives. However, as noted, fintech platforms have not resolved very significant problems of data standardization and interoperability, an issue that is compounded by limited data collection and the nature of the data collected. Industry people in West Africa complain that, to quote, “The banks only register defaults, not overall payment history.”⁷ In this context, banks are only required to report negative information, which means that the credit bureaus have databases of defaulters. To complicate things, while microcredit institutions are required to issue reports to the credit bureaus, mobile money and money transfer operators don’t necessarily issue those reports. Furthermore, the high levels of debt incurred by local populations have led to blacklisting. This is absolutely not a good thing: debt, blacklisting. But it’s also not a demonstration of the seamless integration of people into the commercial banking system since these people are excluded (hopefully, their debts are written off).

This point is underscored when we examine contestation amongst and between private and public institutions, which leads to effective financialization (Jain and Gabor, 2020) as well as its failure (Breckenridge, 2019). As Breckenridge shows, the Kenyan National Digital Registry System, announced in 2014, was never enacted due to conflict between two corporate entities: the Kenyan commercial banks, on the one hand, and, on the other, Safaricom, the telecommunications monopoly that created M-Pesa, a digital mobile money service. These two institutions clearly welcome and work toward financial inclusion and financialization. But conflict arose from their commitments to two different types of credit market. The banks aimed to develop credit scoring and a new kind of asset register (nonfixed asset classes, such as livestock or vehicles) to generate new forms of collateral. The telecom aimed to deliver unsecured high-interest microloans with no collateral registers. Safaricom prevailed, with government backing; hence the telecom infrastructure and modes of monetization became the prevailing gateway to financialization for local populations. On the other hand, financialization via the commercial banking sector failed, as did the establishment of an integrated digital identity system, which the national government was banking on as a means to generate tax revenue.⁸ Breckenridge's point is that there is "no single source of truth": no one model for the extension of credit, no predetermined pathway.

Depictions of financialization mostly assume a prevailing logic and a one-way vector: Global North to Global South. To continue with the example of compulsory biometric identity schemes, these registers are an effective means of incorporating populations into financial systems, such as commercial banks, microfinance institutions, and tax registers. They have been utilized for that purpose in India and Ghana, with great success in the former and checkered results in the latter. And while these schemes are in place in those two countries, they don't exist in Canada or Italy; the vector

of origination and adoption is not North to South. Moreover, in depicting financialization as a great big wave washing over the Global South, we drown the heterogeneity of local institutions, the indeterminacy borne of contention, and instances of failure. We assume that particular categories of people or institutions have predefined sets of interests, which they pursue to great effect. Worse, we posit denizens of the Global South as passive receptacles, devoid of agency.⁹

2 Value Creation

Concentrating on that great wave of financialization distracts us from the operational aspects of financial infrastructures, which illustrate *how value creation is achieved and how it fails*. Most studies of financial platforms focus on rents and value extraction. But an important question is value creation, or the materialization of diverse forms of value. Often assumptions about the value of data – that data is intrinsically valuable – are not necessarily demonstrated. This leads to facile claims, such as the assertion that value is extracted from data sets and the products of machine learning. If the anthropological insight that no object or relationship has intrinsic value holds, then there is no a priori value to extract: Data must be made into a value form. This is important because financial platforms don't hold physical assets (Constantinides, Henfridsson, and Parker, 2018, p. 381), nor do they necessarily generate value through commodity production. Thus, although we frequently hear that "data is capital," this is an erroneous statement that neglects the specific operations of what Birch and Muniesa (2020) call assetization, or the ways that asset classes are generated and how they figure in balance sheet accounting (Birch, Cochrane, and Ward, 2021). The data-is-capital claim leaps over these operations, or *how* data becomes "capital" and *how* data figures in processes of capitalization, as distinct from monetization.

What follows is an illustration of *how* data is turned into capital for mobile telecommunications operators (telecoms) and

money service providers (mobile money) through what is known as the float. The float is a site of value production, translation, and conversion; and it is a site where there is something at stake for multiple actors (Callon, Millo, and Muniesa, 2007).¹⁰ Studying financial platforms in terms of the “how” of value production – or how the float is generated and figures as a form of value – is important not only because it documents a process, but also because it elucidates the effective consequences and political stakes of financial platforms. In other words, a singular focus on the float might be seen as a reductionist view of finance that abstracts from politics. But, to the contrary, far from being an apolitical approach, the analytics of the production of value forms through digital platforms accounts for distributed agency, coordinated forms of agency, asymmetries, and the dynamics of domination and exclusion – all of which can be short-handed as the contingencies and fault lines of power (Callon, 1984, 2005; Latour, 1984). Those fault lines run through financial platforms, resulting in effective financialization and failures in financialization. The float is a lens into those processes. In this instance, it is produced as a fundamental element of financial platforms through both remittance transfers and mobile money, as is explained in Section 3, and is a constituent element of financial infrastructure that emerged with digital financial technologies.

3 Remittances, Mobile Money, and the Float

A constituent factor of the float are remittances, which are a significant financial transfer to sub-Saharan Africa, the international hub of mobile money. Remittances to sub-Saharan Africa have increased over the past decade and, when accounted as part of foreign inflows, they are as significant as overseas development aid and more significant than foreign direct investment. Remittances are a source of external financing and foreign exchange reserve accounting – everywhere. If one excludes China, remittance

flows have been the largest source of external finance for low- and middle-income countries since 2015. According to 2022 World Bank reporting, the African continent received \$49 billion in 2021. But most significant are remittances as a percentage of gross domestic product (GDP). For South Sudan, these represent 35% of GDP; for Senegal, a vibrant West African economy, they represent 11%, and for Liberia, 10%. Remittances are now the second-largest source of foreign inflows on the continent. And in Nigeria, remittances are second only to oil exports as a source of foreign exchange.

We should note that, when they transmit through legacy systems like Western Union, remittances to Africa are the most expensive in world (for \$200, 7.8%). Therefore, many transfers avoid those channels. The World Bank figures thus underestimate total amounts received for all sub-Saharan countries, since they are based on official data. And, importantly, these figures don't account for intra-African remittances, which are transfers between different states and are thus international operations involving international currency exchanges. Intra-African transfers are very substantial and mostly transpire via mobile money and fintech platforms.

International remittances have come into focus as an aspect of financial inclusion, as noted by the extensive literature on the remittance–development nexus, which maintains that remittances fuel domestic consumption, incite investment, and hence contribute to economic development. This is the guiding theme of World Bank KNOMAD (Knowledge Partnership on Migration and Development) Project, aptly dubbed the “remittance–financial inclusion nexus” by Vincent Guermond (2020b, 2022). Beyond the trope of inclusion, inward remittance transfers are also conceptualized as a financial revenue stream, or a future-flow receivable that is potentially significant for financial securitization (Ketkar and Ratha, 2009; Mohapatra and Ratha, 2011; and see Bakker, 2015; Roitman, 2021). But there is another angle on remittances. This relates to international transfers, intra-African transfers, digital wallets, and especially the float.

To view things from that other angle, we should consider the specificity of the African context, or the central role of telecoms (not banks, not big tech) in the realm of digital finance. Mobile network operators (telecoms) create subsidiaries that provide money transfer services, like mobile money and digital wallets. Mobile money is a financial service provided by the mobile network operators/mobile money issuers. It's important to note that mobile money is not fiat e-money. It's not a digital form of a national currency; it's not issued by the central bank. Mobile money is a money transfer tool. E-money is best thought of as a payment instrument, or specifically: "a payment instrument whereby monetary value is electronically stored on a physical device or remotely at a server which represents a claim on the issuer" (Shirono et al., 2021, p. 400).¹¹ Examples include prepaid cards, mobile wallets, web-based e-money, and mobile money. Because telecoms don't have banking licenses, they create subsidiaries, which are licensed nonbank entities. For instance, the telecom MTN Nigeria has a subsidiary called MoMo Payment Service (MoMo signifies mobile money). Through these nonbank subsidiaries, the telecoms establish a "float" with the bank that corresponds to its customer-base digital wallets.

In order to answer the question posed earlier – How is value created by the nexus of telecoms, nonbank subsidiaries, and digital payment services? – we can examine the revenue streams within the value chain. We can start with a (grossly simplified) glimpse into a generic model presented in a handbook, *Mobile Service Innovation and Business Models* (Bouwman, de Vos, and Haaker, 2008):

1. The remittance center – where incoming funds are received – earns a percentage of the transfer or a fee.
2. The mobile operator (telecom) benefits from increased SMS traffic, a reduced churn rate due to the link between customer cell numbers and e-money numbers, and charges per transaction. Telecoms also offer adjacent financial products.

3. The bank theoretically generates revenues by banking the unbanked, as consumers are brought into the sector via financial products offered to telecom customers, such as small consumer loans. But to quote, "If enough money is captured from remittances, *the float and interest provide an additional benefit to the financial institutions*" (Bouwman and Sandy, 2008, p. 239, emphasis added).

This is not necessarily "banking the unbanked" or financial inclusion – it's about generating the float. Mobile wallet transactions, which include both international and intra-African remittances, create a significant cash float for the associated bank.

One thing to consider is the custodianship of the digital wallet. This is complicated because the digital wallet is a product of the mobile network operator and its nonbank subsidiary. Electronic value equivalents of digital wallets are kept in a custodian account, which sits with the partner bank. But mobile money customer funds are pooled into a single account; there is no individual corresponding deposit account per digital wallet. And the telecom is the depositor. Because value held in digital wallets doesn't involve bank deposits in the strict sense, they are not necessarily protected by deposit insurance systems. In most cases, the custodian account is subject to deposit protection, but the e-money account holder (individual digital wallet) is not. However, this varies by jurisdiction due to the emergent nature of value creation and regulation of these platforms.

Those working in the mobile money and fintech industry say that banks "love the float." Technically speaking, the float represents money in the banking system that is briefly counted twice due to processing time for deposits and withdrawals. Commercial banks utilize the float as overnight investable funds to manage aggregate reserves. While digitization and instant settlement would seem to eliminate the float, float management is in fact central to fintech business models, in Africa and elsewhere. Essentially, "float control" entails regulatory arbitrage, or the arbitrage of interest rate differentials.

This practice is ubiquitous and involves: “taking control of as much customer money up front as possible, and managing it in the style of a bank, albeit without the regulatory oversight” (Kaminska, 2019).¹² Fintech and big tech firms throughout the world have been paying customers zero interest and yet collecting interest on the float held by banks (cf. Carstens, 2019). But in sub-Saharan Africa there have been an array of responses to increasing float values, which, in April 2023, totaled over \$1 billion in Ghana alone. These include provisions by mobile network operators for “profit sharing” through interest payments to e-wallet holders (Tanzania), the funding of “corporate social responsibility” projects (hospitals, schools) using interest earned on custodian accounts (Kenya), and guidelines for e-money issuers mandating pass-through of interest earned to e-wallet holders (Ghana). In the latter case, there has been ongoing strife between the telecoms and the banks over float-generated interest. Telecoms and their subsidiaries (e-money issuers) do not hold banking licenses. Hence the e-wallet cannot act as an interest-earning savings account. Likewise, regulations stipulate that floats be held as liquid assets, or in accounts that are classified as current accounts, typically earning 0% interest. Contending parties challenge practices of lending float funds to third parties, dispute the rightful beneficiaries of interest earned, and debate legitimate percentage payouts. The status of custodial float accounts is also at issue.

This is an emerging realm of digital finance and regulation. The management of e-money and its associated revenue streams varies and is evolving. Moreover, as noted earlier in this chapter, these practices don’t neatly confirm obvious vectors of financial inclusion and financialization. Ultimately, we have two scenarios. On one hand, telecom digital wallets and fintech platforms enroll low-income residents into microcredit products, which furthers financialization. This is predatory because they aim to bring the unbanked into the consumer loan market. On the other hand, telecom digital wallets and fintech platforms generate the float,

which is an ambiguous financial object. We can think of the float as the mobile money/fiat money interface that generates a liquidity pool: It is the means to go from one type of asset to another. It’s important to remember that liquidity doesn’t refer to cash per se; it refers to the ability to convert between two different asset classes – for example, to convert an asset or a security to cash, or to convert from e-money to Nigerian naira. In order to appreciate the scale of this potential liquidity pool, we need to appreciate the scale of mobile money in Africa.

In 2021, sub-Saharan Africa had by far the largest number of active mobile money accounts, the largest volume of transactions, and the largest transaction value – a whopping \$490 billion of the global \$767 billion. On the continent, this involves \$84 billion in peer-to-peer remittances, but it also includes significant intra-African trade (business-to-business). The main problem for transactors is the cost of settlement and foreign exchange loss. Intra-African remittances and payments are international currency operations; settlement between African currencies involves buying and selling dollars because they are nonconvertible currencies (or “soft currencies”). An African currency must first be exchanged for dollars, pounds, or euros, and then swapped a second time for a different African currency, which adds an estimated \$5 billion a year to the cost of intra-African currency transactions (Wellisz, 2022). As of 2017, only about 12% of intra-African payments were cleared within the continent. The rest were routed through overseas banks in Europe and North America.

4 Emergent Financial Infrastructure: Real-Time Pan-African Settlement

However, increasingly, money transfer operators can access money markets through digital finance platforms or digital payments gateways. For example, MFS Africa is a pan-African real-time payments network operating in more than 30 African markets and connecting over 320 million

mobile wallets. MFS Africa claims to “render borders insignificant,” which should be read as a strong political claim.

ABC Finance is another payments gateway and currency exchange platform.¹³ Their services include international payments and settlements, forex, and treasury management. ABC Finance ensures connectivity between commercial banks and mobile payment channels through APIs and, increasingly, blockchain ledgers. They claim to be the first digital exchange to do digital currency/African currency conversions and digital currency/mobile money conversions. The ABC pitch is that they bring traditional finance to counterparties. But note that they are not bringing traditional finance to consumers or to the unbanked; they are bringing traditional finance to the counterparties, which are remittance operators and money transfer operators.

At an industry conference, the CEO of ABC Finance underscored a central problem: No one will hold African currency in Africa’s various national banking systems. Because the vast majority of government and corporate bonds are denominated in dollars, African central banks are mandated to support the value of their respective currencies, which means rationing dollars and other hard currencies, leading to difficulties in balancing flows of African currencies. ABC’s response is to become the largest nonbank foreign exchange broker in Africa. It buys and sells currencies using its own balance sheet. In other words, it sells balance sheet liquidity and offers wholesale foreign exchange, sometimes using cryptocurrency stablecoins. Hence the CEO’s presentation of the ABC financial platform as a means to “disconnect Africa from the US dollar.”¹⁴ She elaborated on this somewhat wild aspiration by noting that President’s Day in the United States is a “dollar holiday” – and added, “What if it’s not a holiday for the rest of the world? Why shouldn’t they be able to transact and settle?” In response, her platform has developed a means of wholesale settlement, which aims to solve the conversion and liquidity constraints faced by people wishing to merely exchange and transact on the African continent.

This is not just one CEO’s concern; others working in the digital payments, fintech, and financial sectors in Africa share her view.¹⁵ They generally see the float, which is here produced through the nonbank/bank interface, as a primary site of value production and potentially a device for market-making. Additionally, as many people working in Africa note, and as ABC Finance believes, it also provides a means to circumvent the very conservative national banking system, which generally serves the commodities sector and top-tier corporates. In the past, the national commercial banks served traditional colonial-era sectors – summed up by a local expression, “cement, beer, and banks” (which, today, would be rendered “cement, ports, mining, oil”). Ultimately, the digital finance platforms are in the business of intermediation that potentially circumvents the commercial bank/commodities sector alliance.

Alongside these private platforms, formal public initiatives are being forged, such as the Pan-African Payment and Settlement System (PAPSS). Launched in 2021, PAPSS is a cross-border, financial market infrastructure that enables payment transactions between various African states and currencies. It provides real-time gross settlement through participating central banks, which provide prefunding for African currencies. The aim is to decrease the time and cost of settlement, and to reduce the need for banks to source hard currencies to support transactions between two African parties. Most importantly, this is a response to soft-currency subjugation. PAPSS aims to eliminate overseas (non-African) intermediaries, such as the SWIFT (Society for Worldwide Interbank Financial Telecommunication) system. And it is devised to generate the conditions for local currency lending instead of dollar financing, which entails the extension of local currency bond markets.

We can critique all of this. We can critique MFS Africa, ABC Finance, and PAPSS as instances of marketization, or the extension of private, market-based solutions to political-economy problems. That is true. But for many African communities, this represents relief from the costs of hard-currency

subjugation. Of course, we can't draw big conclusions about the future of dollar hegemony from these developments. Dollar hegemony endures on a global scale – for all of us (Mehrling, 2022; and see Bonizzi, Kaltenbrunner, and Powell, 2020; Gabor, 2021). The point is that, before jumping to conclusions about financialization, it seems important to consider local actors' concerns about the undoing of imperial institutions – banking and monetary institutions being a bastion of neocolonial relations – no matter how belated and no matter how effective (for an example that relates specifically to financial technologies, see Pollio and Cirolia, 2022).¹⁶

Ultimately, as everywhere, we find competing interests and controversy, debt and wealth, realization and failure. This complex yet mundane landscape is made visible by those in Africa who articulate the ways they both resist and co-opt the constraints and affordances of financial platforms and competing regimes of value – the ways that financial platforms are apprehended as problems of both subjugation and autonomization.

5 Beyond the Global North versus the Global South

How does all this relate to the Global North versus the Global South divide? Today, we hear strong calls to decolonize knowledge. In reference to Africa, that's said to be a matter of "recentering the margins" (Breckenridge and James, 2021; and cf. Langley and Rodima-Taylor, 2022; Zeleza, 2007). This is an important commitment. And that commitment is compromised when decentering amounts to the displacement of one Euro-American theoretical debate with another Euro-American theoretical debate – both are anchored in Euro-American debates. Efforts to displace the center so as to reposition the margins as foundational, and not residual, must first consider the terms themselves: center/margin, core/periphery, Global North/Global South.

We should remember that the Global North/Global South distinction comes from

the Brandt Line of 1980. The rich North, the poor South. In the early 1990s, postcolonial studies scholars and activists revised that distinction, noting that the "Global South" is a metaphor, not a geographical location: We can put New York, Johannesburg, Mumbai, Lagos, London, Sao Paulo, Istanbul, Jakarta, Cairo, Dubai, Athens, Sydney, and Shanghai on the same plane – they all include global norths and global souths. But we ignore that important point when we refer to emerging markets, the frontiers of financialization, and developing countries in our references to the Global South – and thereby participate in a developmentalist paradigm.

When we refer to the Global North/Global South distinction, we start with a power differential and then show how that differential is performed. And that's a problem. In doing so, we constantly reconstitute and reconfirm "marginal" spaces and residual categories as just that – marginal and residual. We continually remap developmentalist (modernization) theory and perpetuate the reinscription of "people of the South" into the logics of capitalist dependency, where they figure as endpoints. The Global South, as a signifier and as a concept, partakes in a hierarchy of difference (cf. Sabzalieva, Martinez, and Sá, 2020; Sud and Sánchez-Ancochea, 2022).

In response – and as a thought experiment – we could make a list. We could put three things on that list: (1) microfinance loans (e.g., MShwari, Kenya); (2) buy-now-pay later services (e.g., Afterpay, Australia); and (3) payday loans (e.g., Advance America, USA). All of these involve unsecured short-term credit. They all reflect the fact that banking is expensive for low-income populations everywhere – in Africa and in the United States of America. Instead of starting with a power differential between the Global North and the Global South, it would be constructive to study these credit markets in one frame – for instance, through the productive artifacts of digital platforms and financial infrastructures, like the float. The point in doing this is to account for power differentials – or the fault lines of value production.

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Notes

This chapter is based on a keynote address to the Finance and Society Network Conference, “Intersections of Finance and Society,” September 15–16, 2022 (Roitman, 2023).

1. For a concise statement on this process and review of the literature on digital infrastructures and platforms, see Constantinides, Henfridsson, and Parker (2018).
2. The first mobile money provider launched in the Philippines in 2001, followed by Kenya’s M-PESA, launched in 2007 and now the model for mobile money platforms.
3. Amongst many examples of work that renders visible the materiality of digital practices, see Dourish (2017) and Jatón (2020).
4. Antecedents to this work on infrastructure include Star (1999) and Larkin (2013). While the notion of “infrastructural power,” like structural power, provides insights into practices of domination, at times it seems more descriptive than analytic and lends itself to circular logic (by virtue of infrastructural power, agents exercise power). Power is an elusive concept. Power does not inhere in things; it is not “embedded.” As Foucault maintained (1978), “power is not an institution, and not a structure; neither is it a certain strength we are endowed with; it is the name that one attributes to a complex strategic situation ...”.
5. This schematic encompasses a vast literature, which cannot be fully referenced herein.
6. Fieldwork notes (2020–2023), “High Finance in Africa: The Making of Capital Markets,” US National Science Foundation Grant.
7. Fieldwork notes (2020–2023), Focus Group Workshop “Fintech Platforms and the Future of Credit Referencing in Ghana,” Accra, Ghana, February 11, 2022.
8. The planned National Integrated Identity Management System was ruled illegal by the highest court in Kenya in 2021 due to questions related to data privacy and security. This example can be contrasted with the Indian experience, where 1.2 billion people were biometrically registered between 2009 and 2015. The point is that financialization cannot be presumed to be always already effective.
9. It is worth recalling that the critique of dependency theory in the 1980s sought to reinstate the role of actors’ intentional and self-reflexive agency.
10. Translation refers to the ways that different value forms become commensurate, through pricing modalities, for example, but also through myriad ways of making qualities commensurate with quantities. Conversion refers to substitutability between asset classes, such as between e-value and fiat currency, as described later in this chapter.
11. The International Monetary Fund guide defines fiat bank deposits as non-negotiable contracts and e-money as transferable deposits (though in some jurisdictions, restrictions on transferability apply to e-money deposits).
12. Another primary focus of regulation by central banks relates to how mobile money liabilities are accounted for. At issue is the relationship between these electronic values and “broad money,” or the liquid liabilities of the central bank and the national banking system.
13. This is my anonymized rendering of a global financial services firm founded in Kenya.
14. Presentation made at the Innovation in Payments and Remittances Conference organized by RemitOne, London, March 2–3, 2022.
15. Observations made at the African Investment Services Conference and the African Private Capital Association Conference (both attended in 2022 and 2023). On the politics of global payments infrastructures, cf. de Goede and Westermeier (2022), Nölke (2022), and Brandl and Dieterich (2023).
16. Note the contemporary relevance of the work of the Cameroonian economist, Joseph Tchundjang Pouemi, who wrote *Money, Servitude and Freedom: Monetary Repression in Africa* in 1980 – over forty years ago. See also Pigeaud and Sylla (2021).

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CHAPTER 6

Finance and the Critique of Infrastructural Reason

Andreas Langenohl

1 Introduction: Why Do We Talk about Financial Infrastructures?

This chapter turns a critical eye on the recent and current tendency to frame finance in terms of infrastructures. This tendency can be depicted across the trans-disciplinary fields of international political economy (IPE), international relations (IR), and the social studies of finance. At the intersection of IPE and IR, the role of financial infrastructures in geopolitical reconfigurations – often referred to as “geoeconomics” (Sparke, 2007; Cowen and Smith, 2009; Scholvin and Wigell, 2018) – has supplanted earlier, political-economic takes on international hegemonies, for instance, the dollar hegemony, unequal terms of trade, austerity programs, or governing through debt (Bernards and Campbell-Verduyn, 2019). Nowadays, scholars rather tend to address the significance for changes in international hegemonies of information, payment, and trading infrastructures (Krarup, 2019; de Goede and Westermeier, 2022; Brandl and Dieterich, 2023), including the recent interest in blockchain technologies in general and

cryptocurrencies in particular (DuPont and Maurer, 2015; Campbell-Verduyn, 2018; Caliskan, 2020). Undoubtedly, this trend, as it takes up “new materialist” perspectives on the IPE and the role of finance in it, addresses an important research lacuna, as the technological, cognitive, or other basic structures, processes, and facilities that enable the circulation (and the storing) of financial value are not politically neutral (de Goede, 2021). Yet at the same time, the notion of infrastructure conveys some assumptions and connotations that might turn out to be problematic for a critical assessment of the current role of finance in worldwide, yet differentiated, developments in which global inequalities become locally entangled (see the contributions in Gutiérrez Rodríguez and Reddock, 2021).

This chapter aims at raising a sense of reflectiveness regarding the use of infrastructural reason in the analysis of finance – a point that is increasingly gaining the attention of research into infrastructures more broadly, and also, in some instances, with a view to finance. It encompasses four sections and a conclusion that each address different,

if interconnected, problematizations of financial infrastructural reason. First, infrastructures will be problematized as a modernist social imaginary that reproduces functionalist reasoning about society, thereby systematically effacing asymmetries and exclusions enabled by infrastructures. Second, infrastructural thinking is tightly coupled to conceptions of sovereignty and governability of populations, territories, and resources, thus inviting security thinking. Third and related, infrastructural reason in finance reproduces a globalist view on the IPE together with a realist imaginary of IR, modeled after a zero-sum game. Fourth, infrastructural reason in finance sidelines important political-economic critiques of the global financial economy, effectively putting the imagery of the relationship between production base and financial economy from its feet to its head. In conclusion, when using infrastructural reason to diagnose the present condition of the financial economy, it seems worthwhile to view infrastructures not so much as fungible, smoothly operating, only in exceptional cases failing systems, but rather as leaky networks through which shocks, disruptions, and exclusions are disseminated.

2 The Western Modernist Imaginary of Fully Functional Infrastructures

The notion of infrastructure emerged in the context of nation-state consolidation in Europe under the thorough impact of industrialization in the nineteenth century. To the ambition of sovereign political rule over the state's territory was added the ambition of engineering economic, social, and cultural processes as demanded by the industrial mode of production (Gellner, 1983). The emergence of the notion of "infrastructure," first documented in 1875, was historically contextualized by the rise of industrial modernity and the generalization of grand-scale technologies to a central cultural imaginary in modern Western societies (van Laak, 2004, p. 53; Richter, 2018, pp. 14–16). Just as industrial plants must ideally be operating 24/7 and without failures in order to achieve

the planned output, so infrastructures – transportation networks for people, goods and materials, telecommunications, energy, water provision and sewage, and so on – are expected to operate universally and flawlessly (Star, 1999; van Laak, 2001; see, for a critique, Langenohl, 2020).

However, the fungibility assumption regarding infrastructures was flawed and biased from the start (Anand, Appel, and Gupta, 2018). European colonization was the historical process that ushered in a, if mostly denied in Europe, totally different notion of infrastructure: namely, what one could call incomplete or partial infrastructures. Thus, while historian Dirk van Laak (2004, p. 62) argues that grand-scale technological infrastructures "were pushed into colonized countries like 'Trojan horses' to spell the gospel of modernity," one must add that the expansion of the modernist infrastructural imaginary rather rarely was meant to create on-par relationships between colonized and colonizing societies. For instance, transportation infrastructures in the colonized territories were mostly devised to enable the transportation of raw materials from the hinterlands to the ports to be shipped to Europe, or else to carry troops to fight colonial "wars" (i.e., mass slaughters of the indigenous populations). South Africa is the country where the colonial legacy of colonial infrastructures, not only in the area of transportation, can be most blatantly seen up until the present day. Township residents have not remotely the same infrastructural services at their disposal as suburban or inner-city residents (von Schnitzler, 2016). Hence, the historical legacies and "sedimentations" (de Goede and Westermeier, 2022) of colonial – that is, partial and incomplete – infrastructuration might outweigh its modernist imaginary surplus of functionality and perfection.

With respect to financial infrastructures, their (post)colonial entanglements can be analyzed from two distinct directions. First, it has been argued that the relationship between imperial colonialism and modern finance, including its infrastructural aspects, has been one of co-constitution and cross-enablement. As summarized by Marieke de

Goede (2021), this pertains, for instance, to the role of financial transfer infrastructures in enabling the economic extraction of colonies and the organization of the transatlantic slave trade, as well as, conversely, to the political and military guarantees extended by the colonial empires for finance to expand into new markets and business models. Early on, colonial companies epitomized this nexus of financial and colonial expansion, acting in the name of the colonial state, showing that “the history of trading, financial markets and imperial violence have gone hand-in-hand” (de Goede, 2021, p. 356).

Yet, second, it can be argued that the coloniality of modern financial infrastructures lies also in their partiality and strategic incompleteness. One of the main origins of the modern financial economy and of modern capitalism was the insurance business since the thirteenth century (Lobo-Guerrero, 2011, pp. 13–33). In early imperial colonialism, the extension of high-risk loans to colonial ventures was a precondition for early colonial extraction-based trade to take place. While in Europe the system of extending and ensuring loans was based on existing and multiple fungible financial infrastructures of networks among banks and ruling dynasties, in the colonies it merely crystallized in the scattered presence of trading companies’ posts, whose function was solely to enable the insurance of sea transport. In the wake of that initial phase, imperial colonialism never managed, nor was it interested in, extending the density of European financial infrastructures to the colonies. The German colonies, with Germany being an imperial latecomer, testify that financial infrastructures were at no point planned to be extended to them. Banks shied away from getting structurally too much involved in the financing of imperial state ventures and the infrastructural support of economic extraction. The overall “logic” of (not only) German colonialism ought to be explained not so much by capital interests but by a competition for geopolitical influence among European nation-states (von Trotha, 2004, p. 58) – a competition in which the extension of an infrastructural financial capitalism to the colonies played

hardly any role. Financial infrastructures remained concentrated in the Atlantic North, enabling a more or less random exploitation by settlers and investors privileged through the system of colonial administration, rather than forming a structural component of the colonial administration:

It was neither capital exports nor the amount of profits achieved in the colonies that led to imperialism locally forging the modern universe of capitalism. Of much greater importance was the ambition of European settlers and investors to squeeze out as much as possible, on the spot and at the time, from the wealth of a given territory and from the labor force of colonially ruled human beings. (Gerstenberger, 2017, p. 216, translation A. L.)

In the case of the German colonies, even the buildup of an effective system of taxation – under conditions of colonialism usually serving to pressure the population into accepting miserably salaried labor – was for decades left to commercial companies, themselves highly reluctant to build up any sort of infrastructure (Bade, 1984, pp. 4–7), and nowhere came near to state capacity in Europe. In these colonial ventures, the point was precisely not to create a flat political ontology, as in modernist infrastructural reason, but to infrastructurally create points of entry into domains to be colonized by noninfrastructural means, namely by – often occasional and random, but always violent – extraction of resources and labor.

This conspicuous asymmetry, selectivity, or even outright denial regarding the extension of (not only) financial infrastructures from the Atlantic North to the (post)colonies is still felt today. Didac Queralt (2022) argues that the sophistication of the system of global finance in the long nineteenth century, while bringing about unprecedented and ever after hardly achieved depth and integration of capital markets for the North, was an obstacle for the building up of effective domestic financial infrastructures (crucially including taxation) in Southern countries and colonies, as political leaders found it more comfortable to rely on international lending instead of building up an

expensive tax administration that would have restrained their power. The international, but selective, expansion of the infrastructural reach of infrastructural finance thus turned out to be an obstacle in the way of devising and constructing effective domestic taxation infrastructures in many former colonies. A similar argument pertains to the level of making everyday payments within a postcolonial international division of labor, where remittances keep being expensive due to payment infrastructural selectivities (Rella, 2019). As Brandl and Dieterich (2023) argue, the selectivities and asymmetries built into international financial payments systems survive even institutional and technological innovations, as long as there is no political institution in place that will guarantee access to those marginalized along the terms of social structure and IPE.

In infrastructural reason, instrumental rationality trumps value rationality – including the tendency of instrumental rationality, as highlighted by Max Weber, to preclude any normative consideration regarding its ends. Hence, the functions that infrastructures perform and enable do not always manifest in terms of societal integration, cohesion, or coevalness. Rather, infrastructures may perform the function of enabling and reinforcing inaccessibility, exclusion, and marginalization. The imaginary of infrastructures as fully functional and universal effaces their, oftentimes systematic, partiality (Langenohl, 2020; see also Muellerleile, this volume).

3 Governance, Governability, Sovereignty, Hegemony

Infrastructures are devised to make a given territory governable and to standardize the parameters of its governability. In nineteenth-century Belgium, the dense network of inexpensive commuter trains that connected the big industrial centers with the countryside was seen as flattening the divide between urban and rural spaces of political-economic governance (Vandervelde, 2022 [1903]). This notion of using infrastructures

to create a flat political ontology returns in the ambition of many European nation-states, and currently the European Union (EU), to harmonize living conditions and the population's access to services (Folkers, 2017). At the same time, as the current discussion in Europe on energy infrastructures and energy provision in the face of Russia's war against Ukraine shows, as well as more generally within a recent sensitivity that the EU might be in dire need to create a "geo-economic" network of international allies that would help to "build more resilient connections with the world" (Ursula von der Leyen, as quoted in Forough, 2022), the idiom of living conditions and services can easily morph into one of (in this case, European) security. Infrastructures are held to be effective not only with respect to increasing connectivity, but also in regard to demarcating zones of security, safety, and sovereign governance. Thus, the notion of infrastructure was historically not only bound up with industrialization and an imaginary of grand technicality in isolation (see Section 2). Rather, this imaginary displayed elective affinities with an understanding of modern political sovereignty as depending both on industrial and military "mobilization," as Ernst Jünger opined, and for which infrastructures were seen as a precondition (Richter, 2018, pp. 23–24; cf. Folkers, 2017).

This invites a new turn within the research literature on the nexus of security and finance logics. This literature investigates political and epistemological overlaps between concerns about financial stability and the guaranteeing of financial value on the one hand, and the safeguarding of political security, stability, and ultimately sovereignty on the other hand (de Goede, 2010; Boy, Morris, and Santos, 2017). With respect to financial infrastructures, it has classically pointed to the role of banks and payment services in the fight against terrorism and financial practices associated with it, like terrorist financing through "suspicious" transactions and money laundering, and to the ways financial institutions have been cooperating with political authorities in these respects (Amicelle, 2017; de Goede,

2018). In contrast to this literature, present concerns regarding the role of financial infrastructures in the safeguarding of political security and stability enlarge their vision to IR and geopolitics *grosso modo*. This tendency is reflected in the recent interest in “geo-economic” approaches to the role of the financial economy in the shaping of geopolitical hegemonies and in their challenging. While the notion of “geo-economics” was once used to describe a new stage of IR post-1991, where political-economic relationships (as opposed to military power) would play the central role in shaping international hegemonies (Luttwak, 1990; Scholvin and Wigell, 2018), current research looks in a more detailed way into the genuine role of financial infrastructures (most prominently, the SWIFT (Society for Worldwide Interbank Financial Telecommunication) network) to secure international hegemony through infrastructural power (Dörny, Robinson, and Derudder, 2018; Farrell and Newman, 2019; de Goede and Westermeier, 2022). In line with these general shifts, it is currently pointed out that Russia’s war in Ukraine and the Western governments’ financial sanctions against Russian institutions and individuals have accelerated a change of perceptions among political and financial elites worldwide that financial infrastructures – in particular, international payment infrastructures – must be secured against the consequences of such sanctions. This lesson regarding looming financial sanctions (economic sanctions were termed “economic weapons” early on, see Mulder, 2022) is currently being adopted not only by the Russian and the Chinese governments (Ahari et al., 2022; Nölke, 2023) but, notably, also by the EU and the European Central Bank (Swartz and Westermeier, 2023; Westermeier, 2024), where central bank digital currencies (CBDCs) are discussed as protective shields against potential future exclusions from existing international payment systems.

In light of these developments, financial infrastructures cannot just be analyzed as enabling flows and financial services, as might seem natural given the *locus classicus*

of finance as a “flow world” (Knorr Cetina, 2007). They must as well be theorized as enacting effective delinkages and blockages (a point that was made early on with respect to the financial economy’s “structural holes,” see Castells, 1996), as they are, conversely, debated regarding their preparedness for withstanding and deflecting such attacks. Taking the European infrastructural policies in the areas of energy and finance together, we see how infrastructural reason references the dual nature of the classical Western notion of political sovereignty. Infrastructures are supposed to be able to create security and a monopoly of legitimate violence in a given territory, which crucially includes effective barriers to outside forces regarding infrastructural power, and at the same time to be able to wield international force against other, noncooperating or adversarial polities.

4 Infrastructures, Market Thinking, and Fragmentation

To describe global finance in terms of infrastructures carries the misunderstanding that infrastructures can be truly global. The metaphor of the “flow world” of global financial markets, which Karin Knorr Cetina (2007) devised in order to account for the seemingly ceaseless and uninterrupted flows of financial items and values across all the world’s time zones, seems to align easily with an infrastructural view on finance. Is it not information and communication technologies – nowadays often subsumed under the empty signifier of digitalization – that make this global world of flows possible in the first place? And were financial shocks and breakdowns in the past not associated with infrastructural bottlenecks, inhibiting those flows, as occurred on Black Friday 1987 when crucial financial markets got out of sync because of information jams (Muellerleile, 2018)?

Yet, a more cautious look reveals that those flows depend on highly localized hubs, both in technological and social terms, as described and theorized early on

by Saskia Sassen (1991). Financial pricing, for instance, is first and foremost a networked but localized calculative procedure, depending on hubs of calculative power and software, and not depending on the physical moving around of any *financial* items that would justify the financial flow metaphor (Langenohl, 2023). In addition to these doubts regarding the imaginary of finance as being always about movement and flux, the seeming globality of financial markets has been denounced as “globalism” (Beck, 2002, pp. 39–40), that is, as a particular viewpoint of Western (financial, political) elites on planetary processes that favor the ontologies and interests of those elites while paying no attention to the – in turn, often equally quite “localized,” namely locally devastating – effects of “global” markets. Seen from this angle, the *infra*- in infrastructures, which is usually held to denote an irreducible basis for social, economic, or other processes (Larkin, 2013), effaces the factual subordination of another, “deeper” ontological level effected by these infrastructures – like when habitats become bulldozed for the sake of a new highway. This ontological layer, a *sub-infra*-, of “global” financial infrastructures escapes infrastructural reason, which can only always ask “what for,” never “at what cost.”

Recently, researchers are becoming aware of the nonglobality of financial infrastructures (Brandl and Dieterich, 2023). Within a general analysis of a shifting geo-economic configuration through payments institutions and procedures (for instance, alternatives to SWIFT but also the development of non-US-based transaction systems based on CBDCs, see earlier in this chapter), it is expected that the end of US-dominated global financial infrastructures will soon move into sight (de Goede and Westermeier, 2022; Nölke, 2023). In particular, various governments and central banks are engaged in devising CBDCs in a bid to challenge the hegemony of the dollar as a global currency (Swartz and Westermeier, 2023). Cryptocurrencies and crypto exchanges openly challenge, in turn, what they perceive as the hegemony of a politicized financial economy (Golumbia,

2015; Rella, 2019; Beaumier and Kalomeni, 2022). Thus, understandably, analyses that diagnose a coming fragmentation of the global financial economy and of a competition among different currencies and payment systems abound.

These diagnoses betray the imaginary of “global” financial infrastructures, while at the same time confirming the saliency of the genealogy of the notion of infrastructures in nation-states’ dual attempt at achieving internal integration and power positions within the international system. Seen from this angle, precisely as the notion of infrastructure is rooted in the nineteenth century, which was the century of European nation-states engaging in a “scramble” for colonies and through that in an international competition for hegemony, it lends itself very well, maybe too well, for diagnosing the present situation. However, it is questionable whether infrastructural reason will help us transcending, and critiquing, the idea, hegemonic in turn, of the inescapability of international zero-sum games.

In the heyday of the globalization literature in the 1990s and 2000s, finance was often seen as heralding a world in which nation-state borders and capacities were quickly eroding, giving view to a “global” world. This literature was obviously oblivious of Karl Polanyi’s (1944) historical reconstruction, according to which the first financial globalization at the turn of the twentieth century effectively came along with an ever stronger demarcation of political-economic protectionism (most notably, trade tariffs) and ensuing international confrontation, and ushered in an IPE in which only financial circulation, of all economic circulation, remained by and large “global.” So, “global” finance was never the vanguard of postnationalism, but rather accompanied national zero-sum scrambles in the IPE. While according to Polanyi’s (1944) argument at the end of the long nineteenth century this was the scramble for finding selling markets, since the 1990s, and according to the contemporary literature, it was the scramble for attracting foreign direct investment (Castells, 1996).

Analyzing the 2020s political-economic situation in terms of financial infrastructural fragmentation might thus induce some helpful analytical realism regarding the (in)capacities of finance to act as a force of global political-economic integration. But, this lesson could have been learned much earlier through suggestions in world systems theory, unequal exchange, dependency theory, to name only some of the most prominent strands of critical IPE. Moreover, through anchoring the diagnosis in the materiality of financial infrastructures (payment systems, most often) and thus putting a particular emphasis on the techno-socio-political substrate of financial transactions, the infrastructural fragmentation approach runs the risk of naturalizing a transactional logic of finance, thus effacing the increasing role of (not-exchanged, not-transacted) financial assets in the social-structural polarization of the political economy (Adkins, Cooper, and Konings, 2020).

5 Infrastructural versus Political-Economic Reason

Since the 1980s, a political-economic critique of finance and financialization has gained ground in response to the rollout of neoliberal policies, in particular regarding the deregulation of the financial economy, which came along with a weakening of state institutions, a shift toward austerity politics in case of state budget problems, and an insistence on property at the expense of top to bottom redistribution (Krippner, 2005; Blyth, 2015; Piketty, 2020). This critique has been sidelined by infrastructural reason, which sees financial infrastructures – especially infrastructures enabling trading and thus pricing of financial assets and risks – as the base for the entire economy (Muellerleile, 2018). This is reflected in the fact that financial infrastructures belong to the most securitized infrastructures, and virtually everywhere count among so-called critical infrastructures that require especial protection by the state (Langenohl, 2020). It also surfaces in recent warnings regarding

cybercriminal assaults on stock exchanges, which highlight imminent dangers to the calculative technical infrastructure that is supposed to guarantee a smooth operation of transactions (Langenohl, 2023). If trading and pricing are regarded as the base of the economy, it is these that need protection under all circumstances. A consequence of this infrastructural optics on financial processes may be seen in the ways that the British and the US government – and, with some delay, the EU as well – shifted their perception of the global financial crisis from that of an out-of-control speculative dynamism to that of a crisis of liquidity in financial markets (Langley, 2015). This undermined earlier positions calling for a stricter regulation of financial markets, and notably a reduction in opaque trading practices (FCIC, 2011; Bieling, 2014).

At stake is thus the question if and how issues of social inequality caused and exacerbated by the financial economy can be thought of in terms of infrastructures. Earlier in this chapter, I discussed the problems regarding access to infrastructural financial services as a matter of concern pointing in this direction. These considerations sit well with current suggestions, articulated with a view to Europe and especially to Britain, to rethink social inequality in terms of the weakening of state-funded infrastructural services, from housing to transportation to public health (Foundational Economy Collective, 2018). In terms of finance, one might think here of demands to solve the problem of the underbankedness of certain population segments, or of easing access to loans and credit for poor people. Yet upon closer inspection, it is questionable whether (legitimate) calls for a broader public service can be applied to financial infrastructures. An uncritically affirmative answer would sideline the question whether an “inclusion” of more population segments into more financial services is unconditionally desirable – especially as financial agency is becoming increasingly connected with surveillance technologies (Amicelle, 2017; de Goede, 2018). Such broader and deeper inclusion into finance might just be

the flip side of what has been critically discussed as the “financialization of daily life” (Martin, 2002, p. i; see also Langley, 2008), as it might be another instance of securitization of the everyday.

Again, a look toward South Africa helps further elucidating the problem. In his monograph on *Credit and Debt in an Unequal Society*, Jürgen Schraton (2020) demonstrates the consequences, especially for poor people, to get access to small short-term loans. These are aggressively advertised, mostly by commercial banks and nonbanks, whose prohibitive yet mostly intransparent conditions, in the absence of a law regulating private insolvencies, drive loan-takers into unacceptable spirals of indebtedness. To my mind, there are only gradual differences between these practices and other financial practices in many societies the world over, from commercial (mostly Western) banks shifting the currency exchange risks to private borrowers in Eastern Europe, to the use of microcredit loans in India and Pakistan, whose “security” is based often on self-exploitation of the loan-takers, as collateral for global financial investments – to say nothing about the causes for the latest financial crisis in private mortgages whose risks were not made transparent either to the customers or to the regulation agencies (Langenohl, 2021; see also Roitman, this volume). So, the scandalization of absent access to financial services is no proper substitute for a political-economic critique, displaced as it may seem through the eyes of infrastructural reason.

6 Conclusion: Disruption as Paradigm of Infrastructural Reason

In this chapter, I highlighted pitfalls of infrastructural reason so prominent in today’s IPE, IR, and social studies of finance. For critical and engaged social science, a pressing issue to address is how to turn the notion of infrastructure into one that articulates effective critiques of problematic developments that abound in finance, as well as of the imaginary of

competition for global hegemony that the notion of infrastructure historically carries.

It is perhaps no exaggeration to say that infrastructural reason in contemporary finance is as much about financial disruption as it claims to be (or has so until recently, at least) about financial integration. The advent of blockchain technologies and decentralized finance was more or less openly announced as a libertarian disruption of traditional finance (Golumbia, 2015). The example of international lending to Southern states and colonies in the nineteenth century, referred to earlier in the chapter (Queralt, 2022), effectively channeled international money flows into a decapacitation of state-building in former colonies. The most recent global financial crisis was effected by a mushrooming of transactions in derivative instruments whose sheer numbers and complexity undermined regulatory capacities (FCIC, 2011). And the current politicization of international payment infrastructures, resulting in uses of infrastructural sanctions as “economic weapons” (Mulder, 2022), was metaphorized as financial services’ “atomic bomb.” These examples of financial infrastructural irritation cast into doubt any attempt to align infrastructural reason with the smooth engineering of flows and financial integration. Instead, they call for another paradigm: that of infrastructural disruption, shock, and disintegration.

In such a context, an ambitious discursive endeavor will be to disentangle the notion of infrastructure from the modernist assumption of full functionality and full service coverage (see, for related suggestions, the chapters by Pinzur and Coombs, this volume). Sociologist Philipp Staab (2023), who has investigated the life conduct of staff working in “critical sectors” during the corona pandemic in Germany – care workers, doctors, police staff, and so on – argues that we might be witnessing a turn toward a “society of adaptation” (*Anpassung*). In such a society, life projects and subjectivities will be based on the understanding that infrastructural services are crucial not because of their functionality and perfection, but because of what they achieve amidst overall

chaotic conditions. Because infrastructures cannot be but vulnerable given the sheer size and amount of contemporary macro-risks and threats – Staab mentions climate change, wars, pandemics, to which we might easily add disruptions in the international financial system currently underway – their resilience, partial operability, and adaptive capacities to a sudden worsening of circumstances lends them much more significance than any dream of perfection. At the present turn, it is as difficult as it is important to imagine “adaptive” financial infrastructures that would attain their political, economic, and societal meaning and significance from their ability to cope with their imperfections – that is, from the minimal possible service core they would still be able to deliver in case of outright havoc.

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CHAPTER 7

Assets: Boundary Objects between Financial Practices and Infrastructures

Philipp Golka

1 Introduction

From investment banking to trading and portfolio management, virtually all financial market activity is in one way or another related to assets. However, assets have until recently remained a “blind spot” in political economy scholarship and social studies of finance (Langley, 2020). Although this is rapidly changing as assets, assetization, and asset management are attracting considerable, cross-disciplinary research interest (Adkins, Cooper, and Konings, 2020; Birch and Muniesa, 2020; Braun, 2020), assets have not yet seen much attention from scholars of financial infrastructures. One reason for this may be the fact that assets are highly heterogeneous objects that have sparked a yet-to-be-resolved scholarly debate over their definition (Birch and Ward, 2022; Chiapello, 2023). This makes studying the link between assets and infrastructures more challenging compared to rather clearly demarcated sites such as trading desks or stock exchanges. And yet, assets are of particular importance for scholars of financial infrastructures because, as I argue in this chapter, they mediate between

financial activity and infrastructures and have some infrastructural properties themselves.

The main argument in this chapter is that assets are boundary objects between financial actors and financial infrastructures. Boundary objects inhabit various social worlds in which they have different meanings but nevertheless have a structure that is common enough to facilitate interaction between various groups (Star and Griesemer, 1989). Assets are boundary objects in the sense that they enable interactions – and structure social relations – between a myriad of actors, ranging from smallholder farmers in the Global South to financial traders in New York. Transformed into assets, all kinds of things – from farmland to industrial firms and public goods – become actionable by financial markets, and financial infrastructures play an important role in this process. At the same time, financial activity geared at particular assets can also affect the development of financial infrastructures. These interconnections are schematized in Figure 7.1.

The second argument made in this chapter is that the mediating role of assets

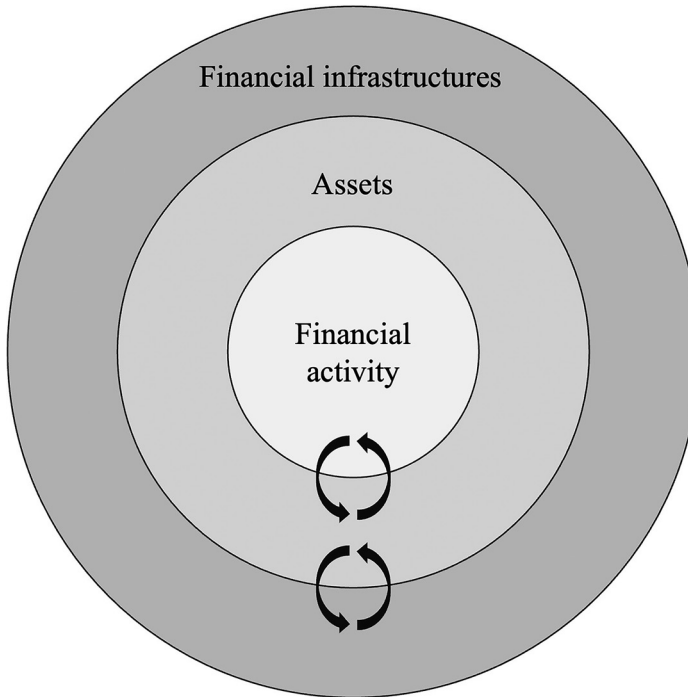


Figure 7.1 Assets as boundary objects between financial infrastructures and financial activity.
Source: Author

differs along their lifecycle. Three different stages in the lifecycle of assets can be distinguished. Assetization is the first one and denotes the sociolegal transformation that restructures social relations in such a way that things become assets (Birch and Muniesa, 2020; Tellmann, 2022). The goal of assetization processes is to dissect cash flows from the objects that generate them and/or to attract financial capital. Assetization has important infrastructural characteristics for the operation of financial markets (Bernards and Campbell-Verduyn, 2019, p. 777): It *facilitates* the trade of these objects – as assets – on financial markets. When qualified according to particular asset classes, it *standardizes* core features and makes them *durable*. Assetization shows *centrality*, as assets structure much financial activity, and *obscurity*, as it produces a taken-for-granted reality – the asset form and the expected returns that come with it – that hides other aspects such as the struggles over return extraction (Golka, 2023). Once traded on financial markets, assets

undergo a translation into their second stage in the lifecycle: asset management. Here, two other practices, accompanied by different actors and infrastructures, take the stage: the management of and activities related to volatile asset prices, as well as the creation of new assets from assets (Leyshon and Thrift, 2007). The final step in the lifecycle of assets is their planned, forced, or accidental breakdown: deassetization. As deassetization often frees up the financial resources previously bound in the asset form, it is of constitutive importance for financial markets. However, as the case of “stranded” carbon assets shows, forced deassetization lays bare the power relations that constitute the asset form. Surprisingly, deassetization has received relatively little scholarly attention, which is why this chapter describes how an “infrastructural gaze” would guide and inform future scholarship (Westermeier, Campbell-Verduyn, and Brandl, this volume).

In Section 2, I briefly discuss the recent scholarly debate over the definition of assets and show how it can be resolved by

understanding assets as boundary objects. The next three sections discuss the role of assets as boundary objects in between various forms of financial activity and financial infrastructures. Each section follows the travel of assets along three key stages of their lifecycle: assetization, asset management, and deassetization. This chapter ends with a conclusion.

2 What Is An Asset?

According to Merriam-Webster, the term asset derives from the French word *assez* (sufficient) and has historically meant “sufficient estate.” One important function of assets is thus to act as a collateral to cover corresponding liabilities. This can be seen in corporate balance sheets, where assets are usually ordered by their liquidity, ranging from cash and marketable securities to illiquid assets such as inventory. But assets are more than just collateral. The Financial Accounting Standards Board (FASB) understands assets as rights to economic benefit (FASB, 2021, E16–36). These may derive from property ownership but there are also other legal and contractual instruments that grant such rights (Pistor, 2019). While scholarship agrees that assets are relational, sociolegal constructs, there is less unity as to whether or not assets are necessarily return-bearing (Birch and Ward, 2022; Chiapello, 2023). This is an important question because return-bearing assets rest on a particular relational structure that enables the extraction of financial returns (Birch and Muniesa, 2020; Tellmann, 2022), whereas other assets such as currency – despite also being sociolegal constructs that grant rights to economic benefits, such as their exchange value – show entirely different relational configurations.

To circumvent these ontological questions, this chapter proposes to understand assets as boundary objects (Star and Griesemer, 1989). Originating in science and technology studies, boundary objects are objects, such as repositories, that facilitate interaction between social groups because their “interpretive flexibility” allows the

maintenance of plural meanings that get stabilized in use without requiring consensus across groups (Star, 2010). Assets are boundary objects as they cater for the plural meanings that arise from the heterogeneous “information needs” of various social worlds (Star and Griesemer, 1989): Accountants may see assets on corporate balance sheets as “resources available for business operation” whereas portfolio managers may view them from their risk-return profile (Chiapello, 2023, p. 1). However, these meanings need not be consensual, as exemplified by the case of cryptocurrencies that are labeled “crypto assets” by their proponents and Ponzi schemes by their opponents.

As boundary objects, assets also enable interaction between these diverse groups. If we follow an asset as it travels from, say, the exploration of an oil field via the balance sheet of a fossil fuel company into the portfolio of an asset manager that is later sold off in response to a divestment campaign, we see that assets travel along complex “chains of translation” (Latour, 1999), understood as structured situations in which different actors act with and upon assets in different ways. In the following sections, I will discuss three of such situations – assetization, asset management, and deassetization – in more detail. In each of these situations, assets serve as important mediators between various actors and financial infrastructures and even carry several important characteristics of infrastructures themselves. Importantly, the infrastructures that enable the creation and trade of assets along their lifecycle are financial in the sense that they are related to the financial dimension of assets – whether or not they are related to financial markets. Investigating the lifecycle of assets thus helps in understanding financial infrastructures even where they precede financial market exchange.

3 Assetization

The transformation of all sorts of things into assets is called assetization and is the first step in the asset lifecycle (Birch and Muniesa, 2020). Redirecting scholarly attention to

the social process of creating assets, assetization scholarship has studied a remarkable breadth of objects, including data (Geiger and Gross, 2021), plant seedlings (V. Braun, 2021), farmland (Ouma, 2020), or real estate (Fields, 2018). Assetization, then, is a relational transformation by which these objects are detached from their initial context or claimants and “rebundled” into an asset (Tellmann, 2022). This process of “narrative transformation” brings together various professions such as accountants, investors, business developers, or certifiers (Birch and Muniesa, 2020).

Scholars of assetization have thus far focused on the creation of return-bearing assets.¹ Here, the creation of durable economic rents is the key goal of assetization processes, which entails that many of these assets are made to keep rather than to be sold on financial markets (Birch and Muniesa, 2020; Birch and Ward, 2022). The asset form, then, can be understood as a boundary object in the contested social process called capitalization that entrenches the valuation of objects from the perspective of financial investors (Muniesa et al., 2017). While various social groups interact in the valuation of objects, the asset form helps investors to “colonize” the valuation process by centering valuation on expected future cash flows (Chiapello, 2015). Aiding in this process are financial valuation tools (such as business plans), through which expected future cash flows are constructed and discounted to the present moment (Doganova, 2018). In many cases, the valuation of “intangible” asset components such as property rights or market share plays an important role as their ascribed value often exceeds that of the tangible asset components such as buildings or machinery (Birch, 2017; Bryan, Rafferty, and Wigan, 2017; Chiapello and Engels, 2021).

Strengthening the perspective of investors and enabling the extraction of rents, assetization is a fundamentally political process. The politics of assetization surfaces not only in struggles over various questions of valuation (Williams, 2020), but also in resistances – even nonhuman ones – to the creation of relations of control

(Ouma, 2020; V. Braun, 2021). To overcome such resistances, proponents of assetization often call for the help of governments (Gabor, 2021; Golka, 2023). A case in point is the assetization of public goods whereby private investors gain ownership of and control over previously public infrastructures (such as water or transport networks) and use their power to “sweat” these assets by extracting monopoly rents and underinvesting in maintenance (Allen and Pryke, 2013; Langley, 2020; Christophers, 2023b). Governments also play a vital role by creating the wider sociolegal infrastructures that enable assetization in the first place and protect the extraction of rents (Pistor, 2019). Governments are furthermore turning to assetization as a form of developmental or industrial policy, subsidizing (“derisking”) private investments instead of financing projects directly (Gabor, 2021). This entails that assetization requires supportive political coalitions: As the attempt to create a market for so-called social impact investments in the UK has shown, assetization needs to be perceived as a credible and salient policy option and may quickly unravel with a change of political contexts (Golka, 2023).

Assetization is an important case for scholars of financial infrastructures for two reasons. First, there are manifold, often bidirectional linkages between assetization and financial infrastructures that have thus far only rarely been made explicit. Informing pricing, risk assessment, and payment, financial infrastructures affect virtually all aspects of assetization (Bernards and Campbell-Verduyn, 2019). A case in point is the role of digital infrastructures in creating assets such as cryptocurrencies that attract speculative capital even without granting access to future cash flows (Campbell-Verduyn, 2017), or that transform monetary flows into traceable digital stocks (Westermeier, 2023). Other examples include financial infrastructures surrounding credit ratings or remittances that mediate processes of abstraction necessary for rent extraction (Kunz, 2011; Bernards, 2019). Complex information infrastructures, or “infostructures” (Campbell-Verduyn, Goguen, and Porter, 2019), play

a vital role in qualifying less tangible things such as windy sites (Nadaï and Cointe, 2020) or carbon credits (Langley et al., 2021) into assets. Another important case is that of the digital infrastructures developed by real estate firms that gather data and automate key functions of the management of geographically dispersed property portfolios, such as rent collection and maintenance (Fields, 2018, 2022). These infrastructures are crucial enablers of assetization processes because they perform essential scale work that turns lower-tier real estate into an attractive investment opportunity. But the reverse may also be true as financial infrastructures can themselves be assetized. For example, Petry (2021) has studied how marketization, internationalization, and digitalization have turned exchanges into providers of infrastructures such as market data or indices. But this leaves open the question whether and how these infrastructures have themselves been turned into return-bearing assets by global exchange groups, and how this process of assetization has affected their operation and development.

Second, an “infrastructural gaze” could also help understand how and under what conditions assetization is bound up with infrastructural characteristics that enable and shape financial market activity, and what role financial infrastructures play in enabling these characteristics in the first place (Westemeier, Campbell-Verduyn, and Brandl, this volume). One important aspect here is that assetization allows separating ownership from control whereby even things that cannot be owned (such as consumers) can still be assetized (Birch and Muniesa, 2020). Through sociolegal operations such as copyrights, assetization allows controlling things even after they are sold – which distinguishes assets from commodities where control relations end in the moment of exchange. Of even greater importance, however, is that assetization results in a “separation of rights from the thing involved” (Birch and Muniesa, 2020, pp. 5–6), for example by separating the (legal and financial) corporation from the (material and operational) firm (Robé, 2011). Shares, for example, grant

rights to a corporation’s future cash flows rather than to, say, a piece of physical equipment. Viewed from an infrastructural perspective (Bernards and Campbell-Verduyn, 2019, p. 777), this separation not only facilitates the translation of real assets into financial products but also creates obscurity in the sense that the real and ongoing struggles over the extraction of financial returns become invisible to financial market actors. Likewise, the laws and regulations regarding assets, such as information requirements for stock market listings, or ratings and quality conventions, form part of the infrastructural work that enables financial activity through standardization and compartmentalization (Chiapello and Godefroy, 2017). However, more research is needed to understand how assetization performs such infrastructural characteristics and what role(s) financial infrastructures play in this process. Viewing assets as boundary objects can provide a useful lens in these research endeavors, not least because it also allows making the connection to financial market exchange, to which this chapter turns to next.

4 Asset Management

The translation of assets into the second stage of their lifecycle is marked by their sale on financial markets. Importantly, not all assets will undergo this translation, or won’t do so immediately, as assets are often made to keep (Birch and Muniesa, 2020). If they do, however, assets become *financial* assets, and are marked by two crucial operations during which the actors and infrastructures related to them change significantly. The first operation is the exchange or trading of assets, which introduces a more or less volatile market price. This means that assets *also* become commodities that can be speculated with (i.e., *asset commodities*). The trading of these asset commodities does not necessarily affect the asset form, even though asset prices may feed back into the sociomaterial structure that underpins the respective asset (such as the corporation whose shares are speculated with). Scholars of financial infrastructures

have paid considerable attention to the ways in which infrastructures enable, shape, and transform the various sites and practices of asset trading. The second operation, however, has thus far received less systematic attention from an infrastructural perspective. This operation is what I call *layering*, that is, the production of new assets from assets (Golka, 2021). After a short overview of research on trading and infrastructures, this section will turn to layering.

The manifold interconnections between asset trading and financial infrastructures have received considerable scholarly attention, particularly in the social studies of finance (see chapters by Handel, Muellerleile, Petry, as well as Tong and Preda, in this volume). The introduction and historical transformation of stock exchanges are a paradigmatic case, showcasing the bidirectional connections between financial activity and infrastructures. For example, the introduction of the stock ticker had a profound effect on the operation of financial markets through standardization and the creation of shared temporal structures (Preda, 2006). More recently, Pardo-Guerra (2019) has shown how the infrastructure of automated stock exchanges has informed the division of professional roles and practices in financial markets. Another example is the development of high-frequency trading, which is, regarding physical proximity or trading algorithms, often tailored to specific stock exchanges but also drives the development of underlying sociotechnical infrastructures (MacKenzie et al., 2012; MacKenzie, 2018). This is also an important insight for political economy scholarship as these infrastructural dependencies inform new inequalities and power relations (Bernards and Campbell-Verduyn, 2019).

What does attention to the asset form add to such scholarship? This is an important question not least because many characteristics of today's trading infrastructures can be traced to their role in facilitating commodity – rather than asset – trading (Pinzur, 2021). One important way to address this question is by understanding how, with the rise of asset management

(B. Braun, 2021), trading and layering are increasingly entangled, and how this entanglement transforms financial infrastructures. Tracing the development of financial exchanges, Petry (2021; see also this volume) has shown how they have increasingly broadened their scope from mere trading sites to what he calls “global providers of financial infrastructures.” However, these infrastructures, market data, indices, and financial products may not only become assets for the exchange groups themselves, but are indeed often geared at facilitating layering by asset management companies or the exchanges themselves. Enabling new forms of layering may thus have become a key factor driving the development of financial infrastructures.

So what exactly, then, is asset layering? By asset layering, I mean the construction of new financial assets from existing financial assets. Two of the most important forms of layering are the construction of portfolios as well as the issuance of derivatives. The fact that the same asset (e.g., a listed share) can undergo both of these layering processes at once points again to the importance and utility of understanding assets as boundary objects. Layering is an important part of financial market activity because it can absorb significant volumes of capital, generate fees for financial intermediaries, and cater for the needs of institutional investors. The rise of the “Big 3” asset managers (BlackRock, Vanguard, and State Street) exemplifies one important approach to layering as these actors construct large-scale, index-tracking, fully diversified portfolios (Braun, 2016; Fichtner, Heemskerk, and Garcia-Bernardo, 2017; Petry, Fichtner, and Heemskerk, 2021). This new, “passive” approach to asset layering has significantly altered global flows of capital and is poised to overtake the traditional layering approach of curated, actively managed portfolios within the next few years (Bloomberg, 2021). It has been enabled by the development of financial infrastructures surrounding exchange-traded funds (ETFs) that allowed tracking indices even for frequent financial transactions (Braun, 2016), and has since led to a fundamental transformation of power relations

within the financial sector by giving index providers and large asset managers considerable infrastructural power (B. Braun, 2021; Petry, Fichtner, and Heemskerk, 2021).

Asset layering also shapes how the financial sector affects the economic governance of the respective portfolio firms and thus translates changes in the realm of financial infrastructures back into the real economy. Passive investing combines full diversification, that is, the inability to “exit,” with performance-independent fees that give little incentives to “voice” (Fichtner, Heemskerk, and Garcia-Bernardo, 2017; Braun, 2022). As indices often weigh firms on market capitalization, passive investing may fuel superstar stocks such as Big Tech or fossil fuel shares that become an important source of asset manager profits (Petry, Fichtner, and Heemskerk, 2021; Baines and Hager, 2023). This means that demand from passive investors affects firms’ share prices more than their dividend payments – that is, the expected cash flows that constitute the asset form. New forms of asset layering may therefore, seemingly paradoxically, shield superstar firms from assetization pressures regarding the extraction of returns. Indeed, this matches the observation that many Big Tech firms pay only little to no dividends (Klinge et al., 2023). However, other approaches to asset layering may lead to different outcomes, as evidenced by private equity and venture capital funds. These funds invest in only a small number of firms, over which they gain considerable control, and earn fees based on their financial performance. These investors are known to exert significant pressure on their portfolio firms, using their position to “sweat” assets, force them to aggressively increase market share to drive up initial public offering (IPO) valuation, or burden them with considerable debt (Froud and Williams, 2007; Robertson, 2009; Birch, 2017).

The creation of derivatives is another vitally important strategy of asset layering. If measured by notational amount, derivatives have, with over \$600 trillion, by far the largest volume of any financial product, and far exceed global US dollar supply.

However, their gross market value is considerably lower. Moreover, the vast majority of derivatives is not based on return-bearing assets, such as equity or bonds, but on interest rates and foreign exchange (BIS, 2022). The development of foreign exchange and interest rate derivatives has been linked to the emergence of new financial infrastructures within governments (Lagna, 2016; Schwan, Trampusch, and Fastenrath, 2021). Historically, derivatives have emerged as an insurance on markets for agricultural commodities (Muellerleile, 2015), whereas asset derivatives such as stock options have long been seen as (illegitimate) gambling. This only changed with the development of the Black–Scholes formula for option pricing in the mid-1970s, which played an important role in legitimating option trading and structured option pricing and the development of respective financial infrastructures (MacKenzie and Millo, 2003; MacKenzie, 2008). The introduction of the Black–Scholes formula also changed option trading as it allowed pricing the volatility of stocks, thus creating a market for risk (Millo and MacKenzie, 2007). Stock options are an important case for the power of financial infrastructures as exchanges and clearing houses such as the Options Clearing Corporation shape virtually all aspects of issuance, trade, and post-trade on option markets (Genito, 2019). However, as Petry (2021) notes, their role beyond the provision of marketplaces has received only little scholarly attention (but see Genito and Lagna, this volume). Hedge funds are the most important actors in derivatives trading, using the latter to increase their market exposure (Holmes, 2009). Hedge funds also create important connections between financial trading centers in the USA and offshore destinations such as the Cayman Islands (Fichtner, 2016). This may partially explain the secrecy and the significant research gap surrounding hedge funds and thus the use of derivatives more generally. As recent market data suggest, equity options are increasingly losing market share relative to ETF and index options that have seen double-digit growth rates (OCC, 2023). This poses the question

of how transformations in one area of asset layering may inform changes in another, and how these dynamics are enabled or mediated by financial infrastructures.

While scholarship has begun to understand the bidirectional relationships between financial infrastructures and asset layering (MacKenzie, 2008; Braun, 2016), more research is needed to address at least four other sets of questions. The first one is how changes in the link between financial infrastructures and asset management can become self-reinforcing. This may include transformations in the epistemic realm whereby growing dependencies on financial markets strengthen financial experts and crowd out other forms of expertise (Golka and van der Zwan, 2022). This points to the second question: unintended consequences resulting from changes in the link between asset layering and financial infrastructures. This is exemplified by the “clearing mandate” introduced to derivatives settling that, contrary to policymakers’ intents, strengthened private authority and created new financial stability risks (Genito, 2019). A third set of questions is whether and how constrained access to infrastructures may spark reactivity. An example is special-purpose acquisition companies (SPACs) – listed vehicles that acquire private companies that then become publicly traded. SPACs remunerate their sponsors with total fees beyond 20–25%, which are called “ridiculous” even within the financial industry (Citywire, 2021). As SPACs are designed specifically to circumvent formal IPO requirements, it is access to otherwise inaccessible financial infrastructures that may make them attractive to some actors despite their hefty fees. A fourth set of questions revolves around how asset layering interacts with infrastructural developments across domains. For example, as described, the development of digital infrastructures was a key enabler for the assetization of housing (Fields, 2018, 2022). This development coincided with the rise of real estate investment trusts (REITs), relatively diversified commercial or residential real estate portfolios listed on stock exchanges. REITs have gained prominence

following the collapse of mortgage-backed securities markets during the 2008 financial crisis and play an increasingly important role in funneling institutional capital to real estate (Waldron, 2018; Fuller, 2021). While REITs have been found to create opportunities and incentives for asset managers to increase rent extraction from real estate (Yrigoy, 2021), less is known about the interaction between these various infrastructural developments. More research that explores the manifold linkages between financial infrastructures, asset layering, and financial actors is therefore needed.

5 Deassetization

The third and final stage in the asset lifecycle is deassetization, that is, the dissolution of the asset form or one of its layers. For the majority of financial assets, deassetization is a planned feature: Stock options cease to exist once the option right is used, as do bonds and loans once they are fully repaid. Layered assets such as fixed-term funds that are common in private equity and venture capital are unbundled after a predefined duration, releasing cash to investors and performance fees to asset managers, while the portfolio items themselves continue to exist as assets with different owners (Cooiman, 2023). Writing off assets that cannot be sold – such as Russian holdings following the Russian invasion of Ukraine (Phillips, 2022) – may also be seen as a particular form of deassetization. As deassetization has, to date, received only little scholarly attention, its interconnections with financial infrastructures remain rather unclear. This raises questions regarding how infrastructural actors such as clearing houses inform the terms and processes of deassetization, and what consequences this has for financial activity more generally. Another fruitful avenue could be to explore further the role of (planned) deassetization for the infrastructural characteristics resulting from assetization processes. For example, Brett Christophers argued in a recent *Financial Times* op-ed (2023a) that private investors investing in public

infrastructures (such as roads) have incentives to underinvest into maintenance and improvement as they will not reap potential profits from such investments due to the lifespan of the fund. An infrastructural gaze on assets and their planned deassetization could thus help address recent calls for a sociology that understands societal futures as shaped by the temporal logics of assets (Adkins, Bryant, and Konings, 2023).

When unplanned, however, deassetization makes visible the inequalities and power relations that are often obscured by the asset form. A case in point here is “stranded” assets, that is, financial assets that are expected to face significant devaluation (Caldecott, 2017). In the context of an escalating climate crisis, fossil fuel assets are increasingly seen as stranded as many carbon reservoirs must not be burned in order to achieve the Paris climate goals. Here, an infrastructural gaze could help unpack how, much like infrastructures that become visible upon collapse (Star and Ruhleder, 2015 [1996]), the threat of deassetization lays bare the ways in which inequalities and relations of expropriation have been made durable and obscured in a layered asset economy (Bernards and Campbell-Verduyn, 2019; de Goede, 2020). Not surprisingly, owners of carbon assets leverage their legal affordances to address the threat of devaluation (Caldecott et al., 2021), or use their power resources to mobilize significant compensation from governments (Furnaro, 2023). However, an infrastructural perspective would go even further and investigate how infrastructural dependencies – and thus investors’ ability to leverage infrastructural power – shape the struggles over carbon deassetization. An infrastructural perspective could also investigate how looming threats of deassetization are translated into risks, and how these and wider climate risks are managed by financial actors, informed by and informing new financial infrastructures (Taylor, 2023). As many carbon assets and sinks are located in the Global South but owned in the Global North (Semieniuk et al., 2022), an infrastructural perspective may also help understand the colonial

aspects of such deassetization struggles as it allows bridging between the micro-level of individual carbon assets and the macro-level of global finance (Bernards and Campbell-Verduyn, 2019; de Goede, 2020).

6 Conclusion

In this chapter, I made the case for assets as important research objects for scholars of financial infrastructures. My argument was that assets are boundary objects that enable interaction across social groups and, depending on the stage in their lifecycle, serve as important hinges between financial infrastructures and various forms of financial activity. Being the focal point of much of global financial activity, assets – and the various approaches to asset layering – play an important role in the development of new financial infrastructures. However, at the same time, assets are critically shaped by financial infrastructures and carry important infrastructural characteristics that enable financial activity in the first place. To unpack these bidirectional interlinkages, this chapter has focused on three key stages in the lifecycle of assets – assetization, asset management, and deassetization – that differ in these interlinkages.

This chapter thus contributes to making renewed research interest in assets and assetization accessible to scholars of financial infrastructures, and to pointing out the importance of financial infrastructures to scholars of assetization. Tracing assets along their various steps of translation, this chapter also takes seriously the reminder from Leyshon and Thrift (2007, p. 109) that financial capitalism is “not all smoke and mirrors” and that “there has to be something there to begin with” – that is, assets. However, taking the asset form – and its manifold interrelations with financial actors and infrastructures – seriously matters not only for scholars of finance. Sociologists and political economists have shown the fundamental importance of assets in structuring new class boundaries (Adkins, Cooper, and Konings, 2020) and global wealth

inequalities (Pfeffer and Waitkus, 2021). Bridging the inside and outside of financial markets, the micro and the macro, and unpacking the making and transformation of power relations (Westermeyer, Campbell-Verduyn, and Brandl, this volume), a shared perspective of assets and infrastructures could help uncover important mechanisms for the entrenchment and perpetuation of such asset-related inequalities.

Note

1. Assets that do not grant rights to future returns such as currency have, to my knowledge, thus far not been studied by scholars of assetization and will be omitted here for the sake of simplicity.

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CHAPTER 8

Payments and Hegemony

Infrastructural Sedimentation, Reach, and Disposition

Carola Westermeyer and Marieke de Goede

1 Introduction: Colonial Payment Infrastructure

Historically, payment, especially if it was to reach across geographical boundaries and long distances, was complex, cumbersome, and materially heavy. Consider the British practice of countermarking coin at the time of its appropriation and exploitation of the Caribbean during the seventeenth and eighteenth centuries. A tool of British imperial rule was the imposition of currency to facilitate local economies and enable (inter-) national trade in plantation economy goods. Issuing new coins was costly and complex, which spurred the practice of ‘countermarking coins’. With small incisions, stamps, or clippings in existing coinage – for instance, coins previously issued by the Spanish Crown – the bullion was authorized for payment in imperial Britain. For example, coinage originally from Peru was countermarked for use in Jamaica or Tobago by the British colonizers with stamps superimposed on the original coinage seals and with clippings to bring the coin in line with British weights and valuation practices (Parsons, 2023). As

such, the metal helped facilitate the transatlantic triangular trade, whereby enslaved people were shipped and put to work on Caribbean plantations, while plantation goods like sugar were shipped to Europe. At the same time, the countermarked coin signifies the reach and authority of British imperial power, whereby bullion backed by London’s Bank of England and imperial weights and valuations upheld and expanded the imperial economy – at great human cost.

In 2022, the Bank of England Museum placed on display the material examples of the countermarked coin in its ‘Slavery and the Bank’ exhibition (see Figures 8.1 and 8.2). This display emphasized the imperial authority behind the countermarked coin, with the Bank of England and the British East India Companies as the centres of authority enabling the circulation of coin from, for example, Peru to Jamaica, St Lucia, and Tobago. As curator Kirsty Parsons concludes: ‘These coins help reveal the relationship between transatlantic slavery, colonialism, and the British economy’ (Parsons, 2023). The countermarked coin both *inscribed* and *was inscribed by* British



Figure 8.1 St Lucia coin.

Countermarked coin for use in St Lucia, about 1813. *Source:* Bank of England Museum: T536.



Figure 8.2 Martinique coin.

Countermarked coin for use in Martinique, about 1719. *Source:* Bank of England Museum: T535.

imperial authority. As such, this payment infrastructure encodes particular hierarchies of power and cross-border territorial authority with extensive geographical reach. Those power structures may endure sedimented inside the material form, even when the power of the underlying authorities is challenged, as was the case for the Spaniards in this example.

In this chapter, we theorize payment infrastructures as crucial material sites of hegemonic power. The account of the countermarked coin illustrates three points that are at the heart of this chapter. First, the material form of payment technologies and the unequal routes of circulation produced by them are integral parts of the ways in which modern money and finance exercise power. Payment technology is not a neutral infrastructure, but a carrier of hegemonic power and a potential site of hegemonic contestation. The material remarking of bullion whereby the British Empire literally stamped over the insignia of the Spanish Crown shows how this payment technology

is profoundly political and a site of power. Secondly, payment infrastructure is inextricably connected to state security and sovereignty. The countermarked coin both was enabled by the authority of the British Crown and helped further circulate the British Empire's authority and economic power. State security and sovereignty were enabled and made durable with and through the payment infrastructure. Thirdly, infrastructures are historically durable, though they may be rerouted or reinscribed. As Susan Leigh Star has put it: 'Infrastructure does not grow *de novo*. It wrestles with the inertia of the installed base and inherits strengths and limitations from that base' (1999, p. 382). New uses or purposes can be grafted onto existing material technologies, reorienting them to new practices of power. In our example, the power of Spanish imperialism remains sedimented inside the repurposed coin, even if it was overridden and reoriented through British rule.

This chapter analyses how hegemony is embodied within payment infrastructures,

thus linking political power to social-political materialities. As this edited volume shows, global financial architecture builds on human and non-human infrastructures, including institutions, currencies, and payment routes that determine global flows of liquidity and money. While semantically close, we seek to distinguish our approach from the notion of infrastructural power developed by Michael Mann (1984). As Coombs (Chapter 4) discusses, Mann employs 'infrastructure' loosely, and it is unclear whether his understanding significantly differs from that of a network. There is no well-defined distinction between the agency of organizations/networks and the background work of infrastructure in Mann's work.

In contrast, we propose that infrastructures themselves are important material actors and sites of agentic capacity. Keller Easterling (2014, p. 15) emphasizes in her study of statecraft why we need to pay attention to the capacities encoded in infrastructures themselves:

Contemporary infrastructure ... orchestrates activities that can remain unstated but are nevertheless consequential. Some of the most radical changes to the globalizing world are being written, not in the language of law and diplomacy, but in these spatial, infrastructural technologies – often because market promotions or prevailing political ideologies lubricate their movement through the world.

Building on the work of Easterling and others, we propose the notion of 'hegemony as infrastructure' (de Goede and Westermeyer, 2022, p. 4). This notion helps shift focus towards the technical specifications, economic motivations, and physical pathways embedded within infrastructures and then unpack how they inherently involve complex political dynamics. In this perspective, infrastructures are not mere instruments for facilitating hegemonic power, but are conceptualized as both obstacles and arenas where hegemonic power is not only exercised but also influenced, impeded, and directed in distinct manners.

Drawing on existing literature that has focused on non-financial types of infrastructure, including railways and waterworks

(Star, 1999; Mukerji, 2010; Lancione and McFarlane, 2016), we distil three elements that typify the hegemonic power of infrastructure and that can be used when taking 'infrastructure' as the starting point for analysis. These elements are: (1) sedimentation; (2) reach; and (3) disposition. First, the notion of *sedimentation* helps unpack the *temporalities* 'frozen' inside infrastructural technologies and routes (Folkers, 2017; de Goede and Westermeyer, 2022). This refers to both past power hierarchies that have become sedimented in the technology and future orientations that are thus made possible. Secondly, the notion of *reach* helps unpack the ways in which geographical *space* is (dis)connected through infrastructures – as with the example of the clipped coin. Thirdly, the term *disposition* refers to the particular choices, directions, and (im)possibilities encoded into infrastructure. This is the concept that Easterling (2014, p. 21) uses to theorize 'the unfolding potentials or inherent agency' in a material structure like a river, a piece of fabric, or a game piece. The disposition of an infrastructure is the agency encoded into its material and technological propensities.

We develop the notion of infrastructure as hegemony further in Section 2. Then we illustrate the arguments empirically by referring to the so-called financial war on terror, where financial infrastructures became a major but highly depoliticized site of security power. Empirically, this chapter focuses on a contemporary parallel to the countermarked coin: the way in which the payment technology SWIFT (Society for Worldwide Interbank Financial Telecommunication) is being appropriated for security purposes. Since the terrorist attacks in the United States that occurred on 11 September 2001 (the events now known as 9/11), the financial payment infrastructure SWIFT has become a site of political contestation and hegemonic struggle. This contestation has (re)made visible how the aims and routes of the (post-Bretton Woods) liberal world order have been encoded into the seemingly technical communications infrastructure of SWIFT.

By adopting the lens of infrastructure-as-hegemony, it becomes evident that infrastructures hold significance beyond being mere tools. They possess the capacity to shape the trajectory of hegemonic power through their intrinsic attributes and interactions. Rather than solely serving as vehicles for the exertion of hegemonic influence, infrastructures can also become stumbling blocks that challenge or redirect political practice. Infrastructural configurations essentially are pivotal points where political forces converge, diverge, and evolve, contributing to the shaping of hegemonic power in diverse and intricate ways.

2 Finance/Security Infrastructure

Financial infrastructure acts as a site of hegemonic expansion, consolidation, strengthening, and contestation. This chapter's point of departure is that financial infrastructures are not simply ('neutral') lifelines of international trade, directing the flow of funds and enabling access to them. They also produce and enhance global (inter-) dependencies via interconnectivities and disconnections, and transform international security and the international political economy through new (economic) technologies.

Yet, the concrete infrastructures that enable the currency to be transferred and monitor its usage have received relatively little attention in analyses of financial and political hegemonies (but see, e.g., Maurer, 2015; Lauer, 2020). Questions of power in finance are often discussed in terms of quantities of financial flows and the dominance of certain currencies that are reflected in the quantities of their usage. The history of payment itself is often analysed in terms of increasing speed, diminishing weight, and extending reach. Research in the social studies of finance and international political economy has focused on the increasing abstraction, fictitiousness, and ephemerality of money and financial transactions (Martin, 2007; LiPuma and Lee, 2015; O'Dwyer, 2019). Contemporary card and mobile payment technologies are indeed a far cry from

the heft of early modern bullion and from the complexity and fallibility of clipping and countermarking coin.

However important the narrative of the power of 'frictionless finance', it risks underplaying the material complexity and geographical unevenness of finance and payment infrastructures and how these have historically evolved. This chapter understands infrastructure as socio-technical relations and more concretely as 'an articulation of materialities with institutional actors, legal regimes, policies, and knowledge practices that is constantly in formation across space and time' (Anand, Gupta, and Appel, 2018, p. 12; see Chapter 1 in this volume). This perspective views infrastructure as inherently both material and socio-political, serving as a gateway to understanding the political economy of technology. Infrastructure is more than matter; it encompasses not only physical substance but also extends beyond matter to include scientific observations, plans, and apparent intangibles, such as political imagination and future planning. Therefore, any examination of the materiality of infrastructure must address both the foundational and evolving composition of infrastructure and the ostensibly immaterial aspects (Barry, 2020, p. 93). As argued by Anand, Gupta, and Appel, drawing on Edwards et al. (2009, p. 12), infrastructures possess 'histories and "grow" incrementally in a dynamic temporal, spatial, and political environment [...]. They are formed with the moralities and materials of the time and political moment in which they are situated.'

As the coin countermarking example shows, moreover, financial infrastructures have long been a focal point of states' and empires' security strategies. Notions and understanding of security change over time, ranging from traditional military security to cold war and nuclear security, to widened notions of cyber and public health security. Infrastructures play a central role for security practitioners, as they enable the fixation and control of the flow of vital goods and people. This was starkly illustrated during the COVID pandemic that took off in 2020, when movements of people were

interrupted and stopped by limiting access to infrastructures of mobility. At the same time, financial infrastructure served to keep economic processes of production, distribution, and consumption going (Langenohl and Westermeier, 2021). Security politics not only uses the steering capacity of infrastructures, but the politics of security is built into them. Critical security studies have drawn attention to security infrastructures, such as CCTV (closed circuit television), algorithms, scoring and ranking practices, and the securitization of infrastructures, often via the notion of critical infrastructure (Aradau, 2010; Langenohl, 2020). Recent analysis also points to the concept of ‘infrastructural insecurity’ as a deliberate strategy to render (telecommunications) infrastructure susceptible to becoming ‘a venue for geopolitical interests’ (Ten Oever and Becker, 2024, p. 1).

With regard to financial infrastructures, the term ‘finance/security infrastructure’ foregrounds the intrinsic relations of the two notions and draws analytical attention to payment infrastructure and its political, technical, and colonial histories (de Goede, 2020). The term also emphasizes the ways in which financial infrastructure and state security practices are historically interlinked. The post-9/11 ‘war’ on terrorism financing provides a crucial current example that will be explored in the remainder of this chapter. Anti-terrorism financing measures seek to direct and reroute financial flows and to make them traceable (Westermeier, 2022). These financial security measures are simply not feasible without financial infrastructures as modes of control that include a variety of diverse elements, such as banks and financial networks, security practitioners, risk registers and sanctions lists, to name only a few (Amicelle and Jacobsen, 2016). Sanctions, currently among the most prevalent security measures, are inconceivable without infrastructural control. Infrastructural reach enables and limits the imposition of sanctions, as discussed later in this chapter. Although financial transactions have transitioned to digital formats and circulate as data, they still rely on concrete

channels and platforms. Money does not simply ‘flow’ from one account to another; it is actively directed and accounted for. Particularly, international transactions pass through several infrastructural actors and institutions (Robinson, Dörny, and Derudder, this volume).

The remainder of this chapter discusses the three elements of sedimentation, reach, and disposition as tools to track how political hegemonies endure in financial infrastructures and become challenged. Our approach puts a focus on past and present notions of security politics and how these are built into financial infrastructures.

3 Temporalities of Infrastructure: Sedimentation

There is a long tradition in the social sciences that has emphasized the temporal politics of infrastructure (Star, 1999; Mukerji, 2010). Studies on dams, roads, railways, and waterways, for example, have foregrounded how these are intrinsically linked to notions of modernity and their role in furthering modern states’ political ambitions (see Langenohl’s chapter, this volume). Far from technological determinism, studies into the politics of technology show how technology is inherently political. In developing and adopting certain technologies, political actors opt for more than appears at first sight. Technologies enable or disable certain options, and some are more aligned with certain political actions than others, although they do not necessarily require or determine them. In other words, not only can the design features of a technology be political, but the technology is political (see also MacKenzie and Wajcman, 1999; Easterling, 2014). Following this line of research, infrastructure is fundamentally both material and political, forming a point of entry into the political economy of technology.

The first element that the study of infrastructures brings into view is that of temporality: infrastructure is about ‘the long-term rhythms of the community’ (Star 1999,

p. 381). Infrastructure connects the past with the present and gestures towards anticipated futures. Infrastructures sediment past power relations, making them viable in the present even though the political regime that established them may seem far gone. Infrastructures are linked to political rationalities: the material structure of infrastructure makes them somewhat resistant to sudden change and constrains political ambitions that run counter to how the infrastructure is set up (Collier, 2008; Opitz and Tellmann, 2015). While digital infrastructures may seem readily adaptable to change, underlying protocols and standards set limits to the updates of platforms and applications. Recent contributions to the field of financial subordination have foregrounded the violent practices that are built into financial infrastructure which still endure today (de Goede, 2020; Alami et al., 2022). The introductory example of the colonial coins provides a striking image of how colonial legacies are forced onto the colonized (Koddenbrock, 2020).

Thinking about infrastructures as sedimented hegemony allows a perspective that brings to the fore the political character of these material connections that is often forgotten when they are described as background or invisible. Infrastructures are materializations of hegemonic projects, such as globalization or mobility, that are present and largely consensual at a specific time and place. As infrastructure endures over years and decades, the hegemonies that were present at the time of fixation pertain to a certain moment in time as well as to this moment's vision of the future: if the hegemonic order changes, if common wisdom alters, the infrastructure and its rooting may itself become a matter of contestation again. Still, contestation does not necessarily entail change within the infrastructure in question, but might instead take alternative courses, as we will discuss in the following.

In the example of the financial war on terror after 9/11, it became starkly visible that payment infrastructure entails sedimented rationalities and hegemonic

order. Everyday international payment transactions are rendered possible through SWIFT, a relatively invisible global network set up in the 1970s to facilitate global trade. As part of the post-9/11 security regime, the United States Treasury, in collaboration with the Central Intelligence Agency (CIA), successfully obtained access to SWIFT data under the auspices of the Terrorist Finance Tracking Program in October 2001 (de Goede, 2012b). This initiative formed an integral component of the broader post-9/11 shift towards a risk-based utilization of commercial data for security objectives, emanating from the George W. Bush administration's aspiration to harness technological tools for the prevention of future terrorist incidents (de Goede 2012a). The analysis of SWIFT data was directed towards the identification of financial transactions, interconnections, and networks associated not only with the 9/11 perpetrators but also encompassing investigations into other suspected terrorists and designated entities (Amicelle, 2011). SWIFT has now become, as one observer calls it, 'a centerpiece of the West's economic arsenal', because it has not only delivered transactions data to the CIA in the continuing combat against terrorism financing but also disconnected Iran from its global services (Lipsky and Kumar, 2023). Discussions on the potential disconnection of Russia from the SWIFT infrastructures surged after the Ukraine invasion in February 2022.

This 'weaponization' of SWIFT is more than the political abuse of an otherwise neutral payment technology. On the contrary, it shows that SWIFT was a political technology from the beginning, offering particular routes and connecting some places better than others. SWIFT emerged in the post-Bretton Woods financial world order to facilitate frictionless global finance and thus encodes the hegemonic ambitions of the time (Scott and Zachariadis, 2014). Yet SWIFT's connectivity was always partial and incomplete, as, for example, former colonies are still often connected through their past colonial capitals. As Leigh Star has pointed

out, infrastructure's politics are rendered visible through the 'situations of those who are not served by a particular infrastructure' (1999, p. 380).

In the same vein, as past infrastructures continue to have an effect in the present, current infrastructural planning, especially public infrastructure projects, entails a certain vision of the future. For example, the ways in which contemporary infrastructures are designed make certain means of circulation more likely than others. As the chapters on digital financial infrastructures (Part III of this volume) show, they embody the cultural, political, and societal conceptions that are dominant at the time of their planning and creation, and they also carry specific notions about anticipated future developments. Collier (2008) emphasizes the possible failure of 'programming' and reprogramming – a political attempt to use existing socio-technical and political formations for a new political agenda. Notably, several digital financial technologies are designed as ways to reshape the existing financial architecture (see chapters by Ehlke and Salzer, this volume). While some financial technologies, especially in Europe, build on existing financial infrastructures to enhance financial activities (Westermeyer, 2020), many non-Western countries tend to leapfrog these interactions between old and new financial infrastructures. In many cases, political change entails infrastructural visioning that seeks to challenge old and enhance emerging hegemonies.

4 Infrastructural Reach

The second element that a focus on infrastructure brings into view is that of spatiality. The term 'infrastructure' originated in 1875, coinciding with the period when European states aspired to extend logistical control beyond their national territories and over their overseas colonial 'possessions' (Schouten and Bachmann, 2022; referring to Mitchell, 2014; Carse, 2016). However, this was rarely meant to create equal relationships between colonized and colonizing

societies, as Langenohl's chapter discusses (this volume). John Allen (2016, pp. 36–37) uses the concept of 'reach' to analyse the ways in which space is 'folded and stretched' to produce 'proximity, presence and distance'. Such presence and proximity cannot fully be captured with traditional measures of distance, thus reach is about the ways in which 'powerful actors make their presence felt' (Allen, 2016, p. 11). While infrastructures are often described as enabling the governance of a (state's) territory, a focus on reach shows how infrastructural power extends well beyond its borders and may be experienced as very proximate in everyday life, for example, through the circulation of coin with stamped authority figures. At the same time, vast areas within a country might also escape the reach of state infrastructure – for example, poorer and neglected areas that are badly connected to public transport or public services (Nolte, 2016). This can be due to formidable engineering challenges or because such endeavours are deemed excessively expensive for states to include in their infrastructure networks. Furthermore, states may intentionally avoid constructing infrastructure in designated frontier regions to avoid integrating specific populations (Schouten and Bachmann, 2022).

Thus, infrastructures, especially financial infrastructures, entail uneven geographies that are best conceptualized through the notion of reach, which draws attention to exclusions and divisions. This is also the case with SWIFT, which is itself a product of the expansion of international financial trade and globalization in a particular historical era. From the outset, European and US banks propelled the network, transforming it into an essential hub of the international payment system (Robinson, Dörny, and Derudder, this volume). The above mentioned mobilization of SWIFT for security purposes began after the 9/11 terrorist attacks on major US landmarks, including the World Trade Center, in 2001. As part of the 'war against terror', the USA secured access to transaction data transmitted through the SWIFT system. This practice

came to public attention only in 2006 when it was revealed that European bank data was also being shared with US intelligence agencies in a complex arrangement whereby SWIFT had agreed to share data from its US-based server with the US Treasury and the CIA. In this manner, the SWIFT infrastructure made it possible for US security services to extend their reach by giving them access to global financial transactions data that would otherwise have had to be subpoenaed in complex juridical procedures. European countries were taken aback, not least because SWIFT, headquartered in Brussels, is subject to European Union law. That SWIFT affair points to how finance and security are imbedded in infrastructures aiming to collect, surveil, and control transactional data, going beyond the territoriality of a specific country.

The concept of infrastructural reach thus enables us to capture how certain actors expand political reach via infrastructures. As the example of SWIFT and the post-9/11 activity shows, the United States leverage their dominant position within the financial system to expand their reach within financial infrastructures although these infrastructures do not fall under their jurisdiction and are not physically based on their territory. The infrastructural reach of the United States thus rests on several pillars that often reflect past power relations that persist in infrastructures and are thus still effective today. As the central actor in the post-Bretton Woods financial order, the United States gained a pivotal role in the international financial architecture. The dominance of Western financial politics, integrated with post-colonial dynamics, has solidified within the SWIFT infrastructure, consequently positioning the company as an indispensable gateway (Dörry, Robinson, and Derudder, 2018; de Goede, 2020). These effects are still felt today, as several countries in Africa and South America remain poorly connected to the network. Banks also report problems with transactions between African countries and China due to differing alphabetical and numerical systems.

Along with SWIFT, the infrastructural reach of the United States is extended via so-called correspondent banks. The decline in the number of correspondent banks by 22% between 2011 and 2020 has given US-based correspondent banks renewed importance (Nance and Tsingou, this volume). Their role is closely linked to the role of the US dollar as the international reserve currency. The majority of international trade is conducted using the reserve currency, controlled by the US Federal Reserve. In the past, the USA has made the claim that all transactions in US dollars fall under US jurisdiction, thus expanding their infrastructural reach via the currency that circulates. Correspondent banks process international payments for other banks, thus serving as further nodes for payment flows. With their decline in numbers, the remaining correspondent banks have become pivotal for security politics, such as sanctions. In February 2022, the Russian Sberbank had its role as a correspondent bank with the US financial system revoked in the context of US sanctions against Russia following its invasion of Ukraine. Sberbank is the largest state-owned Russian bank, holding nearly a third of all Russian bank deposits. As a consequence of the infrastructural disconnection, it is unable to trade using US dollars.

5 Disposition of Payment Infrastructure

Within infrastructures, past political choices are materially sedimented and enable an infrastructural reach which might go beyond a specific territory. The third element in our approach comprises the ways in which past choices materialize in so-called dispositions, which at the same time enable or constrain material possibilities (Easterling, 2014). ‘Disposition’ helps to capture how sedimented politics shape the active form of infrastructure and thus facilitate or limit (political) agency. Keller Easterling (2014, p. 73) theorizes disposition as a ‘stubborn [form] of power ...hiding in the folds’. Further:

Disposition [...] is the medium, not the message. It is not the pattern printed on the fabric but the way the fabric floats. It is not the shape of the game piece but the way the game piece plays ... Not the object form, but the active form. (Easterling, 2014, p. 14)

Thus, disposition refers to the sedimented politics and material propensities of an infrastructural arrangement.

What is the disposition of a financial infrastructure in the examples discussed in this chapter? Surely, there are several dispositions in each example that work to enable and disable certain flows of information, money, or other financial assets. With regard to the example of the colonial coin, we can say that its disposition entailed the way in which the Crown's insignia circulated through it. The coin was authorized by the British Crown as visible through the stamps and clippings depicted at the beginning of this chapter. But the coin also helped fortify the Crown's authority through its circulation. Thus, the material form of colonial coin helped strengthen the Crown's authority; it was disposed towards the British Crown.

With regard to the contemporary nexus of financial infrastructure and security, a key disposition of SWIFT's digital infrastructures is the *traceability* of money and financial transactions. This traceability is now regarded as a crucial avenue to detect illicit financial flows and halt unwanted financial transactions. Traceability is enabled by the active form of payment infrastructure: their way of storing and enabling transactions enables the traceability of money (Westermeyer, 2022). Money relies on infrastructures to preserve attributes like ownership, which are not inherently contained within the amount of money transferred. Money – meaning the amount of a certain currency – does not provide information about its origins and destination; it is notoriously fungible and anonymous. Yet information is attributed by the systems of money transfer and transaction. Confirming one's identity is thus closely linked to the attribution of ownership of money. As banks are required to 'know their costumers', financial

technologies often seek to link to databases that store identity information (see Jafri, this volume). These infrastructural technologies are redeployed for social policy and security practices.

The disposition of digital payment infrastructure entails the traceability of transactions. Monetary movements leave data traces when they travel from one financial node, such as banks or payment service providers, to another. This crucially includes cryptocurrencies that often generate the value of a coin as the result of their transaction history. These imprints left by money in its 'flows' are not generated by the money, but by the infrastructures that enable its circulation, such as bank accounts or credit card networks. When money is stored in digitized data repositories – a scenario applicable to the majority of non-cash funds – it takes on qualities akin to other digital data types. Hence, the manner in which money is in circulation, whether as physical currency, through credit card transactions, or in digital currency form, holds significance. Each of these tangible bases conveys distinct varieties of information which may potentially be shared with payment processors and other financial entities when a transaction is routed through their services. Only cash leaves no data trace. The prominent call to 'follow the money' essentially means to follow the traces that money leaves when it moves infrastructurally.

The disposition of traceability enables the current regime of anti-money laundering (AML) and counter-terrorism financing (CTF) regulation which was significantly shaped by the USA in its 'war on terror'. While AML regulation had already been implemented before, the post-9/11 security regime follows the assumption that money trails reveal activities outside the financial realm. Financial events like payments, transactions, and withdrawals generate identifiable traces, implying that specific actions are recorded as data, such as time markers for payments or codes that indicate the initiator or recipient of a transaction, as well as the payment method employed (such as a credit card or a payment app). The data

from financial transactions harbours substantial potential for inferring details about an individual's undertakings, acquisitions, geographical movements, and even personal characteristics like sexual orientation and health condition, as well as religious and political inclinations (Ferrari, 2020). The efficacy of financial surveillance is perceived to be maximized when the actions of targeted individuals are comprehensively documented within financial records, encompassing events that might otherwise be considered outside the financial domain. The shared belief that 'money trails don't lie' has enabled a considerable regime of financial surveillance that provides the material basis for court cases on terrorism financing and other illicit behaviour (Anwar, 2022).

Infrastructural dispositions of payments also encompass electronic and increasingly automated systems that monitor financial flows, such as AML and CTF software (Bosma, 2022). The categorizations and risk assessments for these technologies are based on international regulatory standards. Within their infrastructural reach, the USA played a prominent role in establishing AML as a policy priority in international finance and in establishing the international standard setter, the Financial Action Task Force, which has implemented a coercive blacklisting strategy with little opposition from other 'rich countries' (Sharman, 2008). Instead, most of those countries supported these moves and shared a certain consensus that AML and CTF measures would increase financial security, largely overlooking or ignoring the exclusionary effects (see chapter by Nance and Tsingou on de-risking, this volume).

6 Conclusion

This chapter has foregrounded the critical role of payment infrastructures as significant sites of hegemonic power. Payment technologies – ranging from coins to bullions, electronic networks, and digital currencies – are imbued with hegemonic power relations. As infrastructures have historically enabled and

sustained state power, payment infrastructures are crucially connected to practices of security and sovereignty. The chapter introduces three elements – sedimentation, reach, and disposition – to typify the hegemonic power of infrastructure, providing a framework for analysing infrastructural dynamics. Through empirical analysis centred on the financial war on terror, particularly the role of SWIFT and the traceability of money, the chapter illustrates how financial infrastructures have become central sites of security.

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Part II

HISTORIES OF FINANCIAL INFRASTRUCTURES



Financial Infrastructures and Colonial History in Africa

Nick Bernards

1 Introduction

There has been a dramatic increase in attention in recent years to the echoes of colonialism, imperialism, and slavery in the contemporary global financial system. There is growing attention in recent research across geography, sociology, political economy, and development studies to how present-day global finance reproduces colonial hierarchies and dynamics. A number of researchers have examined the subordinated position of formerly colonized countries in the global financial system, highlighting the constraints this poses on development and policy space (see Koddenbrock, 2020; Tilley, 2021; Alami et al., 2023). For post-colonial governments this has often meant limited control over macroeconomic and monetary policy, and persistent challenges mobilizing resources for development. Formerly colonized countries also tend to have financial systems that are dominated by foreign banks predominantly based in former colonial powers, which often mobilize very little domestic investment to a relatively narrow range of firms and relatively affluent urban residents (see Kvangraven

et al., 2021; Akolgo, 2022; Bernards 2022a, 2022b; Koddenbrock, Kvangraven, and Sylla, 2022). As Nance and Tsingou (this volume) note in their discussion of correspondent banking relationships and remittances, financial institutions in colonized countries also tend to remain subject to infrastructures largely operated from metropolitan powers and vulnerable to disruption largely beyond their control. The limited availability of credit for agricultural and industrial development in former colonies has been a persistent policy concern throughout much of the twentieth and twenty-first centuries (see Bernards, 2022b). Analysis of durable colonial legacies in financial systems speaks to a wider trend towards examining the ways that contemporary development interventions replicate the spatialities, power relations, and practices of colonial rule (e.g., Engel and Susilo, 2014; Cavanagh and Himmelfarb, 2015; Wainwright and Zempel, 2018; Enns and Bersaglio, 2020).

While previous research has shown clear echoes and parallels between the era of formal colonial rule and the present, less attention has been devoted to explaining *how* past

and present patterns of activity are related. As Cooper (2005, pp. 17–18) rightly notes, we should be wary of ‘leapfrogging legacies’ in discussing the enduring impacts of colonialism – of claiming that ‘something at time A caused something in time C without considering time B, which lies in between’. It is not enough to show a correspondence between past and present patterns without either tracing patterns of continuity and change over time, or showing how continuities are reproduced. So what is it, then, that makes colonial histories durable?

The argument in this chapter is that a lens focused on financial infrastructures – adopting what the editors of this volume call an ‘infrastructural gaze’ (see Westermeier, Campbell-Verduyn, and Brandl, this volume) is highly useful for understanding the durability of colonial patterns of uneven financial development. The argument is focused on African colonial history, with detailed illustrations primarily based on the Kenyan case, but much of what is argued is also likely of wider applicability. I develop the argument in four steps in what follows. Section 2 argues for an infrastructural lens as a means of explaining and exploring colonial continuities. Section 3 briefly describes the landscape of colonial financial systems. Sections 4 and 5 consider some of the key infrastructures of colonial financial systems – bank branches, and collateral in land – and the role that they’ve played in replicating colonial financial geographies over time.

2 How Do Colonial Histories Persist?

A number of recent analyses draw on the concept of ‘infrastructures’ to make sense of long-run colonial legacies (see Mitchell, 2014; Desai, McFarlane, and Graham, 2015; Davies, 2021). Notably, many of these have focused on East Africa, predominantly on transport mega-projects (e.g., Enns and Bersaglio, 2020; Kimari and Ernstson, 2020; Aalders, 2021; Lesutis, 2022). ‘Infrastructures’ here are understood, following Bowker and Star (1996), in the

broader sense of backgrounded technical systems allowing basic functions and circulations to be carried out.

This kind of ‘infrastructural gaze’ (Westermeier, Campbell-Verduyn, and Brandl, this volume) offers promising means of making sense of colonial continuities in two ways. First, infrastructural systems, as a number of authors have argued, were integral to the development of colonial economies, and in the process solidified particular patterns of social relations. Notably, a number of authors have shown how the production of particular kinds of infrastructures was critical to colonial governance across multiple scales (see Kooy and Bakker, 2008; Pritchard, 2012; Mullenite, 2019; Cowen, 2020; Davies, 2021). Infrastructures embody ideas about how societies should be organized, produce, and reproduce racial hierarchies, and entrench inequalities in access. Colonial infrastructures were ‘themselves productive of race’, in Sherman’s (2021) words, insofar as they codified formal racial hierarchies in a variety of different ways (I discuss one example of this, racial restrictions on land titling, later in this chapter). Davies notes – referring directly to Latin America, but making a point that could apply more broadly – that ‘It was through infrastructural networks that colonialism and imperialism operated, which made relations of economic dependency and neo-colonialism possible’ (2021, p. 741). This is no less true of financial infrastructures, although the latter haven’t been studied in historical perspective in the same depth as things like ports, rail, or water and sanitation infrastructures have.

Secondly, thinking in terms of infrastructures offers a useful perspective on the durability of colonial-era systems. Infrastructure studies in general include a perspective on patterns of continuity and change which is highly useful here. Infrastructures are rarely overhauled wholesale. Emphasizing infrastructures helps to consider how new technical systems intermingle with existing ones. As Susan Leigh Star (1999, p. 382) puts it, ‘[i]nfrastructure does not grow *de novo*; it wrestles with the inertia of the installed base and inherits strengths and limitations from that

base'. As a result, infrastructures pattern the spatial and functional arrangement of social practice, sometimes long after their original uses have ceased. In Marieke de Goede's words: 'Infrastructural technologies ... inscribe specific ways of doing things – of routing flows, enabling functionalities, structuring interactions. Often, infrastructural grids – of roads, electricity networks, payment routes – sediment historical power relations and core-periphery relations' (De Goede, 2021, p. 354). These durable systems form the 'installed base' (per Star, 1999) into which new technologies must normally be fitted, through complex processes of adjustment and retrofitting.

One reason why colonial histories cast such a long shadow on the present, in short, is that they are embedded in material networks without which (post)colonial political economies quite simply could not function. Colonial infrastructures thus represent 'imperial remains' in the sense highlighted by Kimari and Ernstson – they are entangled material and social networks that retain important traces of colonial social relations long after the formal end of colonial rule (2020, p. 827). Financial infrastructures are a key mechanism through which spatial patterns rooted in colonial practices of racialization and exploitation have been produced and have persisted long after the formal end of colonialism. Some existing analyses have tentatively developed arguments in this direction. De Goede (2021) in particular has drawn on infrastructure studies to trace out the durable legacies of colonial financial systems – although thus far in very general terms, marking out a research agenda rather than exploring in detail how financial infrastructures enable patterns of continuity and change in post-colonial settings (see also Bernards, 2022a, 2022b). However, while the materialities of colonial infrastructures clearly matter, they are not mechanistically replicated over time. As Aalders puts it, 'the ruins of empire – both material and metaphorical – are durable but do not determine the present' (2021, p. 997). What's critical here is that an attention to colonial financial

infrastructures helps to reveal durable challenges with which subsequent development efforts have grappled.

3 The Colonial Financial System and Its Infrastructures

Colonial financial systems prompted uneven development on two levels. First, they were extractive in character. It's unquestionably true that colonialism generally enriched colonizers – or, primarily, some fractions of capital in metropolitan centres – at the expense of the people and territories that were colonized. Vast fortunes were extracted from colonized territories. Utsa Patnaik (2017, p. 311) has recently estimated, for instance, that net transfers from India to Britain between 1765 and 1938 amounted to £9.18 trillion. Finance capital was a key beneficiary of all this – the London money market was a major source of finance for governments, mining, and infrastructure projects globally throughout the latter half of the nineteenth century. Financial institutions in colonial territories also served in important senses as 'channels' for the extraction of surplus (see Rodney, 2018). Equally, though, colonial capitalisms also worked through the production of differentiated spaces within and between colonized territories, often closely linked to the geography of state power. If the generally extraverted character of colonial financial systems is a key common trait, the differentiation of colonial territory is nonetheless also an important dynamic shaping colonial financial systems.

Colonial capitalisms generated polarization between cities and countryside, built infrastructures – transport and financial systems in particular – designed to smooth the flow of raw materials for export, and actively underdeveloped some territories to create reserves of cheap labour for large-scale mining and plantations. The financial sectors that emerged in these contexts were generally clustered around urban centres, closely linked to metropolitan capitals, and often made their profits primarily by providing remittance services or by lending for

large-scale public works rather than productive credit (see Bernards, 2022b, 2023; Koddenbrock, Kvangraven, and Sylla, 2022, for more detailed discussions). Where they did directly invest in or lend to directly productive activities, this was disproportionately steered towards large-scale plantations or mining operations. In fact, colonial banks in many territories often held the majority of their income-earning assets in metropolitan centres rather than in colonies. Colonial banks very rarely developed the infrastructures – routines, social relations, or physical structures – necessary to lend to the majority populations in colonized territories.

In Sections 4 and 5, I'll describe some of the problems thrown up by the financial infrastructures that were developed in colonial contexts. I put particular emphasis on networks of physical branches linked by transport and telecommunications systems, and on the use of land as collateral.

4 Bank Branches

Physical bank branches, linked together by road, rail, sea transport, and telecommunications systems, were critical infrastructures in colonial financial systems. They played a key role in administering the vital functions of the financial system – notably, assessing credit risks and settling payments. Moreover, if banking operations in colonial Africa depended in large part on social relations and embedded patterns of social practice, branches were important sites where those interactions took place. Previous work has highlighted how branch networks primarily clustered around major cities and other sites of expatriate economic activity (e.g., South Africa's mines or Kenya's settler farms). Some previous research has traced a major expansion in branch banking across sub-Saharan Africa in the 1950s (see Engberg and Hance, 1969), including in some of the case study countries (Morris, 2016; Velasco, 2022). This expansion was highly uneven, with new branches disproportionately built in territories with higher concentrations of older branches. There is clear evidence

that certain territories – notably those with concentrations of settlers (including Kenya and South Africa) or major export industries (notably cocoa in Ghana) – were disproportionately targeted for new branches (see Table 9.1).

There were, in a number of instances, dramatic expansions of commercial banking systems in the decade before decolonization. There was, for instance, a significant expansion of branch networks across sub-Saharan Africa, particularly in British territories, in the 1950s, for instance. What's notable, though, is how much the density of bank branches in 1950 seems to have shaped the density of branches at the end of the decade. Kenya was a major focus of this expansion, along with Ghana, Nigeria, and then-Rhodesia (see Engberg and Hance, 1969, p. 196). Historians have often attributed this expansion in part to efforts by banks in Kenya and elsewhere in sub-Saharan Africa to navigate the political and economic pressures created by decolonization, as well as to capitalize on business opportunities seemingly opened up by the 'developmental' colonialism (see Cooper, 1996) of the post-war period (see Engberg, 1965; Engberg and Hance, 1969; Bostock, 1991; Morris, 2016; Velasco, 2022). While this is broadly true, we can usefully situate this development, and understand its limits, with reference to the patterns of uneven development and contestation described earlier in this chapter. If the expansion of branch banking in the 1950s was in some senses a spatial fix for British capital tentatively seeking out new spaces for accumulation in colonized territories, it was also one that was strongly shaped by the configuration of existing financial infrastructures.

This uneven development of branch banking between territories was mirrored by the uneven development within territories. To take one of the key examples with denser branch banking networks, until 1950, bank branches in Kenya were predominantly located in Mombasa and Nairobi (Engberg, 1965, p. 190; Bostock, 1991; Morris, 2016, p. 652), and virtually all in 'White Highland' areas (see Section 5). As Morris notes, 'of the 20 areas of Kenya where the three major

Table 9.1 Bank branches and estimated branches per 1 million people, 1950–1957

	<i>Bank branches, 1950</i>	<i>Bank branches, 1957</i>	<i>Population, 1960, millions</i>	<i>Est. branches per 1m people, 1950</i>	<i>Est. branches per 1m people, 1957</i>
Côte d'Ivoire	8	11	3.50	2.28	3.14
Gabon	7	9	0.50	13.97	17.97
Ghana	21	82	6.64	3.16	12.36
Kenya	29	97	8.12	3.57	11.95
Senegal	8	13	3.21	2.49	4.05
Tanzania	29	55	10.05	2.88	5.47
Zimbabwe	38	130	3.78	10.06	34.42
Benin	4	5	2.43	1.64	2.06
Cameroon	8	20	5.18	1.55	3.86
Chad	3	8	3.00	1.00	2.67
DR Congo	53	66	15.25	3.48	4.33
Liberia	7	8	1.12	6.26	7.15
Malawi	7	8	3.66	1.91	2.19
Mali	3	6	5.26	0.57	1.14
Togo	3	2	1.58	1.90	1.27
Zambia	23	45	3.07	7.49	14.65
Congo	9	13	1.02	8.84	12.77
Ethiopia	14	32	22.15	0.63	1.44
Guinea	5	12	3.49	1.43	3.43
Niger	1	1	3.39	0.30	0.30
Nigeria	22	142	45.14	0.49	3.15
Sierra Leone	3	14	2.32	1.29	6.04

Source: Author calculations based on data from Engberg and Hance (1969) and World Bank population data.

banks ... were represented in 1950, only two (Kisii and Bungoma) were not dominated by European enterprise' (2016, p. 652). In large part because of the presence of settlers holding mortgageable property titles, Kenya had a comparatively deep financial sector in contrast to most other territories in sub-Saharan Africa (see Newlyn and Rowan, 1954, pp. 76–77). This was reinforced by the fact that Mombasa and Nairobi were sub-regional commercial centres linking export agriculture across East Africa to world markets. Advances to merchants trading elsewhere, especially in Uganda, were typically contracted in one of these two cities (Newlyn and Rowan, 1954, p. 87).

Banks sought to build physical infrastructures that would enable them to profit from the potential rise of a 'middle class' of Kikuyu farmers in proximity to the White Highlands (see Morris, 2016). In practice, though, the

lending operations of commercial banks were refocused on short-term commercial loans in Nairobi and Mombasa (Hyde, 2009, p. 86). While banks built new branches in African-dominated rural areas, these new branches engaged minimally in credit provision. For one major commercial bank, Jørgenson (1975, p. 160) reported in the mid-1970s that the median ratio of advances to deposits in rural branches was 28%, against 58% in urban branches. The result was that expanded branch networks largely channelled rural savings to European- and Indian-owned commercial firms. African borrowers accounted for less than 3% of credit from commercial banks as late as 1967 (Jørgensen, 1975, p. 158). The figure remained only 14% in 1973 (Jørgensen, 1975, p. 161).

These patterns of uneven infrastructural development appear to have had significant impacts on more recent development. The

rapid development of mobile money and digital credit in Kenya is widely celebrated, but uneven. Mobile money and digital credit have had to 'wrestle with the installed base' (*per* Star, 1999, p. 381) of existing financial infrastructures, and in important respects they mirror the geography of colonial financial systems outlined earlier in this chapter. These differences are especially pronounced when looking at credit. Digital and mobile credit have proven to be more controversial than payments, with concerns about growing over-indebtedness facilitated by digital credit apps (see Donovan and Park, 2019), even from erstwhile fintech promoters (e.g., Izaguirre, Kaffenberger, and Mazer, 2018). The potential role of mobile money in laying the groundwork for expanded credit nonetheless remains a key claim about the long-run benefits of mobile money (see Kaffenberger, Totolo, and Soursourian, 2018). So patterns of credit access are particularly telling. And, critically, the rollout of mobile and digital credit closely mirrors the

colonial financial geographies highlighted earlier in this chapter.

As shown in Table 9.2, the proportion of residents in Nairobi Metropolitan Area and Mombasa reporting past or present borrowing using both mobile money services (25%) and digital lending apps (18.2%) is more than double the respective use rates of mobile (12.3%) and digital borrowing (7.1%) elsewhere. Kenya's fintech boom, in short, is predominantly an urban phenomenon, and especially concentrated in Mombasa and in and around Nairobi. While consumer lending, as opposed to commercial lending, has grown dramatically with the advent of the new apps, particularly in the context of widespread precarity in cities, the extension of credit has taken place much more rapidly in proximity to existing financial infrastructures.

The overarching point here is that the fintech boom reflects patterns visible across successive episodes of financial restructuring in Kenya and elsewhere. We can understand

Table 9.2 Mobile and digital borrowing, urban residents by county

<i>County</i>	<i>Total respondents w/ urban residence</i>	<i>Number accessing credit through mobile money (past or present)</i>	<i>Per cent accessing credit through mobile money</i>	<i>Number accessing credit through digital apps (past or present)</i>	<i>Per cent accessing credit through digital apps</i>
Nairobi	703	191	27.2	63	9.0
Mombasa	231	42	18.2	62	26.8
Kiambu	156	72	46.2	68	43.6
Nairobi Metro/ Mombasa total*	1,395	349	25.0	254	18.2
Kisumu	98	15	15.3	1	1.0
Nakuru	98	10	10.2	7	7.1
Uasin Gishu	64	11	17.2	3	4.7
Meru	70	11	15.7	3	4.2
All other urban total**	2,216	272	12.3	157	7.1

* Includes all counties in Nairobi Metropolitan Area (Nairobi, Kiambu, Murang'a, Kajiado, Machakos) and Mombasa

** Urban residents from all counties except Mombasa and Nairobi Metro. NB: Sample sizes for specific smaller urban centres in the FinAccess survey are relatively small, so estimates of mobile and digital credit use in specific cities apart from Nairobi and Mombasa are not likely precise measures. The likely explanation for the much lower reported usage of digital credit in Kisumu as compared to Nakuru, for instance, is random error.

Source: Author calculations based on 2019 Kenya FinAccess Survey data.

this as being the result, at least in part, of a tendency for restructured financial operations to rely on and work through existing infrastructures. The expansion of new financial services, both in the last decade of formal colonial rule and with ‘innovative’ fintech applications since around 2010, has tended to follow the established geography of branch networks. If we want to understand the ways that colonial patterns of uneven development continue to weight on changes to post-colonial financial systems, an infrastructural gaze is important.

5 Land and Collateral

Another key infrastructure of colonial financial systems was the use of land as collateral for loans. There is an extensive literature on colonial and post-colonial land issues across Africa (among others, see Manji, 2020; Ouma, 2020; Dieng, 2022) and more widely. Several recent contributions have shown how systems of property title were central to the historical formation of racial hierarchies and colonial economies, and to the persistence of colonial legacies (Keenan, 2017; Bhandar, 2018). References to a lack of suitable collateral as a primary reason for limited lending to Africans in colonial financial systems are commonplace from authors working in a wide range of different theoretical and methodological perspectives (e.g., Newlyn and Rowan, 1954; Cowen and Shenton, 1991; Uche, 1999). Economics and economic history perspectives on colonial legacies, as noted, often centre on the form and ‘quality’ of property rights under colonial systems.

Property titles to agricultural land were a critical financial infrastructure; indeed, transferrable property titles which could be repossessed in the event of default were arguably the main mechanism by which banks assessed and managed credit risks. In performing this function, property titles also constituted and entrenched processes of racial and spatial differentiation. In Manji’s phrase, ‘Kenyan land policy was ... racialised at its inception’ (2020, p. 32). Titles to land

in the White Highlands were reserved for ‘European’ settlers. Nominally ‘uninhabited’ or ‘unused’ land was claimed by the Crown and subsequently made available for purchase by settlers. Importantly, the question of what constituted ‘vacant’ land was contested – especially because the state treated fallow land and rotating pastures as ‘vacant’. The allocation of land for white settlement disrupted existing forms of agriculture and pastoral livelihoods, and was contested throughout the colonial period, particularly by Kikuyu agriculturalists living near the Highlands (Coray, 1978). The associated policy of segregating African populations into restrictive ‘reserve’ areas based on ‘tribal’ groupings also helped to reshape and reproduce ethnic differentiation (Kanyinga, 2009, p. 328).

Alongside their role in processes of racialized dispossession, the role of land titles as specifically *financial* infrastructures also strongly shaped their development. Notably, land rights were initially conditional on ‘productive’ use, as the state sought to minimize land speculation. This was quickly overturned as settlers complained that such restrictions inhibited their ability to use purchased land as collateral: ‘the settlers are naturally anxious that the land on which they spend their labour should be a marketable and mortgageable security’ (East Africa Protectorate, 1908, p. 30). Officials also began to view speculation on land as a means of raising the value of farmers’ collateral, hence enabling wider access to credit (Lonsdale and Berman, 1979, p. 499). In short, while racial restrictions remained in place, other restrictions on property titles were quickly removed, specifically in order to facilitate land use as means of assessing credit risk.

Settler agriculture was highly stratified. Some large individual and corporate landholders could access relatively cheap credit in London; the bulk of settlers on smaller plots were reliant on the colonial financial system (Van Zwanenberg, 1975, pp. 278–279). Many of the latter were heavily indebted, particularly because banks loaned against the market value of land rather than farm income (Van Zwanenberg, 1975, p. 280).

Small settlers in particular increasingly depended on access to cheap labour, secured mainly through the forcible underdevelopment of reserves and restrictive laws governing the movement of African populations (Berman and Lonsdale, 1981, p. 62). While short-term migrant labour remained important, longer-term tenant farmers ('squatters'), governed by increasingly restrictive Resident Native Labour Ordinances gradually increased as a proportion of the labour force. The intersection of credit infrastructures with racialized structures of property relations in this sense was also crucial. It was not simply ownership over land, but also the control this granted over access to credit – and hence over inputs and machinery – that enabled settler control over migrant and tenant labour. Indeed, the importance of uneven access to formal credit is underlined by the adoption, at the behest of settlers, of increasingly severe restrictions on credit to Africans (see Jørgensen, 1975, p. 150).

In short, the use of mortgageable property titles to exclude some borrowers from formal financial markets was in fact a feature of colonial financial infrastructures rather than a bug. The contrast with trading economies in West Africa is instructive here. Uche (1999) shows particularly clearly that merchants increasingly saw the *restriction* of bank credit to African farmers as a crucial element of maintaining their control over cheap crops. Indeed, merchant firms often actively resisted state-backed efforts to reform agricultural finance, explicitly recognizing the vital role of credit in ensuring control over cheap crops. If the needs of colonial capital were different between colonies organized around settler-run mines or plantations and territories organized around the export of commodities produced by small farmers (needing cheap labour in the former and cheap crops in the latter), credit infrastructures designed around the collateralization of land allowed the mobilization of both.

There were tentative efforts to support African agriculture in Kenya from the 1930s, particularly in Kikuyu regions adjacent to the White Highlands, with the colonial state seeking both to expand its

fiscal base and contain growing political threats. These efforts were given considerably greater emphasis by the intensification of the Mau Mau rebellion – an armed revolt led by the Kenya Land and Freedom Army, concentrated in Kikuyu-dominated regions, which was brutally repressed by the colonial state (see Anderson, 2005). Alongside the horrific counterinsurgency, agricultural reforms – implicitly or explicitly targeted to Kikuyu areas – formed a key part of the colonial response to the rebellion. Roger Swynnerton, then-Assistant Director of Agriculture in Kenya, was appointed to propose a strategy for agricultural development in 1953. Swynnerton's report marked a shift towards an explicit policy encouraging the development of African agriculture (Shipton, 1992), intending to create a politically 'stabilized' middle class of property-owning Kikuyu farmers. Land titling, again, was central to these reforms. Swynnerton proposed expanding formal land titling to 'African' areas, facilitating the use of such titles as collateral, and as a result expanding the scope of capitalist agriculture while using minimal state resources: 'If Africans ... achieve titles to their land in economic units, much greater facilities should be made available to them for borrowing against the security of their land' (CPK, 1954, pp. 54–55). This was, notably, explicitly presented as an alternative to providing direct state support (CPK, 1954, p. 54).

What's important about the Swynnerton proposals is that, rather than amending financial infrastructures to address the restrictions they posed for African agricultural development, the reforms sought instead to alter the way that African communities held land. This approach ultimately threw up important political contradictions which eroded the effectiveness of credit infrastructures oriented around agricultural land.

The point here is that racialized restrictions on property ownership operated as a critical mechanism through which the colonial financial system and colonial economy more widely were produced. Land titles in this sense operated as financial infrastructures and generated important problems for

subsequent development, which ironically gradually undermined the utility of land titles as credit infrastructures. The anti-colonial movement was split over whether settler land should be restored to pre-colonial inhabitants or redistributed among existing residents, as well as the nature of land rights that should be implemented (see Kanyinga, 2009; Manji, 2020). The Kenya African National Union (KANU) – dominated by Kikuyu elites – backed the maintenance of property rights where they existed and the redistribution of settler land through purchase, while the Kenya African Democratic Union (KADU) advocated for the restoration of control over land to pre-colonial inhabitants. KADU proposals would have meant the restoration of the White Highlands primarily to collective control by predominantly Kalenjin pastoralist groups who had been displaced by the definition of ‘uninhabited’ land deployed by the colonial state. KANU ultimately won the pre-independence elections in 1963, with Jomo Kenyatta as prime minister (and subsequently president).

The KANU government under Kenyatta pursued a programme of resettlement of settler land. From 1962 to 1966, approximately 20% of settler land was purchased by the state and sold (on credit) to smallholders; by the 1970s half of former settler land had been redistributed (see Boone, 2011, pp. 79–80). This redistribution preserved a stratified system based primarily on private ownership, albeit one in which some African (and particularly Kikuyu) elites were able to accumulate large holdings (see Manji, 2020). It also established strong state control over the allocation of land for smallholders, many of whom were subject to *de facto* tenancy arrangements in which they were unable to hold a formal land title until repaying (often unpayable) debts to the government for the purchase of settler land (see Boone, 2011). All of this reinforced the highly ethnicized nature of land conflicts, which was arguably intensified after Kenyatta’s death and succession by Vice-President Moi in 1978. Under Moi the accelerated redistribution of land in former reserves, and frequent scapegoating

of Kikuyu smallholders as sources of land scarcity, was a means of developing and mobilizing a cohesive Kalenjin political identity. Large tracts of land were turned over to politically aligned elites under Moi (see Boone, 2011, pp. 85–86).

These changes did have a dramatic effect on the composition of agricultural production. At the end of the colonial period, roughly 80% of agricultural exports came from ‘large’ farms in the White Highlands and 20% from ‘small’ farms in reserves, by the end of the 1960s the ‘large’ and ‘small’ farm sectors each produced about half (see Njonjo, 1981, p. 31). These transformations further cemented the orientation of the major banks towards commercial activity in Nairobi and Mombasa, with agricultural lending restricted to large landholders. The fragmentation of land into smaller plots and the uncertain control of smallholders over land titles meant that the viability of agricultural land as security was greatly diminished (see Shipton, 1992). In practice, increasingly, ‘the ability to attract credit from commercial sources has been established to depend not only on the title deed *per se*, but rather on additional assurance of wage labour, where it is easier to attach salaries for repayment requirements’ (Gutto, 1981, p. 54). Agricultural borrowing was primarily restricted to the largest farmers (many of whom, as noted, had close ties to KANU), particularly those could draw on incomes from formal salaried jobs or commercial property. Survey research in the 1970s found that, while roughly 10 per cent of smallholders overall had significant sources of off-farm income, 70 per cent of farmers contracting commercial loans did (Collier and Lal, 1980).

Observers in recent years point to parallel processes of land consolidation and fragmentation. Hakizimana et al. (2017, p. 564) show in a detailed analysis in Meru county that, while households with access to off-farm income have generally been able to expand landholdings, these represent a minority of rural households. The vast majority of others have only been able to acquire land through inheritance, leading to increasing

fragmentation and pressure on land. Fibaek (2021) shows similar patterns nationally – with increasing rural stratification alongside falling farming incomes and productivity across strata, with the wealthiest households increasingly pursuing reinvestment in off-farm income. From the 1990s, there was also a dramatic expansion of new crops, notably horticultural exports, including cut flowers and fresh vegetables for European markets. This has been reliant on the growth of a landless or semi-landless population engaged in wage labour, often on a casualized basis, and the incorporation of smallholders into precarious outgrower schemes (Dolan, 2004; Hakizimana et al., 2017).

Critically, the reforms introduced in the final years of colonial rule and first decades of independence left intact both the shape of the commercial financial sector and the privatized character of land ownership – indeed, the main thrust of colonial reforms was to introduce private land titles into reserve areas in a failed effort at increasing access to credit for African smallholders. Colonial and post-colonial states unwilling or unable to directly challenge the patterns of private landownership established under colonial rule have been faced with escalating conflict over land and access to water, exacerbated in the 1970s and 1980s and again since 2020 by severe droughts (see Mkutu Agade et al., 2022). The point here is that the place of land as a financial infrastructure in the colonial era has had enduring impacts both for the geography of Kenya's financial system and more widely in social and ecological terms.

6 Conclusion

In this chapter, I've argued that financial infrastructures offer us an important lens on the durability of colonial histories and the ways that the latter pose problems for contemporary development. Colonial financial systems were radically uneven in both social and geographical terms. This has had critical consequences for subsequent development. Looking in particular at the example of Kenya, this chapter has shown how bank

branch networks and land titling operated as key infrastructures of colonial financial systems, and how the uneven development of these infrastructures mapped onto the wider uneven development of colonial financial systems and economies on one hand, and generated important problem for post-colonial development on the other. The historical details presented here are necessarily more suggestive than comprehensive. However, they do suggest the value of closer investigations of colonial financial infrastructures, particularly the development of land titling and branch networks.

Colonized territories continue to mostly occupy subordinated positions in the global financial system (see Alami et al., 2023). Equally, financial systems within colonized territories remain highly uneven, unstable, extraverted, and unable to mobilize resources and investment in ways that will foster development (see Bernards, 2022b; Koddenbrock, Kvangraven, and Sylla, 2022). An 'infrastructural gaze' (Westermeier, Campbell-Verduyn, and Brandl, this volume) helps towards understanding *how* these dynamics persist. One important feature of infrastructures is their durability over time. They condition the form and geography of subsequent developments. As such, a lens focused on financial infrastructures offers us a useful way of understanding the ways that colonial financial hierarchies persist and mutate over time. This kind of perspective usefully calls our attention to the ways that historical patterns of colonial finance remain embedded in financial infrastructures, and how the contradictory development of these infrastructures over time has shaped the development of financial systems as well as wider development outcomes.

In this sense, a focus on specifically financial infrastructures is also a useful complement to a wider debate that has emerged around the 'coloniality of infrastructure' in recent years (see Cowen, 2020; Enns and Bersaglio, 2020; Kimari and Ernstson, 2020; Davies, 2021). There's a tendency in these debates to focus on large-scale built systems – things like roads, railways, or water and sanitation systems. These systems were, generally, built up

to support an extractive colonial economy, embody and reproduce racial hierarchies, and condition subsequent development in important ways. Insofar as finance enters into these debates, though, it is often as an accelerant of imperial extraction and uneven development (as, for instance, in the late nineteenth-century railway boom, in which British capital was exported into major rail projects, primarily in settler colonial territories, see Cowen, 2020). One of the reasons why it's particularly important that we turn an infrastructural gaze on colonial finance is that colonial financial systems are no less extractive, no less racializing, no less consequential for post-colonial development – and indeed no less material and embodied – than transport or communication networks. But financial infrastructures are perhaps less obviously visible, and often deliberately opaque and obscured. Colonial financial infrastructures matter a lot, but it takes work to uncover them.

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CHAPTER 10

Wiring Markets

The Telegraph as Financial Infrastructure in the First Age of Globalization

John Handel

1 Introduction: The Telegraph as Financial Infrastructure

Few technologies changed financial markets more profoundly than the telegraph. Before the telegraph, information and capital moved between financial markets only at the speed of sailing ships or the overland mail. Pricing disequilibria between markets, and price volatility within them, persisted for significant periods of time (Koudijs, 2016). The introduction of the telegraph to financial markets in the mid-nineteenth century changed this. Financiers rapidly operationalized the telegraph and used it to pursue much faster arbitrage operations between markets (Garbade and Silber, 1978; Michie, 1997; Hoag, 2006; Müller and Tworek, 2015). Thanks in large part to the global spread of the telegraph, financial markets at the end of the nineteenth century were more integrated than ever before (Neal, 1992; Bordo, Eichengreen, and Kim, 1998; Campbell and Rodgers, 2017). Beyond enabling securities arbitrage, the telegraph also enabled money orders and remittances to be transmitted between both individuals and financial institutions

(Magee and Thompson, 2006). Telegraphic infrastructure cast a long shadow in the financial system. When the telegraph was replaced by the telex in the mid-twentieth century, the system continued to operate using telegraphic cables laid in the 19th and early 20th centuries (Scott and Zachariadis, 2014). In the late twentieth century, when fiber optic cables finally replaced telegraph cables, the new cables followed the under-sea routes first established by telegraph companies a century before (Eichengreen, Lafarguette, and Mehl, 2016). By enabling financial actors to move capital and information at far greater speeds across far greater distances, the telegraph helped usher in the first age of financial globalization and has no small claim to being one of the most impactful technologies in the history of finance (O'Rourke and Williamson, 1999).

While this story is true in a macroeconomic sense, it is also incomplete. Almost all of the secondary literature cited in the first paragraph rests on a fundamental assumption of technological determinism. Financiers and financial institutions simply seem to react rationally to the exogenous

appearance of technological innovations like the telegraph. Competition and contestation within financial institutions (let alone *between* them) for control over new technologies are considered negligible in the face of the aggregate efficiency gains new technology brought (Pardo-Guerra, 2019, pp. 7–8). Recent research has challenged the empirical dimension of this approach directly by questioning the extent to which the telegraph actually did bring efficiency gains to financial markets (Philippon, 2015; Davies, 2018; Bliss, Warachka, and Weidenmier, 2020). But there is also a more deceptive way in which this technologically deterministic approach has warped our understanding of the telegraph's role in the history of finance. "The telegraph" in this literature appears as an abstraction – a generalized catchall that occludes the wide variety of different technological apparatuses, cables, circuits, and administrative practices which actually operationalized the telegraph within the financial system.

By viewing the telegraph not merely as a static technical object but as a financial infrastructure, a different understanding of the relationship between finance and the telegraph emerges. Thinking about the telegraph as an infrastructure highlights the relational and social nature of its functioning; that is, the technological gains in efficiency the telegraph brought were always shaped and distributed through social processes occurring within and between financial institutions. Put simply, the connections between financiers and financial markets that the telegraph enabled were unequal. Some of the world's largest financial markets, like the London Stock Exchange (LSE), pushed for increased telegraphic connectivity in order to siphon business away from smaller exchanges globally. Many smaller exchanges saw increased telegraphic connection not as a harbinger of economic efficiency, but as a predatory threat, and thus resisted increased telegraphic connection. As the European powers jockeyed for imperial supremacy in the late 19th and early 20th centuries, geopolitics too played out within the technical details of the global telegraphic network. A delay or

deficiency in one empire's telegraphic system often led financial actors to route their orders through the telegraphic infrastructure and financial markets controlled by an imperial rival. The gains in efficiency that the telegraph brought inaugurated a conflict among financiers, financial institutions, and imperial states about who would obtain the benefits of that increased efficiency.

Questions about how the financial power and efficiency of the telegraph would be distributed were not only played out as a struggle between financial institutions and imperial states, but also occurred within a different set of relations: those between the technical object of the telegraph itself and the many human workers responsible for its operation and maintenance. Ostensibly mundane and seemingly apolitical technical questions about managing electrical current, repairing wires, and organizing message delivery systems took on increased importance as financiers, financial institutions, and imperial states looked for an edge over their competitors. Often, these technical questions revolved around managing the *limitations* of the telegraph's infrastructural system rather than maximizing its efficiency. Many newer and faster telegraphs caused damage to the preexisting infrastructure of wires and cables or they contributed to an increased burden on the people tasked with transmitting and delivering messages, creating bottlenecks in the system. Small technical details within the telegraphic system very often had large financial and political ramifications.

Understanding the telegraph as a type of financial infrastructure allows us to see not only the aggregate gains in economic efficiency that new technology brought to financial markets, but how financiers, financial institutions, and states all struggled to incorporate new technology and reshape it for their own ends. In other words, how these institutions fought to capture the efficiency gains that telegraphic technology brought with it. Understanding the telegraph as a form of financial infrastructure allows us to move between different scales of analysis, connecting the technical challenges inherent

in simply making the system work to the larger political-economic conflicts about who that system would work for. The rest of this chapter turns to one particular example of this phenomenon, particularly the LSE's attempts to influence both the domestic and global telegraphic network in the late 19th and early 20th centuries.

2 London's Telegraphic Dominance

Power differentials between core and periphery, and between imperial powers, have been a central concern in the history of telecommunications (Headrick, 1981; Bayly, 1996; Hills 2010). Yet these power differentials are surprisingly absent within histories of the telegraph and finance. It is a striking omission, especially considering just how central financial business was to the profits of telegraph companies and how stridently financial institutions strove to reshape the global telecommunications infrastructure for their own advantage. As recent debates around high-frequency trading have revealed, when market information and orders are transmitted at faster rates, competition for small edges in transmission speed and minor reconfigurations of market structure become *more* important to market actors, not less (Easley et al., 2021; MacKenzie, 2021). In other words, as the introduction of the telegraph sped up connections between all global financial markets, the competition between markets and firms for seemingly small edges in telegraphic transmission speed became ever more intense (Robertson, 2024). While the telegraph helped integrate markets on a long-run, macroeconomic scale, small differences in telegraphic connectivity had distributional consequences in determining which markets and firms profited from global financial integration. Speed was always relative.

London sat at the center of the global telecommunications network in the nineteenth century and exercised the most power over the network's development (Wenzlhuemer, 2013, pp. 271–273).¹ Britain's geographical placement off the coast of Europe made

it the natural meeting point for telegraphic cables passing between Europe, on the one hand, and North America, the Caribbean, and South America on the other. Advantages of geography were reinforced by the might of the British Empire. Imperial security concerns – and Britain's raw ability to enforce them – helped create a network of direct telegraphic cables between Britain and the far-flung corners of its empire (Kennedy, 1971; Headrick, 1991; Headrick and Griset, 2001). The British financial sector, especially the LSE, was another key factor in abetting London's rise to telegraphic centrality. As the largest and most liquid financial market in the world, the high amount of daily business that was transacted via the telegraph on the LSE made it a profit center for many telecommunications companies who began to cater their services specifically for the use of Britain's financiers.

Thanks in large part to the telegraph, the LSE's reach was truly global (Cassis, 2006, pp. 98–100). As one observer from the New York Stock Exchange wrote in 1912: “the London Stock Exchange is the only really international market of the world. Its interests branch over all parts of our globe” (LSE, 1911, p. 353). Because of Britain's deep pool of investors and the concentration of capital in London's banks, many companies operating outside of Britain in the 19th and early 20th centuries dual-listed their securities in their local market and on the LSE (O'Sullivan, 2015). The proliferation of dual-listed securities alongside the expansion of the telegraph network led to the explosion of specialized securities arbitrage. Communicating via the telegraph, arbitrageurs in London would work with local partners in markets throughout the world to eliminate the pricing discrepancies in dual-listed securities. London's telegraphic centrality enabled extensive arbitrage operations, which in turn created a powerful network effect, as London could offer the most liquid markets in most securities combined with the closest prices, cementing the LSE's place as “the centre to which the bulk of investment and speculative business naturally flows” (Armstrong, 1939, p. 141).

The scale of the LSE's business gave it a tremendous amount of power not only over the global financial system but also over the telegraph network. The exchange and its brokers were some of the first clients of new telegraph companies during the 1840s and 1850s (Baines, 1898, p. 158; LSE, 1842–1852, p. 309). Even after the domestic telegraph service in Britain was nationalized and brought under control of the General Post Office (GPO) in 1870, the LSE continued to exercise considerable influence over how the telegraph was operated. Nationalization of the telegraph posed a set of difficult tradeoffs for the GPO to manage. While the GPO did not have to worry about turning enough of a profit to pay a dividend like a private company, individual departments did have a mandate to be economically “self-supporting” (Daunton, 1985, pp. 83–84). The GPO faced a tradeoff between supplying a neutral and fair telegraphic service to all users of the network at a higher cost for everyone or catering specifically to the needs of financiers in order to secure revenues that would subsidize cheaper use of the telegraph by members of the public. Throughout the 1870s and 1880s the GPO opted for the latter, allowing stock exchanges throughout Britain to have privatized telegraph offices and preferred access to public telegraph wires in order to drive up revenues from the financial system and subsidize the costs of telegraphs for the rest of the public.²

Preferred access to the telegraph network, and the advantages such access conferred, were not distributed equally even among financial institutions. The LSE benefited disproportionately from the system of direct “stock wires” that was set up in the 1880s between its trading floor and those of the major provincial exchanges, including Liverpool, Manchester, Glasgow, Leeds, and Dublin. Telegraphic connection between London and the provincial stock exchanges quickly began to erode the uniqueness of provincial share lists (Campbell, Rogers, and Turner, 2020). Shares were increasingly dual-listed on their local provincial exchange and on the LSE, which led to a robust arbitrage business among British exchanges. But

due to the LSE's massive advantage in liquidity over the provincial exchanges, the profits of arbitrage trading between London and the provinces were vastly unequal.³ One of the managers of the Liverpool Stock Exchange estimated that twenty times as much business was sent from Liverpool to London against what was sent from London back to Liverpool (Thomas, 1973, p. 89).

The LSE was even able to influence the development of the telegraphic network in more obviously unequal ways. During the late 1880s, a number of the provincial exchanges formed a plan to establish direct “stock wires” between each other in order to combat London's monopolization of the arbitrage business. The plan was thwarted by the GPO and the LSE, as well as some of the major provincial exchanges themselves. The Dublin Stock Exchange, for instance, was already displeased at how much business they had lost from the telegraph and believed that establishing more telegraphic links of any kind would “take business away” from their exchange (Thomas, 1973, p. 103). The GPO, meanwhile, moved swiftly to protect the massive revenues it received from the LSE and subsequently passed a resolution to “discontinue direct (telegraphic) communications between all provincial offices that have not a direct wire to the London Stock Exchange” (Thomas, 1973, p. 103). Smaller exchanges, like Birmingham, Sheffield, Halifax, Huddersfield, and Bradford, which had pushed for a network of telegraph wires between provincial exchanges, were instead forced to compete amongst each other for direct wires to London, which continued to siphon off the majority of the arbitrage business for itself (BT, 1898–1927).

3 Global Telegraphic Influence and Its Challenges

Imperial competition between Britain, France, and Germany mounted in the 1890s and global telegraphic infrastructure was a crucial stage upon which this competition was played out. Germany and France were particularly frustrated by Britain's global

dominance of telegraphic infrastructure and began to lay their own telegraph cables to circumvent those controlled by Britain. The most impactful of these challenges to British telegraphic supremacy came from a German-laid transatlantic cable in 1900 that connected the German city of Emden to New York City via a waystation in the Azores. It was the first cable that allowed for transatlantic telegraphs to entirely bypass Britain and was so successful that another cable along the same route was laid just two years later (Headrick, 1991, pp. 105–107). In response to the telegraphic challenge from its imperial rivals, the British state began taking a firmer hand in managing its global telegraphic infrastructure (Kennedy, 1971; Headrick and Griset, 2001, p. 552). This included the nationalization of the Submarine Telegraph Company in 1890 and the GPO's subsequent management of the telegraph service between Britain and Europe.

London's arbitrageurs had long been frustrated with the poor quality of the telegraph service that connected their exchange to the principal European exchanges. Delays and telegraphic traffic jams were frequent (*Financial Times*, 1891, p. 1). Since arbitrageurs took advantage of small price discrepancies in the same security that was traded on two or more different markets, even a slight delay in the transmission of a message could be the difference between a profitable or unprofitable transaction. Thus, slow transmission or delays in telegraphs to or from London led financial actors to route their orders to different exchanges on more efficient telegraph routes, depriving London's arbitrageurs of business and the LSE of liquidity and close prices.⁴ For instance, the telegraphic connection between London and Italy was so slow that arbitrageurs in the key Italian bourses – namely Milan and Rome – often routed their orders to the Berlin Bourse first and only then on to London if an arbitrage opportunity still existed (*Statist*, 1896, p. 749). Other major cities and their financial markets – like Vienna and Budapest – still did not have a direct telegraph connection with London but they did have one with Berlin, and thus also routed most of their arbitrage

business to the Berlin Bourse. Without liquid markets and close prices (provided in large part by arbitrageurs), the incentives to route orders to London would further erode and the network effects that had solidified the LSE's financial dominance could be undone. Telegraphic dominance and financial dominance were closely intertwined.

Telegraphic transmission from Britain to the continent was so bad that even British financiers were beginning to circumvent British-controlled telegraph cables when routing their orders to Europe. In 1886, direct telegraph wires were laid that connected Liverpool to Le Havre in France and Hamburg in Germany, allowing Liverpool to send telegraphs directly to continental Europe without routing them through London first. However, almost all of the traffic from the North of England was also routed over these wires, creating constant telegraphic traffic jams and transmission delays. For “all intents and purposes,” a delegation of Liverpool financiers complained, they were not “in direct communication with (Continental Europe) at all” (BT, 1911–1921, File XVI). While arbitrageurs from Liverpool and elsewhere in the British provinces could route their orders to Europe through a relay in London, doing so meant that London arbitrageurs would almost always be a step ahead in closing arbitrage opportunities in European markets. Instead, arbitrageurs in the British provinces began to bypass London entirely by sending messages to New York via American- and British-controlled cables, from where they were relayed over the new, German-owned cable to continental Europe. Even though this route was physically longer, the time difference between New York and Liverpool meant that the transatlantic cables were relatively traffic-free during the European business day, so messages could be relayed and transmitted more quickly (BT, 1911–1921, File XVI). Delays and telegraphic traffic jams on the routes between London and financial markets in continental Europe caused more and more financiers to route their orders over German-controlled telegraphic infrastructure to German markets.

The decision to nationalize the Submarine Telegraph Company gave the LSE a unique moment of leverage over the GPO, and the exchange fought hard to win provisions that would improve its telegraphic connections to Europe. The LSE threatened to raise the rent on the GPO's new offices significantly, from the £250 per year that the Submarine Telegraph Company had previously paid to £500 per year. However, if the GPO established direct telegraphic communication between London's trading floor and those of the key European exchanges like Paris, Amsterdam, Brussels, Berlin, Frankfurt, and Hamburg, the exchange was willing to waive rent altogether (BT, 1889–1946, File I). Up until that point, telegraphs were handed in at offices located in the stock exchange but were sent via pneumatic tube to the GPO's Central Telegraphic Office a few blocks away, from where they were transmitted to the continent. With few exceptions, financial telegraphs arriving in Europe would similarly have to be transmitted from a central office and then relayed to the local stock exchange. Direct “bourse-to-bourse” service attempted to cut out these middle relays within the telegraph network. The GPO, eager to save money on rent and hopeful that the new stock exchange wires would increase business, quickly agreed to the arrangement. But the LSE and the GPO would both come to find that influencing the global telegraphic network would prove much harder than influencing the domestic one.

Establishing direct telegraphic communication between financial markets was a far trickier proposition in practice than it was in theory. There were two major problems. The first was technical. How would the GPO actually implement the direct telegraphic connection between the LSE and its European counterparties? The second problem was administrative. How could the GPO convince European telegraph services (most of which were imperial rivals with Britain) to prioritize the transmission and delivery of financial telegraphs?

The technical problem of creating direct telegraphic connections between stock exchanges was exacerbated by Britain's

position off the coast of Europe. Any new cables laid between London and Europe had to be undersea cables, which were significantly more expensive and technically more difficult to lay than overland cables. This was financially unfeasible for the GPO. Instead they explored two different options: diverting existing telegraph wires exclusively to stock exchange business and introducing new, more advanced telegraph apparatuses that would enable a higher volume of messages to be sent over existing wires.

Diverting wires for exclusive stock-exchange business was both technically and administratively challenging. It also highlighted the stark differences that existed in telegraphic connectivity between different cities and financial markets in the late nineteenth century. On the one hand, cities like Paris had extensive telegraphic connections with London. By 1889, there were 11 telegraphic wires connecting the two cities and, at the peak of the business day, over 280 telegraph messages per hour were sent between the LSE and the Paris Bourse. “If there is pressure of business of any particular kind it is spread over the whole eleven wires,” a GPO official noted, but if five wires were diverted for exclusive bourse-to-bourse service, “a pressure of Stock Exchange business could only be met by the use of those 5 wires and the remaining six would not be available” (BT, 1889–1946, File III). Alternatively, many of the smaller exchanges in Europe did not have enough traffic to merit an exclusive wire. Antwerp, Brussels, and Hamburg all maxed out at between fifty and sixty stock exchange telegraph messages per day (BT, 1889–1946, File II). It was only the stock exchanges with a medium volume of messages where the GPO believed an exclusive wire would be a benefit. Amsterdam, Berlin, and Frankfurt all averaged between 150 and 250 stock exchange telegraph messages per day. Each city had more than enough telegraph wires running into such that diverting one wire exclusively for stock exchange business would not affect the telegraphic capacity of the rest of the system. There was no way to stand up a true system of bourse-to-bourse telegraphy across such an uneven telegraphic

landscape. By the end of the 1890s, the GPO had quietly given up on the project of diverting wires to the direct bourse-to-bourse service because it was an inefficient solution to the problem.⁵

The complaints from the LSE and its arbitrageurs, however, did not abate (LSE, 1910–1913, pp. 143, 169). The GPO, in turn, searched for new solutions to the problem, namely the introduction of more advanced telegraph machines. If higher volumes of traffic could be processed on fewer telegraphic wires, more wires could be exclusively committed to stock exchange business without system-wide slowdowns. Two new telegraphic apparatuses invented by David Hughes and Emile Baudot offered a possible solution. Hughes and Baudot telegraphs specialized in duplex and quadruplex telegraphy, respectively. As the terms suggest, duplex and quadruplex telegraphy enabled two and four messages to be sent along the same wire in different directions. This was a major improvement upon previous systems of telegraphy that operated on a simplex system, which could only send one message in one direction over a wire at a time. Simplex systems were easily overwhelmed by even a moderate amount of traffic, and led to particularly financial forms of manipulation. Liverpool brokers complained that when they attempted to telegraph Germany via their direct, simplex wires, German firms could simply “block the wires” by flooding them with telegraph messages in the opposite direction (BT, 1911–1921, File XVI). Not only could Hughes and Baudot telegraphs handle a higher volume of traffic, but they also automatically printed their messages out, rather than waiting for a human operator to transcribe them. All told, the average words per minute increased from twelve to fifteen on Morse telegraphs, to thirty-one on Hughes telegraphs, to thirty-five to forty on Baudot telegraphs (Butrica, 1986, pp. 78–83, 97–107).⁶

Even though multiplex telegraphy brought significant gains in speed and efficiency, its infrastructure was also more fragile. Multiplex telegraphy worked by splitting the electrical signal it sent over the wire,

which made it especially hard to manage on long wires (where the signal would weaken) and undersea wires (where the saltwater created increased electrical interference). Moreover, wires within the same cable that were operated with a quadruplex system frequently created electrical interference with other wires that were operated on a simplex or duplex service (BT, 1911–1921, File VII). The technical issues involved were so thorny and persistent that even as late as 1935, only three out of the thirteen critical and busy transatlantic cables utilized any form of multiplex telegraphy at all (Federal Communications Commission, 1936, p. 44). Many of the gains in efficiency achieved by more advanced telegraph apparatuses were limited or complicated by the technical fragility of the infrastructure on which they depended.

It is here that labor and administration – the other key problem the GPO faced – came into play. Not only were the more advanced, multiplex telegraphs dependent on a fragile infrastructure, but they were also technically much harder to operate than earlier telegraphs. Operators needed to have a knowledge of electrical engineering in order to troubleshoot problems and keep the telegraphs in synchrony with each other, on top of their usual duties of rapidly transmitting messages (Butrica, 1986, pp. 115–116; Hindmarch-Watson, 2020, p. 65). In Britain, expansion of Baudot telegraphs went slowly in part because the GPO was careful to make sure each operator had enough experience handling the apparatus before they were assigned to operate an entire circuit on their own (BT, 1911–1921, File VII). Similar problems regarding the training of operators plagued the European service as well. Even though the French telegraphic system had been early adopters of Baudot telegraphs – putting over 100 Baudot machines into use by 1891 – French telegraph operators and engineers struggled to implement duplex and multiplex working throughout their service, preferring to use the more advanced machines of Baudot to simply accelerate their existing simplex telegraphic services (Butrica, 1986, pp. 99, 112–113). When the

GPO began attempting to expand duplex and multiplex telegraph service throughout its European circuits, British engineers did not hide their frustration with their French counterparts. The “French administration,” one engineer complained, was known to be “not favorably disposed to duplex working as a general principle” (BT, 1911–1921, File VII). The difficulty of operating and maintaining advanced telegraph apparatuses created new bottlenecks in training a sufficient number of operators for the telegraphic workforce.

Frustration with European telegraph operators was not the only administrative hurdle the GPO faced. In Britain, telegraph messages were delivered from the transmission offices to clients via a small army of telegraph messenger boys. At its peak, the GPO employed 3,200 messenger boys in 1897 and trained them with a military-style rigor (Hindmarch-Watson, 2020; Joyce, 2013). Many arbitrage firms employed their own private messenger boys as well. Life as a messenger boy in an arbitrage firm entailed less militaristic discipline but placed a premium on physical speed. As one stockbroker told a messenger boy in his firm, “in the City, as young man you never walk, but always run” (Janes, 1963, p. 47). The same was not true in continental Europe. British arbitrageurs complained that while “sharp boys” delivered telegrams in Britain, European telegrams were delivered by “army pensioners and other middle aged or old men, sometimes women who are naturally slower than boys” (BT, 1911–1921, File XVI). The European delivery systems had other drawbacks as well. For instance, telegraph messengers in Paris were instructed to “wait until there are a number (of messages) for the same district,” rather than delivering telegraphs individually as they arrived (BT, 1911–1921, File XVI). In order to avoid the delays that occurred when messages were transmitted via the different national telegraphic systems, British arbitrageurs increasingly routed their orders to Europe via private American telegraph companies, like Western Union. Unlike the GPO, private American telegraph companies could

use their own messenger boys in European offices and were therefore able to deliver messages “with the same expedition” that customers had come to expect in Britain (BT, 1911–1921, File IV). Creating a direct, bourse-to-bourse system of telegraphy was beset with technical and administrative challenges that bedeviled the GPO for years.

Gradually, the problems of implementing the bourse-to-bourse system began to give way. By 1911, the GPO had successfully introduced multiplex telegraphy to a number of its domestic telegraph circuits. Armed with an adequate number of highly trained operators, and some key technical innovations – like the adoption of anti-induction devices which helped ease problems of electrical interference between wires in the same cable – the GPO began to push for the introduction of Baudot multiplex working on the key European circuits that connected London to Paris and Berlin (BT, 1911–1921, File VII). Buoyed by the success of Baudot working with Paris and Berlin, the GPO expanded Baudot usage to the Amsterdam circuits and the long-troublesome Milanese circuit by the end of 1912. They also laid further plans to aggressively increase Baudot working to the rest of the Netherlands, as well as Brussels, Hamburg, Frankfurt, Emden, and even to Budapest and Vienna, which had previously not had direct channels to London at all (Table 10.1).

The expansion of Baudot to Europe finally gave the GPO enough open telegraphic channels at their disposal to dedicate telegraph circuits exclusively to the “bourse-to-bourse” service. Rather than creating all new telegraph circuits and wires, the extra telegraphic capacity allowed the GPO to reallocate the circuits that serviced the bourses of Paris, Berlin, Frankfurt, Hamburg, Amsterdam, and Brussels to an office in the LSE for exclusive financial work (Table 10.2). For instance, the two Baudot circuits, which provided eight telegraphic channels between London and the Amsterdam central offices, enabled the GPO to transfer two Hughes circuits to exclusively service financial telegrams between the LSE and Amsterdam Bourse. The Paris and Berlin bourses were the only

Table 10.1 Telegraph channels from London in 1912

<i>Continental office</i>	<i>Baudot circuits</i>	<i>Baudot channels</i>	<i>Hughes circuits</i>	<i>Hughes channels</i>	<i>Total channels</i>	<i>Planned additional Baudot channels</i>
Antwerp	0	0	1	2	2	6
Brussels Central	0	0	0	0	0	6
Brussels Bourse	0	0	1	2	2	0
Amsterdam Central	2	8	1	1	9	4
Amsterdam Bourse	0	0	2	2	2	0
Rotterdam	0	0	1	1	1	6
Havre	0	0	0	0	0	4
Lyons	1/2	2	0	0	2	0
Marseilles	1/2	2	0	0	2	0
Paris Central	1	4	9*	9	13	4
Paris Bourse	2	8	9*	9	17	0
Zurich	1/2	2	0	0	2	0
Milan	1/2	2	0	0	2	0
Rome	0	0	1	1	1	0
Berlin Central	2	8	1	2	10	4
Berlin Bourse	0	0	0	0	0	4
Bremen	0	0	1	2	2	0
Cologne	0	0	2	2	2	0
Dusseldorf	0	0	1	2	2	0
Emden	0	0	0	0	0	4
Frankfurt Central	0	0	1	2	2	4
Frankfurt Bourse	0	0	1	1	1	0
Hamburg Central	0	0	4	5	5	12
Hamburg Bourse	0	0	1	1	1	0
Budapest	0	0	0	0	0	2
Vienna	0	0	0	0	0	2

Note: If there is one circuit and two channels, that means it is a duplex circuit. Alternatively, where the number of channels is equal to the number of circuits this means it is a simplex circuit. The asterisks on the Paris Central and Paris Bourse offices indicate that they shared these circuits.
Source: Author’s elaboration based on data found in BT Archive, Post/30/1988B, File VII.

Table 10.2 Planned bourse-to-bourse telegraphic channels from the LSE in 1912

<i>Bourse-to-bourse plan 1913</i>			
<i>Financial market</i>	<i>Baudot channels</i>	<i>Hughes channels</i>	<i>Total channels</i>
Paris	4	2	6
Berlin	4	1	5
Hamburg	0	2	2
Frankfurt	0	1	1
Amsterdam	0	2	2
Brussels	0	1	1

Source: Author’s elaboration based on data found in BT Archive, Post/30/1988B, File VII.

exchanges that received their own dedicated Baudot apparatus in addition to supplementary circuits operated by Hughes machines. Some administrative issues surrounding the delivery of messages remained. The telegraph office in the Paris Bourse handled both financial and ordinary telegraphs and it was not clear how to administratively disaggregate the two types of messages to ensure speedy delivery (BT, 1889–1946, File III). In London, the GPO still worried that splitting the operation of key circuits between the Central Telegraph Office and the LSE would necessitate an “amount of staff, considerably in excess of what would meet the requirement if the whole of the circuits were concentrated

in one office” (BT, 1911–1921, File VII). But these were ultimately minor issues since “the disadvantages of working certain of the continental circuits from a point in London other than the Central Telegraph Office cannot continue to be regarded as outweighing the advantages of establishing direct communication between the Stock Exchange in London and the Continental Bourses” (BT, 1911–1921, File VII). In August 1913 the GPO signed off on a plan to establish a bourse-to-bourse system of telegraphy between the LSE and its European counterparts.

But the best-laid plans – and telegraph wires – sometimes go awry. When World War I broke out in August 1914 stock exchanges closed, international communication between warring nations was severed, and arbitrage trading became “practically impossible” (*The Times*, 1914, p. 17). The GPO and LSE abandoned their plans for implementing the bourse-to-bourse service. It would take another seven years before bourse-to-bourse telegraphy from the LSE was actually established, in 1921. Even then, the system was far more limited in practice than had been imagined before the war. Only the Paris and Amsterdam bourses were afforded direct telegraphic channels to and from the LSE and, notably, no German exchanges were included. Bourse-to-bourse service was also limited to the busiest hours of the business day (BT, 1911–1921, Files III, IV). Thirty-one years after the idea had first been proposed, a bourse-to-bourse telegraph service was finally in operation. But thanks to persistent problems inherent in managing complex technical infrastructure, sourcing enough staff to operate all the components of the system, and the shifting, explosive consequences of geopolitics, the bourse-to-bourse telegraph system was only ever implemented on a limited scale.

4 Conclusion

Focusing on the particularities of telegraphic *infrastructure*, rather than just the telegraph in the abstract, challenges many of our assumptions about the relationship

between technology and financial markets in economic history. By paying closer attention to the operational details of telegraphic infrastructure, we can begin to move away from big bang accounts that emphasize a single moment of exogenous, technological innovation. Once the telegraph was introduced to financial markets and institutions, its benefits became relative. Telegraphic speed and capacity, as well as the economic benefits such speed and capacity bestowed, were always unequally distributed. Firms, exchanges, and states all had different imperatives when choosing how to implement and use the telegraph. Increased telegraphic connectivity was not always seen as an unalloyed economic good. The competing perspectives of different financial actors about how best to configure the telegraphic system had material consequences for how global telegraphic infrastructure was built and operated. Macro-level conflicts between different states and markets were often played out within the seemingly small and technical space of telegraphic infrastructure. This meant that the power of these states and financial institutions often rested on the infrastructural *limits* of the telegraphic system and on the workers whose job was to make that system run. Understanding the telegraph as a financial infrastructure, then, allows us to see how these seemingly small battles around technical details had large ramifications for the political economy of the financial system as a whole.

Notes

1. Notably, the data collected in Wenzlhuemer (2013) only includes European telegraph connections, not global ones. This understates London’s telegraphic connectivity, which is still the most highly connected node by most of Wenzlhuemer’s metrics.
2. This phenomenon can be seen across a variety of different sources. For instance: LSE (1910–1913, p. 231); BT (1878–1931, Files I, II, V); Royal Commission (1878, p. 318).
3. Regarding London’s liquidity advantage, the secretary of the Liverpool Stock Exchange noted that “in large operations they (London’s

- market makers) become the ultimate resort. They are the final arbiters of the prices of the day" (Royal Commission, 1878, p. 317).
4. For helpful studies of how arbitrage positively impacts market liquidity see Gromb and Vayanos (2010) and Rösch (2021).
 5. An internal GPO memo noted that "it will be best to refrain for the present from making any communication to the Stock Exchange committee on the subject as it might possibly result in a claim for rent of the enlarged office being put forward" (BT, 1889–1946, File III).
 6. See also His Majesty's Stationery Office (1919a, p. 24; 1919b, p. 10).

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CHAPTER 11

Remaking the Financial Infrastructure of the City of London

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In the literature on the political economy of finance, and in particular global financial centres, the infrastructure of the material environment has tended to be underexamined, with only cursory attention given to how new technologies are enabled by urban planning decisions and built into the fabric of working spaces. Yet the production of certain infrastructure systems enables some financial centres to have a competitive advantage over others and shape the larger trajectory of capitalism. This chapter responds to this omission by exploring how the City of London (hereinafter referred to as the City), a core hub for financial and professional services, prioritised the remaking of its infrastructure as a way to rebuild and extend its power. The chapter argues that the City's infrastructural architecture is a neglected feature of its authority. Despite some notable interventions, the general coverage of infrastructure in respect to the City remains sparse, or is located in industry-specific debates, a troubling analytical gap when one considers that the rule-making over, and manufacturing of, infrastructure is always an enduring question for government and private sector agents.

To conduct this survey, the chapter probes the political economy of infrastructural dynamics from the 1980s to the present, a prominent period in which the City has grappled with manifold commercial, technological, regulatory, and cultural changes. The argument uncovers how different groups of professional players – including major firms, local government agencies, property owners, architects, and developers – interacted in ways which produced a significant transformation in the infrastructural experience of the City. The chapter is organised into three sections. In Section 1, the discussion clarifies how financial infrastructure is being conceptually imagined as an evolving, historically determined process, including a particular emphasis on treating 'hard infrastructures', such as buildings, as part of a holistic analysis (Dyer et al., 2019, p. 220). In the second and main section, the empirical story of the City's physical change is explained. The discussion explores how two profound technological trends since the early 1980s – office computerisation and new telecommunications – provoked a remaking of the financial infrastructure of the UK's main financial

centre. The chapter unpacks how, during the 1980s, the City was confronted with major problems in its office stock, in respect to both overall capacity and the internal structure of how buildings could benefit from new technologies. Through the pressure of key banks, among others, the City altered its planning rules and encouraged the construction of its current built configuration; that is, a welcoming container and facilitator of global capital. Section 3 wraps up the chapter with some concluding thoughts.

1 Conceptualising Financial Infrastructure

As examined by Carola Westermeier, Malcolm Campbell-Verduyn, and Barbara Brandl in their introductory chapter to this volume (Section 1), the study of financial infrastructures is inevitably preoccupied with material objects, such as fibre-optic cables, computers, and payment systems, among many other examples. Yet any serious analysis of such structures will, through trying to make sense of functionality or wider politics, invite consideration of systemic socio-economic processes. As other writers have discussed in the social sciences, built infrastructures, or processes of ‘infrastructuring’ (Star and Bowker, 2002), have a ‘peculiar ontology’: they are things (to adhere to a substantialist philosophy where substances are treated as key units of enquiry), as well as relations between things (to align with a processual sense in which objects cannot be understood outside of relations) (Larkin, 2013, p. 329; Barua, 2021). The making and implementation of any financial infrastructure includes a host of design and engineering problems, such as those involving the availability of materials; the relative resilience of existing technologies; the landscape of the built environment; and the links to, and impacts on, other ecosystems. Thus, to concur with other researchers, it arguably makes better conceptual sense to define infrastructures as ‘assemblages’ or ‘entanglements’ of human and non-human elements (Bernards and Campbell-Verduyn, 2019).

This process-based interpretation of financial infrastructure also matters for how one understands historical change, a key theme of my discussion here on the City. In many depictions of financial infrastructure, as a subset of the broader category, the reader can be left with an impression that the system in question is ‘robust’ or ‘stable’ in some sense. Such descriptions are often linked to how power is explained, including the implication that certain financial infrastructures imbue or strengthen forms of power (business, state, sector, class, etc.). While this reading often has credence, any snapshot of empirical analysis which remains too fixated on the present, without a deeper historical context, runs the risk of underplaying the messy, social evolution of infrastructural forms. For instance, financial infrastructures are often threatened by decay, breakdown, and destruction for a range of reasons. Alternatively, new technologies enter financial markets – in the form of products, systems, or revolutions – and generate changes that were not easily anticipated at earlier points of creation. Financial infrastructures can be built for one purpose, yet also spawn unintended effects on other agendas and practices. In other words, despite appearances of permanence, the materiality of financial infrastructure is always undergoing constant change, necessitating in the process maintenance, repair, revision, or replacement (Ramakrishnan, O’Reilly, and Budds, 2021).

With these points in mind, this chapter suggests that any concept of financial infrastructure needs to be open to the material whole within which such systems operate, including paying attention to the mutual interactions between different infrastructures. We need conceptual thinking which is flexible to trace and accommodate ongoing motion in the built environment, along with a sense of the indeterminacy and unpredictability of historical change. As a consequence, the discussion in the rest of this chapter views the notion of financial infrastructure through a wider, historically grounded lens, whereby ‘hard infrastructures’, such as buildings, are also treated as

part of a systemic analysis under the same term (Dyer et al., 2019, p. 220). In this sense, therefore, any political economy of financial infrastructure must involve ‘the structure of buildings, cities, and metropolitan regions’ (Ruby and Ruby, 2017, p. 5), of which the City offers an illuminating case to which we can now turn.

2 Financial Infrastructural Change in the City of London

The City has historically been among the major financial hubs in the world, from its role enabling British colonialism during the seventeenth to early twentieth centuries to its international repositioning since the early 1950s (Kynaston, 2002, 2011; Cassis, 2010). Notwithstanding recent doubts around London’s status post-Brexit (Thompson, 2017; Kalaitzake, 2022), the City is often ranked second to New York as a financial geography, with strengths in banking; insurance; asset management; fintech; as well as related professional services, such as law, accountancy, and consulting (Z/Yen, 2023). The focus here is on one aspect of this recent history: how we can understand infrastructural change in the City from the 1980s to the present. During this period, there was a significant transformation in the built environment of the Square Mile (the informal moniker for the City) to meet the demand for business activity and employment. Among key explanations for the expansion of the City during this time, scholars have tended to focus on macro-policy shifts, such as the initial development of the Eurodollar market; the Big Bang regulatory reforms in the 1980s; or further post-Cold War liberalisation efforts.¹ The political conditions that facilitated these commercial shifts are certainly vital to any story of the City. Yet the modern power of London as a financial centre and, in turn, its larger role in transnational capitalism, would not have been possible without corresponding changes in large infrastructural systems.

It is surprising how often this point is missing from many political economy accounts of the City’s history, although there

are some notable exceptions (see Pardo-Guerra, 2019). For some political economy analysts, disciplinary biases may be at play, such as categorising the built environment as an object of interest predominantly for geographers or other experts found in architecture and property. However, this lacuna undermines our understanding of the City as a financial centre in two major ways. First, from a practical commercial perspective, political rule-making is inevitably operationalised through infrastructures. But it should not be assumed that the built environment is ready for new commercial possibilities following a policy shift; rather, there is often a mismatch between supply and demand, provoking fresh struggles and a scramble for investment. Nor should it be assumed that policy-making, local or national, always initiate the creation of infrastructures since, as is often seen, unexpected technologies can pressure owners, tenants, and developers to advance quicker than policy makers. Secondly, this analysis matters for explaining the power that the City generates as a complex capitalist ecosystem. As some writers have argued, ‘London’s highly advanced (physical) technological infrastructure’ is ‘a competitive edge that is consistently overlooked within the literature’ (Kalaitzake, 2022, p. 625). Infrastructural benefits of the City, such as transport connectivity, telecoms, and cyber resilience, are often promoted by policy makers to consolidate and extend the City’s power (City of London Corporation, 2023c). Indeed, we could go further to claim that the quality of the City’s infrastructure is not simply one factor among others (such as regulation, the legal environment, or human capital), but the foundation of its power, since certain forms of business activity could not operate adequately without such modern systems.

Two technological trends which profoundly shape the City’s built infrastructure will be highlighted in this brief account: (1) computerisation, understood as the incorporation of new desktop hardware devices and software systems into offices and (2) telecoms, particularly the roll-out of fibre-optic cable systems. Some contextual

detail on these technologies is needed here before explaining the specific City history. In reference to the former, prior to the micro-computer revolution, companies dedicated entire rooms and floors to mainframe computers due to the size, heat, and noise of such equipment (Thomas, 2019, 2023; Kaufmann-Buhler, 2021). In the 1960s, led by innovations in the USA, the use of computing was predominantly aimed at lowering clerical-related costs and human inaccuracies in the paper system (Thomas, 2014). From the 1970s, banks did make use of some terminals, such as the Quotron unit and screens made by Reuters and Telerate, but these were mainly for information purposes, such as displaying equity prices (Plender and Wallace, 1985; Pardo-Guerra, 2019). In 1981, the debut of the personal computer (PC) by IBM heralded a new era; it was promoted as a multifunctional device that could be positioned on the desk of the worker for the first time. Such shifts towards the ‘mechanisation of office work’ were combined with a range of justifications, including enhanced productivity, customer service, and job satisfaction (Giuliano, 1982). In contrast to the general PC, the Bloomberg Terminal, launched in 1982, was marketed as a customisable workstation for financial institutions seeking to connect their traders with real-time financial data and market-relevant news (McCracken, 2015). By the end of the 1980s, computerisation had become mainstreamed in major commercial centres, with an estimated three quarters of City employees working at a screen (Duffy and Henney, 1989).

In reference to telecoms – which should be viewed as interwoven with these corporate computing trends – the 1980s saw significant investment in fibre-optic technology as telecom firms rebuilt their communications infrastructure. Compared to copper cables, fibre optic offers a number of advantages, including: superior speed and greater bandwidth; lighter weight; minimal susceptibility to radio interference; and enhanced security. The first commercialised fibre-optic investments were made in locations and along routes where communication traffic

was heaviest, such as around New York, Chicago, and Washington, DC (Moss, 1987). Bandwidth capacity continued to improve through the 1980s and 1990s, along with lowered costs. In the UK, the development of such infrastructure was encouraged by the privatisation of the industry, which included an early experiment from 1981 with Mercury Communications, before the incorporation of British Telecom as a public limited company in 1984 (Moss, 1987; Ward, 2019). By 1989, the technology had advanced to enable the first transatlantic, submarine fibre-optic cable, a development which proved crucial for operationalising long-distance electronic foreign exchange trading (Eichengreen, Lafarguette, and Mehl, 2021). When the Internet began commercialising in the 1990s, data flows became more important than voice traffic, and fibre-optic cables were repurposed for handling the increasing demand for bandwidth and storage capacity (Graham, 1999).

By tracing the impact of these macro-technological forces – which have obviously shaped many locations in the world – we can explore how infrastructural change co-evolved and, indeed, enabled the regulatory changes of the 1980s to become a material manifestation. This historical story highlights my argument about the need to track, through a process lens, infrastructural change in the service of finance where technology plays a disruptive force. We find that some agents are inevitably better at perceiving and preparing for these emergent trends than others. With this context in mind, we turn to address how the City was remade.

2.1 Confronting Inadequate Infrastructure and Policy-Making (1980–1986)

In the early 1980s, there was a serious mismatch between what financial companies desired for their working environments and the infrastructural resources the City could offer. In other words, computerisation and more advanced telecommunications had been developed and were viewed as critical for the future, but this did not mean that such technologies could be immediately

deployed into the physical space of the City. Two problems were apparent. First, much of the office stock was built either from the eighteenth to early twentieth centuries and, thus, could not be easily reconverted due to conservation rules; or was derived from the early post-World War II decades, which featured poor-quality buildings that were now decaying or obsolete (Roberts and Kynaston, 2002).² Property owners and users argued that more space was required, built to a superior standard, with a flexible internal design which could accommodate ongoing commercial adjustments (DEGW and EOSYS, 1983; Duffy and Henney, 1989; Thomas, 2020). Such buildings were in short supply within the City and, as a result, some firms began to relocate to other locations in London, such as Salomon Brothers' move to Victoria. Secondly, according to critics, compounding this material situation, the City of London Corporation, as the local authority, had an insular planning culture which was too focused on heritage concerns rather than the needs of business. The most emblematic and controversial projection of this culture came in 1984 when a Draft Local Plan proposed expanding conservation areas in the City, such as limiting the potential for enlarging any building to no more than 20% (Corporation of London, 1984; Eagleton-Pierce, 2023).³

Following the publication of the Draft Local Plan, a firestorm of criticism was unleashed against the local authority by a range of City players, including companies (such as Barclays and Credit Suisse First Boston); the property industry (for instance, Land Securities and Savills); and the wider policy community (including the Bank of England and the Centre for Policy Studies) (Corporation of London, 1985). Such groups argued that the future of the City was threatened by an overly cautious, isolationist Corporation approach which did not adequately grasp the precise infrastructural demands of professional services in the context of global finance. As a result of this pushback, an internal power struggle at the local authority brought forward new decision makers who were more amenable

to corporate interests and the Big Bang agenda within the second Thatcher term (1983–1987).⁴ Subsequently, in a revised and approved Local Plan in 1986, conservation issues were still present and viewed as part of the Corporation's guardian role, but did not restrict planning to the same degree as the Draft agenda (Corporation of London, 1986; Eagleton-Pierce, 2023).⁵ Elsewhere at this time, although not a clear threat to the Corporation, one can also note that the launch of the London Docklands Development Corporation in 1981 by the Thatcher government set in motion the development of Canary Wharf, which would become, by the 1990s, a major office rival to the City. Overall, the result of this planning shift energised corporate users, property owners, investors, architects, and the wider development community to plan for new working spaces in the City that could enable the benefits of computerisation and new telecoms to be realised.

2.2 Building the New Financial Infrastructure (1987–1999)

From the late 1980s, in order to respond to business demand, the City experienced a period of rapid expansion which involved the reconfiguration of existing buildings as well as the development of new sites (Ross Goobey, 1992; Hendershott, Lizieri, and MacGregor, 2010). For instance, office stock availability grew from around 620,000,000 m² in 1987 to approximately 740,000,000 m² in 1993. According to another estimate, between 1985 and 1992, around half of the City's office stock featured some form of reconditioning (Powers, 2007). There were at least three technical problems to resolve at this time. First, the power cabling for computing and peripheral devices required considerable space, for which raised flooring was viewed as an essential need of building design. Secondly, for major banks, particularly US and Japanese players, there was an aspiration for large, open trading floors, ranging from 2,000 m² to 5,000 m², enough to fit 500 to 800 traders in a single space (Duffy and Henney, 1989; Ross Goobey,

1992; Pryke, 1994). As outlined in respect to macro-technological trends, the most elaborate trading desks needed to contain multiple terminals and screens, equipment which encouraged the demand for open floors. Thirdly, such computing produced what was called at the time ‘wild heat’, which, if not removed or controlled through air conditioning, could damage the infrastructure. In addition, given the importance of maintaining corporate data and records, which were increasingly being digitised, some tenants also requested space for ‘back-up’ power sources on site in case of supply disruption from the National Grid (Daniels and Bobe, 1992; Thomas, 2023).

The opening of the Broadgate development next to Liverpool Street Station in 1991 can be offered as a pertinent illustration of how these problems were managed. Architecturally defined as a ‘groundscraper’, that is, a building with a large footprint, relatively few stories, and a flexible interior, Broadgate provided almost 118,000 m² of office space and served as a model for City developers on how to reinvent private development. Developed by Stanhope Properties, run by Sir Stuart Lipton (who remains a major City player), and Rosehaugh, headed by the financier Godfrey Bradman, the scheme was an innovative project which tried to anticipate and shape what physical infrastructure would be needed in the City (Davenport, 1991; Ross Goobey, 1992; Harris, 2021). DEGW, a leading architectural design agency, was brought in to determine what the likely tenants wanted from the space (Thomas, 2023). American Express, UBS, Royal Bank of Scotland, Deutsche Bank, the Henderson Group, and ICAP were all initial occupiers, as well as the European Bank for Reconstruction and Development (Marmot and Worthington, 1986; O’Doherty, 2009). Broadgate contained the open office spaces they required. The emphasis on malleable internal structures also carried a conscious financial impulse: it made the balance sheet of developers and tenants more resilient in the face of inevitable business cycle changes or new fashions (Thomas, 2020). In addition, Broadgate was also interesting not only

in terms of how technological infrastructure was driving the need for new building forms, but also because of how the location of the development – at the ‘periphery’ of the City, rather than in its ‘core’ – signalled where clients were willing to be housed for the future.⁶ As Broadgate expanded and inspired other projects through the 1990s, the observation of Frank Duffy at DEGW became a reality: ‘[b]uildings have become, in a sense, an extension of the computer’ (Duffy and Henney, 1989, p. 33).⁷

In addition to the computerisation in financial services, the late 1980s and 1990s were also significant for the parallel development of new telecoms infrastructure. By the end of the century, in the context of the liberalisation of the industry led by successive administrations (Thatcher, Major, and Blair), six firms had constructed fibre-optic grids beneath the streets of the City (BT, Mercury, City of London Telecommunications (COLT), WorldCom, Energis, and Sohonet) (Graham, 1999).⁸ The launch of COLT in 1992 is an interesting example of the interplay between finance and infrastructure because it was funded by Fidelity Investments, the US asset manager, with the aim of serving banking, insurance, and law firm clients.⁹ As its original home territory, the COLT network was thickest in the City, but by 2000, new connections extended into the West End and Docklands in the east, totalling 257 kilometres of cabling (Rutherford, 2005; Pehrsson, 2020). One of the most significant technological benefits of COLT’s infrastructure to corporate players was the deployment of the first synchronous optical networking and synchronous digital hierarchy (SONET/SDH) network in the UK.¹⁰ Superior to the existing BT legacy system, the SONET/SDH protocol, now a worldwide standard, enables larger bandwidth and the capacity to switch between multiple data types, such as voice, video, and other data (Fransman, 2002). In sum, by the early 2000s, in light of widespread broadband adoption and more advanced wireless technology, some of the main foundations of the current financial infrastructure of the City had come into view.

2.3 *Infrastructure Takes to the Sky: The Eastern Cluster of the City (2000 on)*

We can see how the modern history of the infrastructure of the City contains material forms undergoing frequent ruptures. What appears in one moment to be fixed and permanent is, in the face of new demands and social forces, dislodged and rendered redundant. Capitalist infrastructure, in all its planetary dynamics, still follows Marx and Engels' (1998, p. 38) famous line: 'all that is solid melts into air'. In the remaking of the City's financial infrastructure, the 2000s was another notable period of change due to important policy decisions at the Corporation. In 2002, under pressure from the emergence of Canary Wharf as a rival financial district and the new Greater London Authority, the Corporation approved the Unitary Development Plan (UDP), a policy which permitted consideration of tall buildings in the City. Although the City had some skyscrapers, such as Tower 42, built in 1981 for NatWest bank, strict heritage rules, notably to protect viewing corridors of St Paul's Cathedral and the Tower of London, prevented many from being proposed (Gassner, 2020). By contrast, the UDP introduced a 'new architectural language in the City' (Kaika, 2010, p. 453), one that was legitimised via the neoliberal-inflected threat that, without the approval of such development, London would 'miss out' on global business. In addition, the justification for the verticalisation of the City was also made on grounds that urban space needed to be denser, particularly to limit commuter mobility and the further encroachment of green spaces (Glaser, 2019).

The development of the Eastern Cluster of the City – extending from Bishopsgate in the west and eastwards along Leadenhall Street, and from Liverpool Street in the north to Fenchurch Street in the south – has become the main space for skyscraper construction this century. In 2004, the trend began with the opening of 30 St Mary Axe ('the Gherkin'), now a landmark building (Powell, 2006). Subsequent significant projects included Heron Tower (completed

in 2007), Broadgate Tower (completed in 2008), the Leadenhall Building (completed in 2014), and 22 Bishopsgate (completed in 2020 and now the tallest, topping out at 278 m). Other neighbouring skyscrapers are planned, including 1 Undershaft, scheduled to be the tallest building at 310 m when completed. By 2019, the Corporation surmised that the Eastern Cluster had become the new 'epicentre' of the City (City of London Corporation, 2019, p. 7) and, certainly for casual observers, such skyscrapers project a powerful 'hill-like' skyline profile.

Three reasons behind the emergence of the Eastern Cluster can be given. First, as noted from the UDP policy shift, developers and planners believe that demand for offices will continue to rise. This forecast has largely proved accurate. In terms of the City workforce, it stood at 245,000 in 2004; rose to 414,000 by 2014; and totals 615,000 in 2023. At the same time, the total floor space in the City was 775,000,000 m² in 2004; before increasing to 862,000,000 m² in 2014; and, by 2022, new development, much of it in the Eastern Cluster, had increased the figure to 944,000,000 m² (Hendershott, Lizieri, and MacGregor, 2010; City of London Corporation, 2023a, 2023b).¹¹ Secondly, compared to 1990s, occupiers now require infrastructure which is not only adaptable to IT requirements, but also operates with enhanced energy efficiency. Indeed, the flight to high-quality buildings in the City – those that have such sustainable credentials – has meant that it has become harder to let older structures with weaker environmental standards.¹² Thirdly, since the global financial crisis and the post-COVID work-from-home trend, the Corporation has been trying to diversify the economic and cultural functions of the City. Such policy activism has been partly effective. For instance, by 2022, 14% of jobs in the City were defined as technology-focused and the local authority has been keen to market the Eastern Cluster as a start-up hub with 'sustainable' and 'resilient' office spaces (City of London Corporation, 2021, p. 6; 2023b). The effort to promote the City as a tourist destination is connected to this strategy. For example,

most of the new tall buildings are required to provide viewing platforms, attractive plazas, green spaces, and street art. In this sense, therefore, the physical infrastructure of the Eastern Cluster has a double function: it both enables commerce to be realised and, through encouraging non-financial business and tourism, broadens the scope for modification beyond the financial sector.

3 Conclusion

This chapter has explored how we can understand the recent historical evolution of financial infrastructure in a global commercial centre, the City of London. By examining two dimensions of infrastructure – modern computerisation and new telecommunications – I have explained how the built environment was transformed to facilitate the needs of major business enterprises. Infrastructure is conceptualised here as a process whereby technologies are physically enmeshed into a diverse array of socio-economic interests, reshaping working practices in the process. The operationalisation of this financial infrastructure in the City was initiated through the guidance (or threat) of USA, European, and Japanese banks, who wanted to enhance their working environments for profitable trading. But I have also explained how such direction can only be followed within a complex ecosystem of infrastructural organisation, involving legal planning agencies, property owners, developers, architectural designers, and relevant investors. Such decision-making includes attention to a range of concerns, notably competition with other financial centres, local heritage rules, and, increasingly, the desire for sustainability and diversifying the commercial function of the territory. Professional groups in such policy games interact with each other in different ways – ranging from cooperative ties to antagonistic struggles – to forge the blueprints for new forms of financial infrastructure. We need to understand how such infrastructure moves from conception to physical reality to grasp how financial centres, such as the City,

try to retain and consolidate their forms of power. Once normalised, these systems often become taken for granted by end users yet, as plotted in this historical story, it would be better to recognise how such infrastructure is not just one dimension of capitalist life, but the very substratum enabling other structures of power to operate.

Notes

1. The London-centred Eurodollar ('offshore') market, established in the late 1950s and estimated to be worth a gross size of \$1,150 billion by 1980, was a key institutional innovation which enabled the UK to maintain a competitive advantage by making loans and accepting deposits in US dollars (Schenk, 1998; Braun, Krampf, and Murau, 2021). The Big Bang regulatory reforms, launched in October 1986 and closely associated with Prime Minister Margaret Thatcher (1979–1990), contained two significant acts centred on the London Stock Exchange: the abolition of monopolistic fixed commissions on securities transactions and the opening of the exchange membership to foreign companies. Echoing the Conservatives, the Labour government (1997–2007) continued to adopt a sympathetic political treatment of the City (Plender and Wallace, 1985; Reid, 1988; Moran, 1991; Kynaston, 2002, 2011; Talani, 2012; Martin, 2016; Copley, 2021).
2. The City has twenty-seven conservation areas, which are spaces of special architectural and historic interest in which additional planning controls are applied to developments. Much of the core of the City, such as around Bank Junction, is under a conservation edict.
3. This proposal also needs to be understood in the context of a 'conservationist backlash against the destructive vandalism of some 1960s developments' in the City (Roberts and Kynaston, 2002, p. 39).
4. In the most significant moves, Michael Cassidy assumed the position of Chair of the Planning and Communications Committee in 1985, replacing Chief Architect Stuart Murphy. Cassidy subsequently hired Peter Wynne Rees as City Planning Officer (1985–2014).
5. For instance, in comparison to the Draft Local Plan, plot ratios of five to one were allowed in all new building developments,

- along with the authorisation to build deeper basements and access 'air rights' over transport infrastructure. Such changes enabled an expansion of the City floor space by 25% (Thomas, 2023).
6. Historically, all major banks needed to be located in close proximity to the Bank of England in the core of the City. This was justified on the basis of the Bank's supervision role and its own centralised settlement system (Pryke, 1991). In 1984, as the Big Bang reforms developed, this spatial norm began to loosen and the Bank accepted that the activity of financial services could be positioned in many locations, within and beyond the City.
 7. In reference to other projects inspired by Broadgate, 125 London Wall (Alban Gate), designed by Sir Terence Farrell, is also considered synonymous with the Big Bang reforms. Upon completion in 1992, the building was occupied by JPMorgan who sought a modern office space with a large floor plate.
 8. As explored by Ward (2019), there exists a long history of attempts by financial interests in the City to gain privileged access to the latest telecoms technology. For instance, in 1983, in the context of BT's privatisation, the City was one of the first areas in the UK to receive experimental fibre-optic cables.
 9. The investment was also made due to the profitable opportunities emerging in the private telecoms space at this time (Fransman, 2002).
 10. SONET was originally developed for North America. SDH is a similar technology developed in Europe and Japan.
 11. This general upward trajectory has, of course, featured many cycles. For instance, since the onset of the COVID pandemic, the vacancy rate for offices in the City rose from 3% at the beginning of 2020 to 10% by the end of 2023 (Sidders and De Paoli, 2023).
 12. The pressure to move to buildings that have a lighter carbon footprint has been encouraged by firms that have a wider commitment to achieving net zero, along with stricter government regulations on minimum energy efficiency standards.
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Alternative Financial Infrastructures in Russia

Roxana Ehlke

1 Introduction

Russia's recent innovations in financial infrastructures, especially in the payment sector, have attracted some scholarly attention. Using a wider perspective on global processes, many authors (de Goede and Westermeier, 2022; Nölke, 2022; Shagina, 2023; Fantacci and Gobbi, 2024) have examined the interconnections between the creation of new systems for financial transactions and the politicization of the established, Western-dominated systems, like the payment systems Visa and Mastercard, or the financial messaging system SWIFT (Society for Worldwide Interbank Financial Telecommunications) (see also Nölke, this volume). With a narrower focus on the alternative systems that were created in the Russian payment and banking infrastructure, Gusev (2016) has explored the history of payments in Russia and the chain of political decisions that can explain the creation of the new system. The political motivations behind the establishment of the new systems with regard to the aims of foreign policy and regional integration have been discussed by

Gricius (2020). Gorshkov (2022) has examined more concretely the new systems' relation to overall trends in cashless payment popularity in Russia, while, for example, Kochergin and Iangirova (2020) have looked at their long-term prospects. Between those two strands of research, Mishura and Ageeva (2022) focus on newly created infrastructures in the context of financialization and contemporary Russian authoritarianism (Mishura and Ageeva, 2022).

The present chapter adopts a similar focus as Mishura and Ageeva (2022) as it attempts to understand these structures as expressions of processes resulting from and reinforcing channels projecting infrastructural power. Concretely, the chapter discusses the consumer payment systems of the Mir payment cards and the Faster Payment System (FPS), as well as the plans for the creation of the Russian Central Bank Digital Currency (CBDC), the digital ruble.

Section 2 introduces the conceptual background for the case study. Section 3 discusses the case's historical context and the origins and antecedents of the Central Bank of Russia's (CBR's) interventions in

the financial infrastructures of the country. Section 4 addresses the development and nature of the newly created structures and discusses their ramifications in the framework of infrastructural power. Section 5 attends to the criticism of and controversies around the CBR's policies in this regard, examines the way that the CBR is constituted as a state institution through the project, and discusses the implications of these processes for the future distribution of power within Russia's political economy.

2 Theoretical Perspective: Infrastructural Power in Contemporary Russia

Infrastructural power denotes a way to project power indirectly and diffusely (see Chapter 1, this volume). In this vein, this section discusses the creation of payment infrastructures since the Soviet Union dissolved as a process connecting Russia's legislative and executive powers, the financial regulator, and large state-owned as well as private companies. Michael Mann differentiates between despotic and infrastructural power of states. The latter he describes as "the capacity of the state to actually penetrate civil society, and to implement logistically political decisions throughout the realm" (Mann, 1984, p. 189). Unlike despotic power, infrastructural power does not mean a control of civil society,¹ but the capacity to influence its activities by centrally coordinating them. While being analytically autonomous from one another, the two dimensions of power can coexist and mutually reinforce each other. The infrastructural power of an authoritarian state can mean a further monopolization of social power in the hands of the state and help enforce despotic control over the civil society and potential opposition groups emanating from it. The infrastructural power of states emanates from a need for territorially centralized coordination which cannot be provided by the civil society and is understood to be more effective from a functional perspective. Tendencies of militarization of

the economy can lead toward an increased reliance on a more active coordinating role of the central state (Mann, 1984).

Coombs (Chapter 4, this volume) argues that the concept of infrastructural power can be understood in three ideal types: instrumental, communicative, and network forming. Distinguishing these types helps to extend the possible perspectives informed by the concept and allows a fuller understanding of state–society relations with regard to the financial sphere. Instrumental infrastructural power is the ability of state institutions to intervene in the markets and contribute to the shaping of their workings and outcomes. Communicative infrastructural power refers to the state actors', especially central banks', explanations of their policy to the public. It entails the safeguarding of public trust in the institution's competence to exercise its instrumental infrastructural power and its commitment to its declared policy goals. Network-forming infrastructural power describes the ability of the state to penetrate institutions that are of a hybrid state–civil character (Coombs, this volume).

The understanding of the latter network-forming type of infrastructural power relies on Mitchell's (1991) argument that the state cannot be posited as an entity separate from society. The separation between state and society must rather be understood as a result of structural effects which constitute the state through a political process that takes place within the network of institutions of a potentially hybrid state–society character. The boundary of the state in this hybrid space is set by the exercise of state power itself.

The Bank of Russia, as the central agent that implements innovations in financial infrastructures, is entangled in the wider processes of power that shape both politics in Russia in general and the nature of the Russian state in particular. Especially concerning the post-Soviet period, scholars have often underlined the significance of interpersonal networks and rivalries between differing elite factions (Kononenko and Moshes, 2011; Viktorov, 2015; Viktorov and Kryshchanovskaya, 2023). Those networks form an integral part of the state. At the same time, they are not limited to

the state, but are also located outside of state institutions, especially at the nexus between the state and business (Kononenko, 2011, p. 6). Even though the beginning of Putin's presidency in the year 2000 marked the beginning of the end of relatively unchecked, independent oligarch influence in politics, the significance of the networks and the rivalries between them have not declined (Kryshtanovskaya and White, 2011).

With regard to the Bank of Russia, the relevance of networks also takes effect concerning the CBR's functionaries. The appointment of the former minister of economic development, Elvira Nabiullina, as the Bank's governor in 2013 hinted at closer ties between the regulator and the government (Johnson, 2018). The appointment of Nabiullina was followed quickly by legislation that significantly expanded the CBR's mandate and its regulatory competencies (Johnson, 2018, pp. 113–114). Still, Nabiullina's network affiliation has sometimes been located around the comparatively liberally perceived former president Medvedev (Kryshtanovskaya and White, 2011, p. 36; Johnson, 2018), and the CBR has long been considered a stronghold of economic liberalism (Johnson and Köstem, 2016; Bluhm, 2024) within the wider tendencies to develop Russia into a state-controlled capitalist system via a steady increase of state ownership and control throughout the economy (Vernikov, 2014). In the context of Russia's escalation of hostilities in Ukraine since 2014, the CBR's policy has repeatedly exhibited alignment with the government's foreign policies, for example, when it withdrew around US\$100 billion in US Treasury bills from the US Federal Reserve in the context of the annexation of Crimea in 2014, anticipating possible sanctions on the reserves (Johnson and Köstem, 2016). Since Putin's first term in office, the CBR has increasingly been pursuing policies to enhance monetary sovereignty. This enabled it to lessen the impact of financial sanctions and aid the executive's foreign policy ambitions (Sahling, 2024).

The significance of networks for politics in Russia has to be taken into account

to understand the way network-forming infrastructural power affects state–society relations. The hybridity of state–society relations is naturally less pronounced in the authoritarian state-capitalist context than in the more liberal, democratic context that Braun (2020) studied. Nevertheless, it plays a role with regard to the relations within the elites and between different power networks. The cashless payment systems that are the focus of this chapter constitute a special infrastructure within the wider infrastructure of the market where state and society actors interact and compete. The nature of this interaction and competition in the area of payment infrastructures has been radically altered in Russia since 2014.

3 Payment Infrastructures and State Power in Early Post-Soviet Russia

After the end of the Soviet Union, a fierce competition between Russian banks ensued as each fought to establish a leading national payment system, substituting international card payment brands. From 1992 on, the first Russian card brands emerged alongside the existing, but poorly developed acceptance network for Visa and Mastercard (Guseva and Rona-Tas, 2014, pp. 159–161). During the 1990s, the competition in the Russian market for card payments took place primarily among domestic brands, rather than against foreign competitors. The fierce competition between potential providers of a domestic solution that led to this fragmentation had been stimulated by discussions about the need for a domestic alternative to the international payment networks that had been going on since the early 1990s. Apart from arguments regarding cost efficiency and technological considerations, nationalistic arguments in favor of a domestic system referred to the need for independence from foreign-owned infrastructure (Guseva and Rona-Tas, 2014, pp. 158, 162).

The race to establish a dominating domestic network left the payment market

highly fragmented, as the state had neither the capacities to develop an integrated solution itself, nor the capability to enforce cooperation in the sector (Guseva and Rona-Tas, 2014, pp. 162–163; Kochergin and Iangirova, 2020). The infrastructural power of the state, both in its instrumental and in its communicative varieties, was insufficient to facilitate the coordination within civil society that would have been needed to create a common national system. Although it was declared politically desirable, the objective to develop a national payment system to overcome this fragmentation could not be achieved. Even though the impact of the 1998 financial crisis on the banking sector pushed the Russian banks toward some degree of cooperation, the international brands had become the dominant players in the market (Guseva and Rona-Tas, 2014, pp. 162–163). By 2003, their market share surpassed the share of the plethora of payment systems provided by Russian banks (Guseva and Rona-Tas, 2014, p. 158).

From 2010 on there were efforts to create a multifunctional identity card. This was meant to combine medical insurance information and information on federal and municipal services with a payment function. The largest and majority state-owned Russian bank, Sberbank, became the main shareholder of the company created to develop the card and the payment function was to be based on Sberbank's own payment system, Sbercard. Even though the payment function was not the project's focus, it was meant to promote cashless payment to facilitate payments for government services and social transfer payments and to help fight corruption. Even though the project was ultimately unsuccessful due to exploding implementation costs and a lack of user acceptance (Gusev, 2016), it shows how the potential of cashless payment was connected early on to the prospect of further regulatory innovations that would significantly enhance the reach of the state through such infrastructures.

Sovereignty concerns about possible US access to Russian data and the danger of relying on foreign systems led to legislative initiatives to limit the role of foreign providers on the Russian payment market in 2011. The proposed law initially contained requirements to store reserves inside Russia as potential collateral in case of service disruptions and to store payment data exclusively inside Russia. With the more liberal part of the government being more critical about those requirements, and in the face of strong US lobbying against it, those provisions were ultimately removed from the proposal (Gusev, 2016; *The Guardian*, 2010). The consolidated state still took measures to advance the creation of a national card payment system. In 2013, the CBR published a brief outline of a strategy to develop a national payment system in its regular bulletin. The need for such a system was justified by the potential for development regarding both the domestic economy and integration into the global economy (Bank of Russia, 2013, p. 32). According to the outline, the CBR's role in the payment system should be enhanced, while the banking system should serve as the institutional basis of the payment system and competition in the sector should be safeguarded. The "single retail payment space" that should be created within the Russian Federation should subsequently be extended to the Eurasian Economic Community and the Commonwealth of Independent States,² thus facilitating cross-border transactions in the national currencies. Also, the supervision of the CBR over foreign payment service providers active in Russia should be strengthened (Bank of Russia, 2013).

In contrast to the 1990s, the proposed national solution now had to be introduced into a situation in which the dominance of the international brands was already established. Writing in 2014, Guseva and Rona-Tas described the new situation as an uphill battle and pointed out that "[i]f [...] the Kremlin succeeds in challenging the hegemony of Visa and MasterCard, it would be

a tribute to the power of the state to redraw development trajectories set in motion by a path-dependent logic” (Guseva and Rona-Tas, 2014, p. 164). What was unforeseeable at that point in time was the way in which the international reactions to Russia’s foreign policy after 2014 aided the state in breaking those path dependencies.

4 The Creation of Infrastructural Power over and through Payments

After Russia’s annexation of Crimea following the mass mobilizations that led to the resignation of Ukraine’s pro-Russian president Yanukovich in 2014, the European Union and USA imposed far-reaching sanctions on Russia. Apart from diplomatic and sectoral economic sanctions, the successively imposed measures also entailed targeted sanctions against selected institutions and individuals (Fischer, 2015; Kluge, 2019). The resulting disruptions in the cashless payment services provided by Visa and Mastercard impelled the Russian government to act. Already in March 2014, the two companies had suspended servicing cards issued by four Russian banks that were subjected to US sanctions due to their ties to Russian individuals who were blacklisted by the USA because of proximity to the Russian government. Visa and Mastercard were obliged to avoid any dealings with entities under US sanctions (BBC, 2014). For the same reason, the two companies suspended all their services in Crimea (Reuters, 2014).

These developments gave the political impetus for a significant exercise of instrumental infrastructural power on the payment market in the form of a law commanding the creation of a national card payment system within a year. This law contained the central features of the 2011 proposal, which had ultimately been discarded. Even though services were restored for two of the Russian banks after some days (Petroff, 2014), this law was signed about a month

after the initial suspension. Apart from the creation of the domestic payment system, the legislation explicitly outlawed future suspension of services by international payment companies. To ensure some compensatory recourse in such a case, international payment providers were required to make a security deposit at the CBR to cover possible liabilities (RIA Novosti, 2014; *The Guardian*, 2014).

The CBR, as the agent of this infrastructural intervention, was given the momentum to start realizing the agenda that had already been outlined in the above-mentioned payment system development strategy in 2013, the year prior to the geopolitical fallout. It was bestowed with the task of simultaneously limiting the power of foreign payment services in the Russian market and creating the domestic alternative. To this end the joint-stock company National System of Payment Cards (NSPK), entirely owned by the CBR, was set up in 2014. While the setup foresees future sales of stocks, the CBR must retain the voting majority and a directing role in the company’s management (AO “NSPK,” 2023a; [Interfax.ru](https://www.interfax.ru), 2017). The NSPK’s Operations and Payment Clearing Centre (OPCC) was created first to facilitate the implementation of the requirement in the 2014 legislation that transaction data generated by any payment system active in Russia must be processed within its jurisdiction. In early 2015, domestic card transactions by the Visa and Mastercard systems started being processed through the NSPK’s OPCC, as was also required by the law passed in 2014. Providers with a small market share compared to Visa and Mastercard were shifted to the OPCC in 2016 (*The Guardian*, 2014; Kochergin and Langirova, 2020).

Martijn Konings had earlier argued, based on the US context, that financial crises catalyzed an extension of state power through the expansion of regulatory competencies (Konings, 2010). The case of Russia’s post-2014 policies on payment infrastructures

shows how geopolitical crises can have a similar effect. The institutions erected by the 2014 legislation were supposed to solve the problem of exposure to international sanctions by getting around foreign payment systems while simultaneously avoiding dependence on a nonstate infrastructure, which could narrow the scope of state power (Mann, 2012, p. 59; Braun, 2020; Braun and Gabor, 2020).

The disruptions in the services of the international payment cards revealed a potential void in Russia's financial infrastructure and an urgency to act that gave momentum to the extension of CBR's instrumental infrastructural power in the most literal sense. This way the state could also take up its objectives regarding a wider array of governance infrastructures. Unlike in 2005, payment was now the central feature and selling point.

Central to this is the "Mir" payment card system, which has been operated by the NSPK since 2015 (AO "NSPK," 2023a) and has been expanded thanks to strong governmental support. After the first cards were issued in December 2015, the payment system was primarily promoted via mandatory schemes for recipients of transfer payments or workers in state or municipal institutions. In 2017, it was made mandatory to use Mir cards for any recipient of regular government payments ([Interfax.ru](https://interfax.ru), 2017; *TASS*, 2017). To sustainably expand the Mir system, the promotion efforts spread beyond initiatives directed to recipients of government funds. As a result of those initiatives, the number of card holders had increased significantly while turnover remained low since the target group was less likely to both use cashless payment methods and have high incomes at their disposal (Kochergin and Iangirova, 2020). Banks as well as high-turnover retail stores and service businesses in Russia were eventually obliged to accept Mir cards at their ATMs and for payments, respectively ([Interfax.ru](https://interfax.ru), 2017). Additionally, the use of Mir was promoted through a variety of other campaigns, not only in the public sector. Many businesses have offered cashback

schemes or reduced prices in connection with the use of Mir cards (AO "NSPK," 2023b). The CBR plans to extend the use of such promotional campaigns in cooperation with commercial banks and retail and service providers (Bank of Russia, 2021b, p. 23). Such campaigns bolster the instrumental infrastructural power of the CBR since they entail a significant chain of influence inside the privately dominated retail market. The decisions involved in the creation of such agreements potentially have strong effects on the competitive position of market participants.

The development and propagation of the national payment system also provided a chance to advance other infrastructural projects in synergy with Mir card payments, as already envisioned in the initiative with Sberbank after 2010. Apart from the promotional campaigns with retailers and service providers, several regional projects introduced multifunctional cards that incorporated a function of payment through the Mir system. Mainly situated in the western part of Russia, these regional projects distributed citizen cards combining a payment function with, for example, identification and electronic signature functions, information about health and social insurance policies, and a payment mechanism for public transportation (Kochergin and Iangirova, 2020). The CBR expects "that NSPK will participate in the development of mechanisms for the provision of state, municipal, social and other services to simplify the interaction of households with the government agencies [...]" (Bank of Russia, 2021b, p. 23). An example of this is the development of a unified system for the cashless payment of transportation fees based on a processing system created by the NSPK (Transport NSPK, 2023). Campaigns through which multifunctional campus cards were issued to university students and the regional resident cards are to be expanded, and it is envisioned that a Unified Resident Card that incorporates various nonfinancial functionalities will be created (Bank of Russia, 2021b, p. 23). This opens up a variety of possibilities regarding

the indirect and diffuse projection of state power vis-à-vis the citizens.

Another project that presents even further-reaching possibilities in this regard is the Russian CBDC, the digital ruble. It started its testing phase with a group of banks and a limited circle of clients in August 2023 and is supposed to be gradually introduced until it is used broadly in 2025 (Bank of Russia, 2023). The digital ruble is described as a third form of money, next to cash and the noncash money in bank accounts (Bank of Russia, 2020, p. 3). It aims to decrease transaction costs and, especially for remote areas of Russia, contribute to better financial inclusion (Bank of Russia, 2021a, p. 7; 2022c, p. 115). It is supposed to provide an alternative to the use of private digital currencies and should help reduce illegal activities (Bank of Russia, 2020, p. 10; 2022a, pp. 2, 20–24, 29). Innovations based on the digital ruble are also expected to benefit the state. The traceability of the coins will enable the government to determine on what kinds of goods digital government funds are allowed to be spent. In the initial communication regarding the project, a function designed to color the digital ruble was suggested. Digital rubles that the government pays for public procurement or other government contracts would be marked for a specific area of transactions and therefore blocked for spending for unintended purposes using smart contracts (Bank of Russia, 2020, pp. 15–16; 2021a, p. 19; 2022c, p. 115). Since that original communication, the CBR announced both that this provision will not be realized (RBK Crypto, 2023) and, later, that the question concerning the coloring function will again be considered at later stages of the implementation of the CBDC ([Interfax.ru](https://interfax.ru), 2023).

This shows that the possibility to use the digital ruble to determine the spending of funds received from the government is not only technically feasible but also a probable future way to extraordinarily extend the state's coordination capabilities toward the market and society as whole. Technically, transactions in digital rubles should be

carried out via a digital ruble platform provided by the CBR (Bank of Russia, 2021a, pp. 8–10). This way, all transactions can potentially become subject to surveillance by the CBR. This could allow the state to use the provided infrastructure for very targeted repression and lead to a unprecedented synthesis of infrastructural with despotic power capabilities.

5 Infrastructural Power in Conflict with the Banking Sector

The CBR underlines that the digital ruble is designed in a way that should uphold the existing mode of interaction between customers and commercial banks (Bank of Russia, 2021a, pp. 8–9). It is expected that the digital ruble will partially substitute other forms of money, negatively affecting liquidity and increasing volatility in the banking sector. A shock to the banking system is nevertheless not expected because it is assumed that the adoption of the money will be gradual (Bank of Russia, 2021a, pp. 25–26; 2022c, p. 119). Simultaneously, competition in the banking sector to attract or retain clients with better services and lower costs would be increased (Bank of Russia, 2020, pp. 3, 7–8, 16; 2022c, p. 120; Grishenko et al., 2021).

In the course of developing the digital ruble, the CBR took into account the potential for conflicts with banks. In the communication on the topic, the process of gathering and incorporating feedback from the industry is prominently depicted (Bank of Russia, 2020, p. 40; 2021a, pp. 3–6; Skorobogatova and Zabotkin, 2021). Criticism from other parts of the banking sector nevertheless ensued. Commercial bank representatives expressed concerns that the digital ruble would constitute a direct competition to the established banking system. Apart from the risk of causing an outflow of funds from the banking system, the digital ruble could also endanger the position of the CBR as the independent regulator of the financial market (Kasarnovski and Koshkina, 2021). Representatives of smaller banks expressed

concerns about a possible monopolization of payment services in the hands of large banks (Tosunyan, 2020; Buylov, 2023).

A somewhat similar controversy had arisen earlier with regard to the regulatory support for the NSPK's payment networks. Additionally to the Mir payment system, the NSPK had created the SBP, which was launched in January 2019 and enables instant payments using mobile phone numbers or QR codes, irrespective of the participants' bank affiliation (Bank of Russia, 2021b, pp. 6–7). In October 2019, all banks that were systemically significant with regard to market share were obliged by law to service the new system (Yeremina and Astapenko, 2019; Bank of Russia, 2021b, p. 7), a step that has not been taken with regard to Mir (Zarutskaya and Dubrovina, 2023). While most of the banking sector praised this decision, the biggest Russian Bank, the majority state-owned Sberbank, which accounts for about 60% of card transfers, initially refused to join the SBP and only did so after the imposition of penalty payments (Buylov, 2019). Sberbank has been creating its own system to transfer funds via telephone number. The head of Sberbank, German Gref, has repeatedly spoken out about the involvement of state-sponsored instruments in the financial market, for they would naturally create monopolies and skew the field of competition (Yeremina and Astapenko, 2019). In an interview in June 2023, Gref also called for more competition in the payment sector and argued for either creating a structure parallel to the NSPK or privatizing it. Sberbank would not be able to develop such a system itself. The state should rather provide instruments for the banks to do so (Gref, 2023). Also, representatives of the majority state-owned VTB and the private Tinkoff Bank expressed interest in taking part in the creation of an alternative system (Zarutskaya and Dubrovina, 2023).

Such criticism is acknowledged by CBR representatives but rejected by pointing out the concerns of the Russian state. In an interview with the newspaper *Kommersant*

in 2021, the first deputy governor of the CBR and head of the NSPK's supervisory board, Olga Skorobogatova, argued that the instruments created were infrastructural contributions and as such to be categorically distinguished from the banks' commercial activities involving client interaction. These new infrastructures would rather contribute to creating the conditions for fair competition among the commercial banks. A future privatization – when further development goals, especially with regard to the Mir system, are accomplished – was possible, provided the return on the initial investment is guaranteed. Also, the building of this infrastructure has been a matter of national sovereignty. A possible privatization would have to take the “interests of the state” into account (Skorobogatova, 2021). In response to calls in 2023 for the creation of a competing structure to the NSPK, the governor of the Bank of Russia, Elvira Nabiullina, expressed the same position, arguing that the NSPK as a private monopoly “will not be better than a state monopoly, because the services will be developing the interests of the private shareholders [...]. This would hardly be a development of a nationwide infrastructure [...].” (Zarutskaya and Litova, 2023).

The invocation of the interests of the state when justifying the policy on financial infrastructures in the CBR's communication raises the risk of undermining the regulator's communicative infrastructural power. As Coombs (this volume) argues, the infrastructural basis of a central bank's communicative power rests on steady public communication based on scientific methods to achieve a certain credibility of its expertise and policy choices. As the CBR increasingly positions itself as a state actor needing to safeguard state interests against the commercial banks, even the state-owned ones, it potentially jeopardizes such supposedly apolitical credibility. As already indicated by the CBR's policies in the context of the annexation of Crimea in 2014 and the ensuing sanctions against Russia, the CBR is drawn closer to the government executive

and away from its former position as a beacon of economic liberalism compared to other Russian state organs.

Supposedly to somewhat mitigate the risk of losing its credibility by engaging in political discourse, the CBR tries to avoid such discourse in its official publications. In the development strategy for the national payment system, geopolitical factors are merely mentioned as a feature of growing importance in international relations that is beyond the CBR's sphere of influence but affects its work (Bank of Russia, 2021b, p. 31). At the same time, the invocation of the regulator's role in safeguarding national sovereignty places it in a currently very significant ideological power network of a meaning system (Mann, 2012, p. 7) positioning Russia in an existential struggle against a supposedly hostile West. This is line with tendencies of verticalization throughout the entire political structure since the beginning of Putin's presidency. This indicates that the severely risen capability of the CBR to exert infrastructural power instrumentally makes its less reliant on the infrastructural character of its communication in this regard. At the same time, the pronounced self-positioning of the CBR as a state actor hints at how the network-forming infrastructural power of the presidency went hand in hand with this development.

The conflicts with the banking sector indicate that the projection of network-forming infrastructural power is not limited to the relation between the state and the CBR. Mishura and Ageeva (2022, p. 1123ff.) argue that Russia's financial sector is increasingly shaped into a "financial vertical" in which financial flows are controlled by the state using quasi-monopolistic financial institutions, mostly banks. This happens alongside an increase of banks' role in society which entails an expanding market share for the largest banks and a growing role for state-controlled banks. Financialization and the ascent of new financial technologies incentivize and facilitate the further strengthening of quasi-monopolistic state-related

structures (Mishura and Ageeva, 2022). The discussions surrounding the CBR's role in the market show that this to some extent also applies to the state-owned enterprises in the financial sector. Despite the state's role as a majority shareholder, these institutions are market actors with some degree of leverage in their operational decision-making. With the entrance of the CBR into the payment market and, with the digital ruble, allegedly also into the banking market, the state insulates itself from possibly restricting influences that could emanate from different, especially rather economically liberal, elite factions in some of the state-controlled financial enterprises. The boundary between the state and the market was shifted by a strengthening of elite networks closer to the state's power center at the expense of more peripheral networks within the elites. The position of the CBR as a state agency was further strengthened not only in relation to the private sector, but also in relation to other elite actors in the economy at the nexus between the state and the private economy.

6 Conclusion

After Russia's invasion of Ukraine in February 2022, the significance of the Mir payment system became strikingly obvious, as Western payment card providers fully withdrew from the Russian payment market. Visa and Mastercards which have been issued outside of Russia stopped working inside the country, and cards issued by Russian banks are no longer serviced abroad. The Mastercard statement clarified that, due to legal requirements established after the first distortions in card services in the context of the imposition of sanctions in response to Russia's annexation of Crimea in 2014, the company has no ability to block domestic transactions using Mastercard-branded cards (Mastercard, 2022; Visa Inc., 2022). The CBR announced that the domestic payment functions and customers' funds connected to Mastercard and Visa cards would not be affected by the

sanctions due to their processing via NSPK (Bank of Russia, 2022b).

In the years since Russia's annexation of Crimea and the subsequent threat of financial sanctions on Russia's use of Western financial infrastructures, the Russian state had accelerated the creation of alternative systems. The perceived urgency of the issue helped to overcome former logjams in this development. Central in this was the foundation of the CBR-owned company NSPK, which today operates the Mir payment system and the SBP. Further, the trial period for the digital ruble, Russia's CBDC, was started.

The concept of infrastructural power, which describes the capability of the state to project power by coordinating activities in and logistically penetrating society (Mann, 1984), helps to understand the ramifications of these developments. Coombs (this volume) argues that the concept of infrastructural power can be extended to communicative and network-forming effects that allow for a wider use of the concept in the understanding of state–society relations in the financial realm.

The seamless domestic functioning of Visa and Mastercard payment cards as sanctions were imposed in 2022 – made possible by the prior investments of the CBR – vindicated the position that such a strong engagement on the part of a state institution was justified. This large-scale state-driven development stands in stark contrast to the early years after the fall of the Soviet Union. Then the state did not possess the capacities to successfully launch such a project despite the goals not only to lessen the vulnerability of Russia's payment sector toward foreign companies but also to make use of regulatory infrastructures that could be built using similar technological channels.

Domestically, the extension of the state via the construction of financial infrastructures was enabled by the consolidation of the state and its enhanced infrastructural power position. This concerned not only the financial means to make the necessary investment but also the heightened control over the CBR. Ensuring the CBR's control over the Mir system served to avoid reliance

on nonstate infrastructures which could limit the power of the state. Conversely, the propagation of the Mir system provided a vehicle to further infrastructural projects envisioned earlier, like the unified resident card, and also to strengthen the state's grip on actors in the private economy. With the digital ruble, an even stronger infrastructural power over the entire economy and population at large is looming.

The creation of the new systems was incited by the constraints imposed by international sanctions. The revitalization of a discourse of national sovereignty and of threats to Russia's geopolitical position led to an entanglement of political and economic considerations and facilitated a strengthening of tendencies toward an authoritarian state-controlled capitalist system. It shortened the perceived distance between the central bank and the state and enabled a significantly stronger state involvement in the payment markets.

One reason for this distance appearing to be diminishing is the fact that representatives of the CBR are defending their involvement in the payment markets against criticism from the banking sector by underlining its role in defending national sovereignty. This is untypical for central bank communication (Coombs, this volume), which derives its credibility, and therefore its capacity to enlist the public, from an ostensibly apolitical, technocratic appearance.

The discussion around the CBR's role as a payment provider and its plans with regard to the digital ruble demonstrate the potential significance of the network-forming effect of infrastructural power, an effect which is obvious in the relationship between the state and the CBR, but also for the relationship between the state and the economy. In this it testifies to the monopolization of social power in the hands of the state and indicates that the boundaries of the state also run through large companies that are controlled by the state as a majority shareholder and that those boundaries are successively shifting outwards.

Overall, the development of financial infrastructures in Russia in recent years

demonstrates the mutually enforcing character of despotic and infrastructural power (Mann, 1984). It also shows how this was intended on part of the state when it lacked the capabilities to generate the needed coordination and how the external shock of the economic sanctions created the need to shift economic policies towards the needs of foreign and security policy.

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Notes

1. For Mann “civil society” denotes that realm outside of the state where power is exercised through ideological, economic, or military networks but, other than state power, not centrally over the entire territory of the state (1984).
2. Predecessor of the Eurasian Economic Union.

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Colonial Legacies in Lebanese Financial Infrastructures and the Impact on Financial Crisis

Cybele Atme

I Introduction

It was pitch black as I drove through the streets of Beirut. The buildings, which usually lined the roads haphazardly, were barely visible. The lights from the apartments with electricity looked like yellow squares floating in the dark skies. The headlights from other cars were blinding, making it difficult to recognize where I was at first. I felt like a stranger in my own city, until a hint of light from a familiar landmark in the distance would remind me of my location, whether it was a small grocer, a shawarma shop, a supermarket, a coffee place, or an advertising billboard.

One billboard caught my attention. It was a big yellow advertisement for OMT, the biggest money transfer operator in Lebanon and a daughter company of Western Union. The billboard featured an elderly man and a younger one embracing each other, with the Arabic words ‘haddak bi-kull al-zurūf’ (there for you in all circumstances) and the subtitle ‘istilim ḥawāltak min al-kbārij bi-l-dulār’ (receive your transfer from abroad in US dollars).¹ For some Lebanese people, if not most, remittances in US

Dollars have been the only means of survival in times of financial collapse. (Excerpts from fieldnotes, 2022)

During my fieldwork in Beirut between May and December 2022, the exchange rate of the US dollar to the local currency, the Lebanese lira (LL), was the subject of daily conversations. I was frequently approached by self-proclaimed ‘financial experts’ speculating about the increase or decrease of the rate, and regular passers-by and friends would enquire about the most recent exchange rate. The exchange rate fluctuated drastically, varying between 30,000 LL and 40,000 LL for one US dollar within the span of a month. This exacerbated the dire economic situation for Lebanese citizens, because the exchange rate of the local currency to the US dollar determined what they could afford to buy since most products were imported.

Being pegged to the US dollar, the value of the local currency was dependent on the availability of US dollars at the central bank’s reserves. In 2019, Lebanon’s credit rating by several financial corporations dropped

significantly, indicating that the Lebanese central bank was acquiring more debt than it could account for (Cordall, 2019; Rickards, 2020). To manage its debt and the dollar peg, the central bank depended on financial engineering and created attractive conditions to lure foreign dollar deposits from the diaspora and investors into the country (Rickards, 2020). However, this financial plan was not sustainable. The drop of Lebanon's credit rating coupled with the financial sanctions targeting the region discouraged dollar deposits.

By 2020, it became clear that the central bank had failed to preserve enough US dollars in its reserves. This led to severe shortages of essential goods such as fuel, medicine, and food (Hubbard, 2021). The situation was compounded by the COVID-19 pandemic and the devastating explosion in Beirut's port in August 2020. Lebanon's financial crisis began to take headlines in major newspapers, and since then, Lebanon has been cited as having suffered one of the worst financial crises in the world since the mid-1800s (Hubbard, 2021).

Popular media reports have attributed the Lebanese financial crisis to clientelism and corruption among political and financial elites (Chaya, 2019; Rickards, 2020; Blair, 2021). According to these accounts, the financial schemes of the elite led to the shortage in US dollar reserves at the Lebanese central bank. However, little attention was paid to how the system of dependency on US dollar reserves was established in the first place. This chapter aims to answer the question: How did Lebanon become so dependent on the US dollar? Exploring this question through an infrastructural gaze sheds light on the deeper colonial capitalist structures and embedded dependency relations that enable present-day inequalities.

2 An Infrastructural Perspective

Stemming from science and technology studies, the concept of infrastructure is used to highlight the ways in which seemingly technical devices and systems, such as roads and payment systems, are not neutral, but rather

embedded in politics and power dynamics (Star, 1999; Larkin, 2013; Appel, Anand, and Gupta, 2018; de Goede and Westermeier, 2022). Notably, post-colonial research found that infrastructures reinscribe power dynamics that were dominant at the time of their creation (Bear, 2020; Sims, 2021; Bernards, 2022). Therefore, in conceptualizing the central bank of Lebanon as an infrastructure, this chapter focuses not just on the physical building itself or the services it provides, but on the intertwined network of monetary policies and decrees it produces, the rationalities and motivations behind these policies, the monetary reserves and currencies it works with, the people who work there, and the political relations that influence its work.

This chapter aims to add to the insights gained in historical and sociological analyses of the case of Lebanon, which have found that the monetary system of Lebanon has never been sovereign because of the aligned interests of the political elites and dominant powers (Halabi and Boswall, 2019; Safieddine, 2019; Noe, 2022). Economic trade relations between the mercantilist Lebanese and the French not only facilitated the infiltration of colonial capitalism in the region, but also the continued orientation towards financial policies which benefit both the colonial and mercantilist elites. Ever since the Ottoman Empire, Mount Lebanon was home to a group of mercantilist elite who benefited from specific trade in silk and other goods with the French (Gaspard, 2004). Right after the end of the French colonial mandate, Lebanon was dubbed as the Merchant Republic (1950s–1960s), which Carolyn Gates describes as a time of extreme *laissez faire* (in Khater, 2000, p. 569). Along with other researchers validating her findings, Gates attributes this phenomenon to a combination of historical conditions and trade relations between the mercantilist and French that also predated the colonial rule (Gaspard, 2004).

The purpose of this chapter, however, is to show that the continuity of the influence of both the colonial and mercantilists is not only implicated through political and economic relations, but also through physical infrastructures. The central bank of Lebanon, which was mandated by the French, was

designed under specific rationalities which continue to embody the bank today. To demonstrate this, I will use an infrastructural perspective to discuss Lebanon's present-day monetary dependencies and to show how the dependency on the US dollar is a monetary policy sedimented in the *Banque du Liban*. I show this sedimentation by highlighting reoccurring patterns in the historical development of the central bank that were centred around colonial rationalities.

This chapter thus contributes to a theoretical discussion of the central bank of Lebanon which has not yet been discussed using an infrastructural gaze. To achieve this, I draw upon observations conducted during fieldwork in Lebanon in 2022,² and the extensive archival research conducted by historians, particularly Hicham Safieddine's comprehensive studies on Lebanon's financial history (Safieddine, 2015, 2019). First, I conceptualize the establishment of the central bank of Lebanon as a product of colonial rationalities. It was created under the auspices of the French colonial rule to monopolize their currency, to benefit their financial markets at the expense of local development, and to maintain control through debt relations. Secondly, I demonstrate how these colonial rationalities were sedimented, persisting as reoccurring patterns during the development of the bank, extending even after the official termination of the French colonial mandate. Consequently, I contend that these colonial rationalities have become ingrained in the central bank, maintaining foreign currency-dependency relations that continue to shape the contemporary financial landscape of Lebanon.

3 Sedimentation of Infrastructures

Today, central banks are the infrastructures that connect countries to the global financial system. However, the way in which they are connected differs from country to country. Eric Helleiner argues that central banking in colonized countries created dependencies on the economies and financial markets of colonial powers (Helleiner, 2002a, 2002b). Despite the end of the

colonial rule, these dependencies continue to shape the financial markets of previously colonized countries today.

Conceptualizing the central bank of Lebanon as an infrastructure allows us to connect these past dependencies, created by colonial capitalism, to the present-day financial crisis. Infrastructures in socio-technical sciences are defined as an 'amalgam of technical, administrative and financial techniques' (Larkin, 2013, p. 330), and as a 'relation between technology, space and power' (Tribillon, 2021, p. 40). Therefore, in addition to being systems that facilitate the circulation of things or people, infrastructures are also about knowledge, meaning, and power. In this section, I synthesize the literature that has used infrastructures to discuss the continuities of power relations throughout history. These researchers show that infrastructures are stubborn and difficult to change.

De Goede and Westermeier (2022) use the concept 'sedimentation' to discuss how social and political relations are embedded in infrastructures over time. Sedimentation refers to the way in which historical power relations and dependencies become inscribed in the material structures of society, such as infrastructure. In his study on post-Apartheid South Africa, Edwards argues that the persistence of racial segregation is not enforced by separate facilities per se, but rather by automatic acts ingrained in habits and norms (Edwards, 2019, p. 364). He finds that infrastructures are path dependent because they are shaped by historical, social, and technical factors that create durable and difficult-to-change configurations. Other research has also shown the stubbornness of infrastructure, whether it is fintech technologies replicating spatial inequalities in Kenya (Bernards, 2022), former colonizing countries acting as major payment hubs in global payment systems (de Goede and Westermeier, 2022), or contemporary railway developments utilizing colonial techniques of calculations of risk, state guarantees, and debt accounting in India (Bear, 2020). In all this research, the continuities of colonial legacies through infrastructures are shown by highlighting

the social conditions and rationalities that were dominant at the time of the creation and planning of infrastructures.

Building on this research, I show how colonial monetary rationalities are sedimented in the central bank of Lebanon. I use the concept of sedimentation as defined by de Goede and Westermeyer (2022) and conceptualize the colonial rationalities behind the initiation of the central bank of Lebanon as routes. Through a historical account of the development of the central bank, I find that these routes are inscribed and reinscribed at different times and in different social conditions. As such, in line with the purpose of this part of the book, using the case of Lebanon, this chapter responds to a call for more research on how histories and colonial relations continue to shape modern financial infrastructures (de Goede, 2021).

4 Colonial Rationalities of the Central Bank

In this section, I lay out the colonial rationalities under which the predecessor of the central bank of Lebanon, the Banque de Syrie et du Liban, was created. I argue that the Banque de Syrie et du Liban was mandated under the French rule to benefit the French colonial rule. I do this by showing that the bank was established under three colonial rationalities: to monopolize colonial currencies, to benefit colonial financial markets, and to uphold control over colonized regions. These rationalities can be seen in the goals and aims of the constitution of the colonial bank, and the historical events that influenced its development.

I conceptualize these rationalities as routes that were inscribed at the time of the creation of the Banque de Syrie et du Liban's infrastructure. These routes were meant to lead to beneficial outcomes for the French monetary regime. The structuring of these monetary routes in this way was not unique to Lebanon. Helleiner (2002b) shows that colonial powers took care of their monetary expenses through restructuring the monetary regime of colonized countries in their favour

(Helleiner, 2002a, 2002b). The first route was the creation of a currency dependency, by linking the local currency to the French franc, to monopolize the colonial currency in the region. The second route was the creation of monetary policies that were centred around de-regulation to benefit the French market rather than local development. The third route was the creation of debt relations to uphold control of the region.

4.1 Route 1: Monopolizing the Colonial Currency

Much like the post-Ottoman territories in the Middle East, Lebanon was under the occupation of colonial powers after the collapse of the empire (Saffiedine, 2015; Daher, 2022). The French Mandate was authorized in the region of Syria and Lebanon in 1919–1943 under the Sykes–Picot Agreement. In 1924, a convention was signed under the financial mandate to institutionalize what could be understood as a central bank in present times, called the Banque de Syrie et du Liban (Saffiedine, 2015).

Under the French financial mandate, a local currency, the Syrian lira, was created under the management of the Banque de Syrie et du Liban. The Syrian lira was created as legal tender and replaced all other currencies that were present at the time (Saffiedine, 2015).

Before colonialism, foreign, domestic, and even local currencies were used alongside each other and across countries (Helleiner, 2002a). Colonial powers introduced what Helleiner (2002a) calls the territorialization of currencies: through a central bank, one currency was given legal tender within a country. Having one currency as legal tender reduced transactional costs and was meant to boost the emergence of national markets (Helleiner, 2002b).

Colonial powers territorialized currencies differently in their home countries compared to their colonies. While colonial powers stabilized their currencies by backing it by gold reserves, colonized countries had their local currencies linked to colonial currencies. This meant that colonial powers

could benefit from monetary gain through seigniorage,³ a greater degree of control on the money supply, and influence on macro-economic conditions (Helleiner, 2002b).

In the case of Lebanon and Syria, the Syrian lira issued by the Banque de Syrie et du Liban was linked to French francs (Saffiedine, 2015). While the French francs were backed by gold reserves, the Syrian lira was backed by the French francs. This meant that the value of the Syrian lira was fixed at a specific rate which was determined by the French. Originally, 1 Syrian lira was equal to around 20 francs. This meant that linking the Syrian lira to the French francs did not necessarily benefit the local monetary situation. As such, Saffiedine argues that Syrian lira was merely the French franc in disguise (Saffiedine, 2019). One of the rationales behind linking the Syrian lira to the French franc was to monopolize the colonial currency in the region. Therefore, currency dependency constitutes the first route.

4.2 Route 2: Benefiting the Colonizer

In addition to linking the local currency to the French franc, the French financial market also benefited from the Banque de Syrie et du Liban's monetary policies rather than national markets. Coupled with controlling the value of the Syrian lira, the Banque de Syrie et du Liban was exclusively governed under French law and had a French governor (Saffiedine, 2015).

The Syrian and Lebanese governments at the time were only granted small shares of the central bank. According to Saffiedine, the French minister justified the exclusion of the local states from participating in the convention that established the bank by citing 'the uncertain political situation' in the territories of Syria and Lebanon (Saffiedine, 2015, p. 66). As such, the Banque de Syrie et du Liban could be said to have been a French private bank that was authorized to act as a central bank. However, this meant that monetary policies executed were favourable to the French market. This is seen through the laissez-faire policies that were implemented at the time.

Even though the 1924 convention included a commitment to promote local economic development, in practice there was little evidence of economic planning and support of local industry (Saffiedine, 2015, p. 69). Monetary policies implemented by the French were outward-oriented, motivated by free-market capitalism with limited government intervention and regulation. These policies included little regulations on businesses and private banking, minimal ratio requirements, and the introduction of a mortgage-lending regime that private banks could indulge in (Saffiedine, 2015). Foreign banks in the region were dominated by French ones, who favoured foreign commerce and trading foreign exchange. Investment and credit in industry and agriculture were sidelined by these banks and the Banque de Syrie et du Liban. These policies thus contributed to an import-reliant economy, strengthening the power of financial elites and leading to an increased inequality in the region (Saffiedine, 2015).

As such, the rationale behind laissez-faire policies of the Banque de Syrie et du Liban was to benefit the French economic and financial markets, rather than boost local development and prosperity. Therefore, financial de-regulation constituted the second route.

4.3 Route 3: Upholding Control of the Colonized Region

By inscribing the first two routes in the Banque de Syrie et du Liban, the French were able to link their financial markets with Lebanon and Syria and boost their local economy. Additionally, Saffiedine shows that even the economic statistical missions that occurred were only meant to infiltrate French capital rather than boost local development. Saffiedine finds that 'by 1932 close to half of the [central] banks holdings in deposits were siphoned off into investments abroad, namely in French government bills and securities' (Saffiedine, 2019, p. 69). This created unsolicited loans of the local governments to the French government (Saffiedine, 2019). The French inscribed a third route in the bank which was meant to uphold control

within the region. This route constituted the creation of debt relations to cover colonial military expenditures.

This rationale is not unique to the case of Lebanon; as Graeber argues in his historical analysis of debt, the development of national currencies originated from financing the military expenditures of rulers and the waging of foreign war (Graeber, 2011). During World War II, the French used the Banque de Syrie et du Liban to finance their military expenditure in the region (Safieddine, 2015; Ghosn, 2021). Allied military expenditures in the region were financed by taking out loans from the Banque de Syrie et du Liban and denominated in the Syrian lira (Safieddine, 2015). The creation of this loan arrangement could only be possible due to the link of the Syrian lira to the French franc, and the control of the French government of the Banque de Syrie et du Liban. The French high commissioner applied the monetary provisions which he found fit to make this loan arrangement. This meant that the French were able to take out loans denominated in Syrian lira as they pleased. As such, a surging number of French francs were printed to secure this loan, leading to hyperinflation (Safieddine, 2015).

Significant economic and social consequences were felt by the region during period between 1941 and 1944, and trust in the French franc diminished (Safieddine, 2015). The debt configuration that the French colonial powers created through the Banque de Syrie et du Liban was thus solely purposed to uphold their power in the region, even though it led to the deterioration of the local monetary system. Therefore, the third route inscribed in the Banque de Syrie et du Liban was the creation of debt relations that favoured foreign powers.

5 'Decolonization' of the Central Bank

Despite the suffering the French monetary system brought, it was not easy for the local governments to disconnect from the French financial rule. Even though Lebanon gained

its independence in 1946, the French maintained their financial mandate until 1948 (Safieddine, 2019). After negotiations in Paris with the local governments of Lebanon and Syria, the two independent states developed their own financial trajectories (Safieddine, 2019; Daher, 2022). In the case of Lebanon, I demonstrate how the development of the central bank, even after gaining independence in 1946, continued to be influenced by the colonial routes outlined in Section 4. This influence is evident, first, in the minimal central bank reforms in Lebanon following the end of the mandate and, secondly, in the fact that significant reforms were only initiated in 1964, under the influence of a new imperial power, namely, the United States.

5.1 *Reinscribing Colonial Routes*

The Paris negotiations 1948 led the economies of Lebanon and Syria to be separated. Given that Lebanon and Syria had different monetary approaches, they requested that the customs union between the two countries be abolished too (Safieddine, 2015, p. 82). Influenced by more socialist ideologies, Syria's monetary reform took a different turn than Lebanon's. It created a separated central bank and completely withdrew from the Banque de Syrie et du Liban's concession. In so doing, Syria was able to focus on local industrial and agricultural development (Safieddine, 2015; Daher, 2022). Being based in Beirut, the Banque de Syrie et du Liban continued to act as the central bank in the case of Lebanon and was managed by a French governor, Rene Busson (Safieddine, 2019). As such, Lebanon continued to use the same financial infrastructure as was set up by the colonial powers. Despite some changes in the monetary policies of the bank, colonial routes of the bank remained intact.

First, due to the instability of the French franc, the local government wanted to de-link from the French franc and create a new currency. However, to de-link from the franc, the French asserted that it should be relieved from the debt that was acquired to fund its military expenditures during World War II (Safieddine, 2015). The argument

was that the debt would equate the assets and investments it left behind after the mandate. After looking for help from foreign powers to dispute the French argument, a Belgian financial advisor recommended that they accept this deal instead (Safieddine, 2015).

As such, the new currency, the Lebanese lira, was issued under these conditions. The new currency was not linked to the French franc, but instead was a floating currency backed by gold and foreign currencies (Safieddine, 2015). To stabilize the Lebanese lira against the free market, the Banque de Syrie et du Liban used foreign exchange reserves to buy and sell Lebanese lira. Similar to the first colonial route, the focus was still on currency dependency and stability, by replacing the link to French franc with a link to foreign guarantees. In addition to that, even though the new currency was de-linked from the French franc, the French were able to benefit from this by relieving their debt.

Secondly, monetary policies continued to prioritize laissez-faire ideals of financial de-regulation. The Banque de Syrie et du Liban used foreign exchange reserves to buy and sell Lebanese liras and set interest rates to encourage foreign investors to hold the local currency. As such, there were no restrictions on foreign currency transactions and low reserve ratio requirements for banks to give out loans (Safieddine, 2015). This meant that by prioritizing the value and the stability of the Lebanese currency, the monetary policies under the Banque de Syrie et du Liban were aimed at encouraging and attracting foreign investments into the economy. This monetary model fit well for the mercantilist and financial elites who acquired vast fortunes from import trade and capital inflows (Yassin, 2012; Daher, 2022). In addition to that, given that the governor of the Banque de Syrie et du Liban was still French and the long-lasting relations between the French and the Beirut financial elite, French capital was still favoured (Safieddine, 2015). As such, prioritizing financial de-regulation over local development is in line with the colonial rationality to infiltrate foreign markets.

Thirdly, by being a signatory to the Bretton Woods Agreement after World War

II, Lebanon became embedded in the new financial order regulated by international financial institutions such as the International Monetary Fund (IMF) (Safieddine, 2015). The IMF regulatory framework was centred around central bank reform. Key reforms included establishing an independent central bank that was far removed from political influence, and ensuring stable exchange rates with the US dollar being the global reserve, were also essential parts of these reforms (Safieddine, 2015). In the first decade of Lebanon's IMF membership, the organization lacked an enforceable mechanism to impose such regulations. However, the IMF did provide technical assistance and missions to ensure a transition to these reforms (Safieddine, 2015). The IMF principles challenged the Banque de Syrie et du Liban's laissez-faire policies, which were based on de-regulation and were highly politicized. However, although this new financial order aimed to remove French colonial influence from the central bank, the IMF ultimately facilitated a new form of control. This was done by facilitating debt relations and conditionalities that introduced an alternative model of imperial influence, namely US influence.

5.2 *New Headquarters, Same Rationality*

According to Safieddine, the financial policy advisors who played a crucial role in the monetary reform in Lebanon were educated at the American University of Beirut (AUB) (Safieddine, 2015, 2019). He calls them the AUB institutionalists. The IMF's influence, as well as the AUB institutionalists' advocacy for independent institutions and a strengthened central bank, led to the establishment of the Banque du Liban in 1964, with a Lebanese governor.

With the construction of new headquarters for the Banque du Liban, Safieddine argues that this was meant to symbolically represent its independence from the Banque de Syrie et du Liban. Notably, the employees merely transferred from one bank to the other. French financial experts and advisors to the Banque de Syrie et du Liban

also contributed to the Law of Money and Credit, which established the reform of the new bank (Safieddine, 2015). As I will show in Section 6, the colonial routes thus remain stubbornly sedimented within the financial infrastructure, directing the development of the central bank.

First, the mandate of the Banque du Liban prioritized *laissez faire* and currency stability. The first annual report of the central bank stated that ‘the central bank of Lebanon should avoid compromising the free economy and the immunity of the currency’ (Beit Beirut Museum, 2022–2023). Financial regulation was thus limited to currency stabilization, and monetary policies were geared towards maintaining exchange rate stability, rather than economic development.

Even during times of instability and economic crisis, reforms were still centred around currency stability. Due to the deterioration of the trust and value in the local currency, in the mid-1960s and 1970s, the Lebanese lira was no longer able to be upheld by its floating exchange rate (Safieddine, 2015; Daher, 2022). In response, the Banque du Liban eventually pegged the Lebanese lira to the US dollar at a fixed exchange rate by 1997 (Daher, 2022). This was in line with the expectation of Bretton Woods, which encouraged stabilizing currencies using the US dollar (Helleiner, 2006). As such, the US dollar was preferred as the global reserve currency over gold. Therefore, the development of the central bank from the Banque de Syrie et du Liban to the Banque du Liban still followed the colonial route of focusing on currency dependency, but at a fixed rate with the US dollar.

Secondly, the Banque du Liban’s reformed policies continued to be centred on open markets and *laissez-faire* policies. According to Safieddine, even the AUB institutionalists did not challenge *laissez-faire* policies. Instead, they only advocated for conservative rather than radical central bank reforms. For example, they advocated for increasing the minimum reserve requirements for loans. However, there was little discussion of the regulation of private businesses (Safieddine, 2015). Therefore, these

policies appeared to provide more state regulation on money markets but did not diminish the privileges of the private banking sector. Thus, they further consolidated the interests of the financial elite.

Nevertheless, this was not favourable to the local development of the economy itself. Researchers found that the persistent *laissez-faire* policies contributed to increased inequalities in Lebanon, resulting in extreme economic and social downturns between 1966 and the 1970s. Coupled with local sectarian conflicts, these social inequalities instigated the fifteen-year civil war from 1975 to 1990 (Daher, 2022). The destabilization of the economic and political situation caused the value of the Lebanese lira to deteriorate. The following shift from a floating currency to one pegged to the US dollar increased confidence in the Lebanese lira. However, it also increased reliance on the US money markets (Safieddine, 2015; Daher, 2022). As such, despite the emerging power stemming from the Bretton Woods System, the colonial routes of currency dependencies and de-regulation continued to privilege foreign markets.

Following the civil war, foreign entities together with international organizations (such as the IMF and World Bank) continued to facilitate and provide loans to Lebanon, with conditions that emphasized economic liberalization and the integration of Lebanon into the global economy. This led to the further opening up of the economy to foreign investment, especially in the financial and real-estate sector, and a decline in what was left of the agriculture and manufacturing sectors (Daher, 2022).

6 Sedimentation of Colonial Rationalities in Lebanon’s Central Bank

The previous sections demonstrated how colonial routes inscribed in the predecessor of the Lebanese central bank have directed its development in certain ways. These colonial routes were originally only meant to benefit the French colonial powers. However,

throughout history, shifting power dynamics have reinscribed these routes in different ways. Despite the shifting power dynamics, the development of the bank was directed towards currency dependency, financial de-regulation, and more debt relations.

These three routes are in fact intertwined with each other. By depending on foreign currencies, the central bank was constantly looking towards foreign markets to stabilize its currency. This meant that the central bank sought monetary policies that would benefit foreign investments. These policies first benefited the French market, then the financial and mercantilist elite, and later the Bretton Woods System. However, this meant that throughout history less attention was given to the development of agriculture and manufacturing. History has shown that these *laissez-faire* policies have contributed to exacerbating inequalities in the region (Gaspard, 2004; Yassin, 2012; Safieddine, 2015; Daher, 2022). The combination of these inequalities with specific socio-political conditions have led to financial instability at different points in time. The debt relations acquired in times of financial crisis and instability also only leveraged foreign power. As seen in the debt conditionalities under the IMF financial order, integration in the world economy through financial de-regulation and stabilizing the currency with the US dollar peg were further encouraged.

As a result of these intertwined routes, the central bank of Lebanon has been directed towards hinging the local economy to the Western market in a way that is not beneficial nor sustainable for the local economy. Similarly, the colonial bank was meant to connect the local economy to the French one in a way that was not beneficial to the local economy either. Therefore, the rationale behind the establishment of the colonial predecessor of the central bank is still relevant to the way it functions today. As such, we cannot understand the financial crisis resulting from the policies of the central bank today without looking back at the rationalities behind its creation.

Research on post-colonial systems has argued that political independence from

colonial rule does not necessarily mean economic or cultural independence. Power continues to be reproduced through the acquired know-how that has been passed on during the colonialism (Young, 2016). As such, decolonization in Gramscian terms only corresponds to a shift between political and civil societies. A 'civil society' is that which no longer requires physical control, but rather the ruling class operate in complicity with the needs of international benefit (Young, 2016, p. 45). As I have shown using the case of the central bank of Lebanon, infrastructures too are complicit in the continuity of colonial legacies.

This complicity is seen through the rationalities that are sedimented throughout the development of colonial infrastructures even after the alleged 'decolonization' process. I have shown this by conceptualizing colonial rationalities as routes that are inscribed in the infrastructure of the Banque de Syrie et du Liban. I found that these routes, which were meant to benefit the French market, continued to direct the bank towards foreign markets and dependencies. The sustenance of this model relied on the skills and know-how of the urban elite 'and their long-standing relationship with the Western market system' (Yassin, 2012, p. 68). As such, the development of the Banque du Liban through its colonial routes was not only familiar but also favourable for the urban financial elite of Beirut. The Banque du Liban's development continued to serve the interests of the ruling elites, both through its policies and through its colonial, and later US, connections. Thus, even though there were changes in the shift of power after 'decolonization', the financial infrastructure continued to function under the rationalities that created it.

7 Conclusion

As Bernards (2022) points out, while colonial infrastructures are durable it does not mean that they necessarily determine the present or future. For that reason, it is important to bring to view the ways in which infrastructures develop over time alongside shifting

power dynamics. By recounting the social conditions and rationalities behind the development of the central bank of Lebanon, I showed the reoccurring patterns over time. As such, I argued that colonial rationalities are inscribed in the central bank, dictating it in a certain direction. Through currency dependency, monetary development, and debt relations, the Banque du Liban became hinged on foreign financial infrastructures.

As shown in the research on global financial infrastructures, without banking relations with major banks it becomes almost impossible to reliably transfer money to the Global South. This can result in the economic isolation of countries that are targeted by nationwide sanctions, such as Venezuela, Iran, and Syria (de Goede, 2011; Daher and Moret, 2020; Brandl and Dieterich, 2021). While Lebanon's economy was not isolated, financial restrictions and a decrease in foreign financial flows to the country did bring about a complete financial collapse. In Lebanon, the harm of financial restrictions was indirect, by impacting access to foreign currency, which in turn limited access to basic resources. The shortage in the US dollar reserves led to a complete collapse of the financial infrastructure in Lebanon, compounding the collapse of other infrastructures and shortages such as electricity, water, and fuel, and thus depriving most of the local population of basic needs and public utilities.

In conclusion, journeying through Lebanon's financial history using an infrastructural lens shows us the persistence of colonial rationalities in shaping the present. Years of foreign currency dependency has casted a shadow over Lebanon in 2020. Much like the OMT billboard stood as a familiar landmark in the midst of darkness, it serves as a metaphor for the reoccurring theme of reliance on foreign currency to rescue Lebanon from the abyss. The money-transfer advertisement promises that foreign transactions in US dollar will be there for citizens 'in all circumstances'. The reliance on foreign currency as a lifeline in times of crisis is ingrained in the very fabric of Banque du Liban and mirrors the historical

pattern of dependence that has perpetuated itself over time. These dependencies cannot be solely attributed to local actors but are deeply ingrained in old and emerging infrastructures, reinforcing financial relations that favour dominant powers.

Notes

1. This transliteration follows the guidelines provided by the *International Journal of Middle East Studies*.
2. The research and insights in this chapter are part of an ongoing research project for a PhD dissertation. This work was supported by the small grants scheme of the research initiative on Rebalancing Public & Private Interests and Erasmus Centre of Empirical Legal Studies of Erasmus School of Law and the sector plan for law funding of the Ministry of Education, Culture and Research.
3. According to Helleiner, 'Seigniorage is usually defined as the sum of money accruing to the issuer of money that is derived from difference between the cost of producing money and its nominal value' (Helleiner, 2002b, p. 19).

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Part III

ORGANIZATIONS AND ACTORS OF CONTEMPORARY FINANCIAL INFRASTRUCTURES



Exchanges

Infrastructures, Power, and Differential Organization of Capital Markets

Johannes Petry

1 Introduction

What is the role of exchanges in capital markets? In public perception, the terms ‘stock exchange’ and ‘stock market’ are often used interchangeably, mostly referring to the latter. As central hubs, exchanges facilitate the circulation of financial information and the concentration of financial services firms, thereby serving as ‘anchors’ for financial centres (Wójcik, 2012). Therefore, exchanges are often depicted as marketplaces, neutral spaces where borrowers and investors meet to buy and sell ownership stakes in companies or trade commodities, derivatives, or other securities.

Traditionally, exchanges were merely such national marketplaces, mutual non-profit organizations owned and controlled by their members, which is reflected in earlier analyses of exchanges that rather focused on those members (Baker, 1984; Abolafia, 1996). Academic debates have often mirrored this perception of exchanges: while they facilitate financial market transactions, exchanges themselves are often not perceived and analysed as (powerful)

actors, but rather as marketplaces or sites dominated by other actors (for a literature review, see Petry, 2021a).

But more than mere marketplaces, exchanges are powerful actors in their own right. Over time, they have become complex organizations whose task is the provision of financial infrastructures that enable the functioning of capital markets in the first place. While financial markets are used by investors to allocate financial assets, provide corporate financing, and facilitate economic growth, certain infrastructural arrangements must exist to *enable* these transactions (Bowker and Star, 1999): from market data, indices, financial products, trading platforms to clearing, exchanges shape the infrastructural arrangements of capital markets. Exchanges are the providers of these financial infrastructures (Petry, 2021a), thereby shaping capital markets, their development, characteristics, and dynamics.

As this chapter illustrates, exchanges exhibit both commonalities and differences. Section 2 examines commonalities across exchanges – notably their role in the provision of financial infrastructures. However,

not all exchanges (and capital markets) are equal with respect to both how they organize markets as well as their relative importance within the global financial system. Section 3 thus discusses how exchanges are embedded within specific institutional environments which informs how they organize markets differently, while Section 4 illustrates the hierarchical nature of exchanges within the global financial system. However, we can also observe tectonic shifts within global capital markets. Section 5 therefore examines potential contestations through the rise of exchanges in emerging markets. Section 6 concludes by discussing exchanges within the context of an increasingly fractured global economy.

2 Commonalities: Organizing Financial Infrastructures

Exchanges are one of the institutional foundations of contemporary capitalism. The early history of stock exchanges dates back to ancient China during the Tang and Song dynasties where, in the seventh century, the first ‘joint stock’ companies were created. In Europe, pre-modern forms of stock exchanges have existed in Venice, Florence, and Genoa at least since the fourteenth century. This was followed by the founding of the Amsterdam Stock Exchange through the Dutch East India Company in 1602, which – while not the first exchange as such – was the first embodiment of what we today perceive as modern stock markets. As Braudel (1983, p. 101) noted, ‘what was new in Amsterdam was the volume, the fluidity of the market and publicity it received, and the speculative freedom of transactions’. Thus, the modern stock exchange was born. While exchanges can be created for virtually anything – from bonds, to bitcoins and carbon emissions – stock and derivatives exchanges have historically emerged as their most prominent forms (see Chapter 10, this volume).

From the 1980s onwards, however, exchanges underwent important changes (Petry, 2021a). While there is variation in exchanges’ transformation (see Section 3),

we can observe important commonalities with respect to their core activities, that is, is the provision of financial infrastructures for capital markets. Exchanges have diversified their activities horizontally – by adding new asset classes, time zones, and countries to their market portfolio – and vertically – by buying/merging with other financial service providers such as clearing houses or index and data providers. You can now buy market data and analytics tools from exchanges; license their indices; trade various financial products and asset classes on their platforms, not only equities but also bonds, foreign exchange, commodities; or derivatives (e.g., index derivatives based on indices which the exchange might calculate itself in turn based on its proprietary market data); co-locate your servers next to theirs to enhance trading speed; and use their clearing house, settlement, collateral management, custodian services, and regulatory reporting tools. What exchanges do has changed significantly. This has endowed them with considerable power to shape capital markets (see Swartz, this volume).

While financial markets are used by investors as sites of exchange, financial infrastructures need to be in place to *enable* these transactions in the first place (Bowker and Star, 1999) – existing and newly emerging systems through which ‘payments are settled, risks are assessed, and prices agreed’ (Bernards and Campbell-Verduyn, 2019, p. 777). Crucially, financial infrastructures are ‘the social, cultural, and technical conditions that make [financial markets] possible’ (MacKenzie, 2006, p. 13) – socio-technical systems that enable the functioning of financial markets but tend to be taken for granted and assumed (Star, 1999; Edwards, 2003; see also Pinzur, this volume).

Providing these infrastructures is more than a mere technical exercise. Financial infrastructures are inherently political as infrastructural arrangements modify the distribution of power and capabilities within marketplaces (Riles, 2011; Pardo-Guerra, 2013). As Bernards and Campbell-Verduyn (2019, p. 783) note, financial infrastructures ‘can confer, extend and enable new

forms of governance'. Drawing on Mann's (1984) work on the infrastructural power of the state, Braun (2020) for instance demonstrates how states' attempts to govern through markets provide financial actors with infrastructural power due to states' increasing entanglement with financial markets on which they rely for governance purposes (see also Coombs, this volume). Infrastructure is thereby conceptualized relationally (Bernards and Campbell-Verduyn, 2019), and it is this entanglement that provides financial actors with infrastructural power (Gabor, 2016; Sgambati, 2019), as state-market interactions take place 'on the turf and according to the rules of financial markets' (Braun and Gabor, 2020, p. 241). Crucially, as Bernards and Campbell-Verduyn (2019, p. 783) emphasize, 'power often depend[s] on control over key financial infrastructures'. Financial infrastructures 'sediment' power relations and 'shape, enable, constrain that power in specific ways' (de Goede, 2020, p. 355).

This chapter argues that the implications of this 'control over key financial infrastructures' (Bernards and Campbell-Verduyn, 2019, p. 783), and who sets 'the rules of financial markets' (Braun and Gabor, 2020, p. 241), require closer examination in the emerging literature on infrastructures and power. While SSF/STS (Social Studies of Finance/Science and Technology Studies) perspectives in infrastructure usually focus more on the micro level (Pinzur, this volume), international political economy literature on infrastructural power focuses on the macro level of the state (Coombs, this volume). While both of these perspectives are helpful to understand the politics of financial infrastructures, this chapter emphasizes the meso level – concentrating specifically on those actors that provide, create, and control financial market infrastructures, thereby connecting the micro and macro levels (see also Campbell-Verduyn and Hütten, 2023). In other words, how and by whom markets are organized matters.

Through their transformation, exchanges have turned into exactly such providers of financial infrastructures. They are important

actors whose power derives from their ability to define the features of the infrastructures for financial markets. Exchanges do not derive power through *participation* in financial markets, but from their role in *organizing* their underlying infrastructural arrangements. Rather than instrumental or relational, their power is more architectural in nature – from market data, indices, and products to trading platforms – they enable the operation of capital markets.

Through their role as providers of financial infrastructures, exchanges have therefore become constitutive for how capital markets function. First, by deciding which companies can list on their market or which products (stocks, bonds, derivatives, indices, etc.) can be traded, exchanges define *investment opportunities*. Secondly, exchanges exercise influence over who gets to participate in these markets and who is able to invest into – and own – these listed assets, thereby influencing *investor structures*. Thirdly, whoever wants to participate in these markets can only do this through the systems implemented by exchanges. Through these systems, exchanges set *investment rules* of how trading/investing is conducted, monitored, and sanctioned. Fourthly, because of their role of organizing markets exchanges have historically had close relationships with regulators and governments. Exchanges therefore also have a certain degree of *political influence* beyond capital markets.¹

By organizing infrastructures exchanges constrain and influence the actions of those actors entangled within their markets. Exchanges decide the 'rules of the game' – acting as gatekeepers, deciding who gets in, what is traded, and how trading is conducted.² Thereby, they are crucial actors that *shape capital markets*. Developing an understanding of exchanges as actors rather than marketplaces as well as exploring the provision of financial infrastructures as the source of their power helps to place them and their activities within the political economy of global finance.

While this section discussed the provision of financial infrastructure as an important commonality, there are important

differences between exchanges. As the next sections illustrate, not all exchanges organize markets equally, nor are all exchanges equals.

3 Differences: Differing Institutional Logics

In contrast to the premise that markets are uniform, both capital markets and exchanges are ‘embedded in distinct sets of social and political institutions’ (Ebner and Beck, 2008, p. 4; see also Vogel, 2018). As Deeg and Jackson (2006, p. 152) highlight, ‘these institutional configurations create a particular contextual “logic” or rationality of economic action’. Every economy consists of a set of institutions which create distinct patterns of constraints and incentives that shape and channel actors’ behaviours (Zysman, 1994, pp. 245–246). By making some forms of action more likely or reasonable, a particular logic emerges that is distinct from other institutional contexts (Thornton and Ocasio, 2008).

So, while functionally capital markets are characterized by market-based mechanisms of coordination between buyers, sellers, and investors, these markets are also embedded within variegated institutional settings that facilitate different *institutional logics* which underpin and shape the functioning of markets. Instead of viewing capital markets as homogeneous entities, this chapter therefore proposes to analyse capital markets as variegated – while characterized by market mechanisms, different institutional logics can underlie capital markets, leading to very different market dynamics and outcomes (Ahrne, Aspers, and Brunsson, 2015). Exchanges are hereby important actors that facilitate these different forms of how markets work. How exchanges (i.e., market organizers) are governed and which constraints and incentives they face matters.

Some aspects of their transformation are quite similar across exchanges. All over the world, exchanges have become electronic marketplaces, be it the New York, Shanghai, or Malawi stock exchanges. However, a crucial institutional characteristic where we see

significant divergence between exchanges is how they are situated within as well as negotiate the relationship between states and markets.³ For this reason, it makes sense to construct a heuristic typology which distinguishes between two ideal-typical poles on the state–market continuum: ‘state-capitalist capital markets’ and ‘neoliberal capitalist capital markets’ (Petry, Koddenbrock, and Nölke, 2023).

In Western economies exchanges have essentially become neoliberal corporations – publicly traded companies that must make profitable business decisions to increase shareholder value; they are situated within an institutional setting informed by a neoliberal logic. The underlying neoliberal institutional logic that informs the functioning of these markets is one of a separation between state and market, depoliticizing markets and instead putting a significant degree of trust in the collective agency of private (financial) actors to achieve efficient outcomes by seeking to maximize (private) *profit* (Peck and Tickell, 2002; Major, 2012). While states are tasked with the role of creating markets in neoliberalism, they should not intervene in these markets once established (Slobodian, 2018). The state’s priority is rather to enable private profit creation instead of other socio-economic outcomes (Chomsky, 1999). Instead of ‘natural’, these markets should be conceptualized as *neoliberal capital markets*.

But capital markets do not have to follow a neoliberal institutional logic. While capital markets have emerged as important economic coordination mechanism globally (Gabor, 2018), these markets can function significantly differently as exchanges and capital markets may be informed by a very different institutional logic – that of state capitalism. While profit creation for private finance capital is the primary underlying principle in neoliberal markets, importantly, in the state-capitalist ideal type, the state intervenes into capital markets to facilitate state objectives (Lai and Daniels, 2015). In state-capitalist economies, less trust is put in free markets but rather in state guidance, whereby ‘market forces are

utilized' but only 'as long as state control over key economic aspects remains intact' (McNally, 2013, p. 42).

China is a prime example of this. In China's capital markets, the state aims to steer market development into 'productive' tracks, and this steering role of the state is ingrained into the institutional setup of markets (Gruin, 2019). Consequently, the state, national development goals, and capital markets are much more entangled than in neoliberal capital markets. Instead of profit/shareholder value, the performance of exchanges, their personnel and management are measured by their contribution towards state objectives rather than commercial indicators. They consequently organize market infrastructures in ways that contribute to these state policies both domestically and abroad. By shaping market infrastructures, the Chinese exchanges extend the state's ability to exercise *control* within capital markets by monitoring, regulating, and managing the behaviour of market participants as well as the ability to direct market outcomes towards the accomplishment of *national development* policies. Following orders from the Chinese authorities,⁴ the Chinese exchanges organize the infrastructural arrangements of capital markets in ways that aim to prevent 'over-speculation', maintain social stability, serve the real economy, and contribute to economic reform in spite of a controlled integration into global finance (Petry, 2020). So, while investors within Chinese markets are largely profit-driven, Chinese exchanges organize the infrastructural arrangements of markets according to state objectives. Rather than neoliberal, capital markets organized by Chinese exchanges – within the context of China's socio-economic system of state capitalism – produce a different type of capital markets that can be categorized as *state-capitalist capital markets*.

The defining difference between neoliberal and state-capitalist logic is thus not the existence of markets per se but rather the principles that underlie market organization (profit creation vs state objectives) and the actors that dominate/shape these markets (private finance capital vs state institutions)

(Petry, 2021b). Exchanges here organize markets by designing market infrastructures that aim to steer markets by monitoring, regulating, and managing the behaviour of market participants towards the accomplishment of certain economic and political objectives – reproducing state capitalism through financial means (Petry, 2020). While state influence over capital markets in such a setup is neither absolute nor always effective, a different way of thinking about and actively managing capital markets dominates in the state-capitalist ideal type.

Going beyond the provision of financial infrastructures which all exchanges have in common, this section explored how their distinct institutional embeddedness influences exchanges' organization of capital markets as different institutional logics facilitate different infrastructural arrangements that shape how markets work. In other words, not all exchanges organize markets equally. Section 4 explores further differences between exchanges, notably the hierarchical nature of the exchange industry and concentrated power of a few global exchanges.

4 Differences: Hierarchical Nature of Exchange Industry

While all exchanges create financial infrastructures, the extent of their individual power derived from these infrastructures differs substantially. Traditionally, every country had an exchange of varying size. Since the 1980s, however, a new global hierarchy between exchanges has emerged – with global exchanges from the West at the top, complemented by a few regional and larger national exchanges. Overall, an enormous concentration of marketplaces, liquidity, and power had taken place.

Instead of equally powerful national marketplaces, a few global exchanges have come to dominate the exchange industry and thereby the organization of financial infrastructures (Petry, 2021a): CME Group which operates Globex, the world's largest futures trading platform, the largest fixed income trading platform (NEX), and

which partially owns index provider S&P Dow Jones Indices; ICE Group which runs the New York Stock Exchange (NYSE), the world's largest stock market, and several large derivative exchanges like NYBOT (New York Board of Trade) or LIFFE (London International Financial Futures and Options Exchange), together forming the world's second-largest derivative market; Nasdaq Group which operates the iconic Nasdaq stock market, 28 other US and European capital markets, while Nasdaq's technology is used by 130+ marketplaces globally; Cboe, the world's largest options exchange, which also owns BATS (Better Alternative Trading System), the world's largest alternative trading system (ATS), and EuroCCP, Europe's largest equity clearing house; Deutsche Börse Group which owns index provider Qontigo, Europe's largest derivatives market Eurex, and Clearstream, the world's second-largest international central securities depository; and LSE Group which, next to the London Stock Exchange (LSE), owns index provider FTSE Russell, Refinitiv (formerly Reuters Eikon), and LCH.Clearnet, the world's largest clearing house.

First, these mostly US-based exchanges control the majority of *globally relevant* financial infrastructures.⁵ They run the largest, most prestigious and profitable venues, own the most important products, indices, and technological know-how, and shape the development of capital markets globally. By operating the futures markets that create the prices for WTI and Brent, ICE and CME essentially shape the world's oil market; despite Brexit, the majority of Euro-denominated clearing of derivatives still takes place in London via LCH.Clearnet (James and Quaglia, 2019); and a handful of mostly exchange-owned index providers set standards for market accessibility and corporate governance, increasingly steering global capital flows (Petry, Fichtner, and Heemskerk, 2021). Global exchanges are positioned at crucial nodes within the global financial system.

Secondly, global exchanges also shape how capital markets work elsewhere as the former have been both impacted by financial

globalization but have themselves also turned into important agents thereof, spreading the development of capital markets globally.⁶ They export their financial infrastructures to 'underdeveloped' markets, support their development, and sometimes even run these smaller markets, promising to create growth by capitalizing on their economies of scale and helping create new financial products and services. In return, global exchanges earn fees, buy (a stake in) those smaller exchanges, or have preferential access to their market data and products.

Nasdaq, for instance, provides technology to 130+ market organizers in 50 countries,⁷ 40+ exchanges use LSE Group's Millennium platform,⁸ Deutsche Börse Group technology is used by over 30 exchanges and it facilitates various cross-listings and joint ventures,⁹ while CME Group has multiple similar cooperations.¹⁰ Especially when exchanges are (relatively) underdeveloped, such infrastructure and knowledge transfers are crucial (Wójcik, 2012, pp. 114, 121). Not least because global exchanges aided processes of market development, the number of countries with stock exchanges nearly doubled from 59 to 117 between 1980 and 2005 (Weber, Davis, and Lounsbury, 2009). Through the provision of financial infrastructures, global exchanges create, connect, and shape marketplaces globally, thereby also significantly shaping the way in which developing country capital markets work. They define the rules of the game in global markets: they have hence become the *rule-makers* of the global financial order – while exchanges on the lower rungs of the global hierarchy often follow their lead as *rule-takers*.

Importantly, these global exchanges are mostly US-based companies. Financial infrastructures globally converge around characteristically American 'best practice' – including denominating trading and clearing in USD. In this respect, US-based global exchanges fulfil a similar role as other actors that disseminate Anglo-American norms in financial globalization (see Sinclair, 2005, p. 4). By organizing capital markets according to a neoliberal script and disseminating

their financial infrastructures globally, global exchanges facilitate and reproduce US financial hegemony within the global financial system. Hegemonic power is ‘hardwired’ into financial infrastructures (de Goede and Westermeier, 2022; also Westermeier and de Goede, this volume).

While all infrastructures derive their power from the provision of financial infrastructures, this section has illustrated the unequal power relations between exchanges, as the central nodes of global financial infrastructures are controlled by only a handful of Western exchanges. Section 5, however, draws attention to contestations of this power constellation through the growing importance and global impact of non-Western exchanges.

5 Contestations: Beyond Western Markets

However, important changes are afoot in the world of exchanges. Since the 2007–2009 global financial crisis, non-Western capital markets have emerged as central nodes in the global financial system as ever more financial flows are directed towards or originate in emerging markets.

While for decades CME was the world’s largest futures market by trading volume, in 2019 the National Stock Exchange of India took this position, and in 2022 CME was also superseded by Brazil’s exchange B3 (see Datz, this volume). Chinese exchanges have toppled Nasdaq and NYSE as the world’s largest initial public offering (IPO) markets, with more companies being listed in Hong Kong, Shenzhen, and Shanghai than anywhere else in the world. Contrary to what one might think, the world’s largest IPOs were not US tech companies. Facebook/Meta, for instance, only ranked 8th; instead, a Saudi Arabian oil company (Saudi Aramco), a Chinese ecommerce giant (Alibaba), and a Japanese investment holding company (Softbank) occupy the top three spots.

Whereas in 2000 non-Western stock markets only accounted for 22.4% of global market capitalization, their share had

doubled (46.1%) by 2020. A similar picture emerges for futures exchanges where the non-Western share of global futures/options trading volume increased from 39.5% to 60.6% between 2007 and 2020. This increasing importance of non-Western markets is mainly due to the rise of a handful of large emerging markets – notably China, but also other countries like the BRICS+ (Brazil, Russia, India, China, South Africa, Iran, Egypt, Ethiopia, and the United Arab Emirates) as well as in Asia.¹¹

This increasing financial activity in non-Western exchanges not only means a quantitative shift but it also has two significant implications. First, exchanges in many of these countries operate quite differently. They often tend more towards the state-capitalist (or developmental; see Petry and Pape, 2023) end of our continuum, thus creating pockets of autonomy from the neoliberal capital markets created by global exchanges. Secondly, many of them are increasingly internationalizing themselves – exporting their different ways of organizing markets abroad. This raises questions not only about resistance towards neoliberal convergence but also potential contestations thereof.

While powerful, global exchanges are also constantly in competition with each other as well as with non-exchange trading platforms such as ATS or dark pools and market structure is consequently much more fragmented (Mattli, 2019). Therefore, especially when it comes to the state-market relationship – which means whether exchanges are themselves profit-driven companies subject to market pressures/competition or whether exchanges are subject to state control/influence to achieve certain national development objectives – we can see big differences between Western and non-Western exchanges.

As previously discussed, China is the extreme case where exchanges are state-owned and policy-driven, consequently organizing capital market infrastructures in a way that follows state-capitalist logic (Petry, 2020, 2021b). But it is far from the only country where markets function differently from global exchanges.

More examples can be found in other BRICS countries. In India, state institutions are still the largest owners of the stock exchanges and regulatory authorities exercise a lot of control over the design of market infrastructures. Foreign investor access is restricted, speculative trading practices such as high-frequency trading are limited, and offshore trading of certain financial products – such as index futures based on the Indian stock market – are severely curtailed. Indian markets are much more state-permeated than Western markets (Petry, Koddenbrock, and Nölke, 2023). And while Russia's capital markets had been more liberalized previously, the state has equally started to severely intervene in the organization of capital markets via the Moscow Exchange (Viktorov and Abramov, 2022) – a policy that was accelerated in the run-up to the Ukraine invasion and in the face of Western financial sanctions.

Similarly, exchanges in Asian developmental states organize capital markets very differently from Western markets (Pape and Petry, 2023). While exchanges are formally listed companies in Korea and Taiwan, foreign ownership is severely limited, and state influence remains extensive. Exchange management is essentially decided by regulators and the exchanges are vital in facilitating certain developmental policies. This includes protecting retail investors as capital markets serve as an important fix in their respective societies, for instance, by banning certain trading activities like short selling or by punishing foreign investors as scapegoats to placate retail investors who lost money in market downturns (also Yasuda, 2023). Other aspects include protecting their non-freely tradeable currencies and keeping global investors at bay through a variety of infrastructural arrangements to control market access as well as monitoring and intervention measures.

Even in Japan, which is probably closest to Western exchanges, the stock exchange is in a very different position of power vis-à-vis market participants. While ATS are allowed, they only account for a fraction of trading (around 10%), and market

regulations are designed in a way that keeps them small. While seemingly open, Japan's market structure is deliberately designed to maintain its stakeholder model of capital markets. Deregulation only took place at the margins: international high-frequency traders basically driving up share turnover through trading between the ATS and main exchange,¹² accounting for 70.6% of trading in 2022.¹³ The majority of the market are long-term holdings with very little turnover by Japanese corporates and financials (52.1%), which is complemented by a somewhat more active retail investor segment (17.6%).¹⁴ Market infrastructures thus basically reinforce a traditional buy-and-hold market while allowing a certain international high-frequency trading appendix. Across East Asia, exchanges organize capital markets decidedly differently than in Western markets (Pape and Petry, 2023).

Importantly, these non-Western exchanges are increasingly internationalizing themselves – exporting their different ways of organizing markets abroad. Chinese exchanges have actively engaged in constructing financial infrastructures along the Belt and Road (Petry, 2023). Similarly, Japan Stock Exchange's acquisition of the Yangon Stock Exchange was partially motivated by the desire to gain political allies and to fend off competition, such as from Chinese and Korean exchanges, which have invested in and operated marketplaces in Bangladesh, Pakistan, Kazakhstan, and Germany (China), or Uzbekistan, Laos, and Cambodia (Korea). As these countries compete for their standing as regional economic powers, according to one exchange representative 'the Japanese government encouraged that relationship' while 'the Korean government [also] strongly encourages Korea Exchange (KRX) to expand their business in Southeast Asia, *even though it's not profitable*' (cited in Pape and Petry, 2023, p. 243).

Similarly, we can see the construction of new cross-border financial infrastructures between the BRICS countries, especially with the aim of reducing vulnerabilities vis-à-vis US-dominated market structures and potential sanctions (see Nölke, this

volume). This is especially visible in ongoing Sino-Russian financial infrastructure collaborations. To shield themselves from a US-dominated/USD-denominated global financial system, the two countries facilitate RMB/RUB cross-currency trading, developing a unified RMB/RUB liquidity pool and alternative financial payments infrastructures. These collaborations have important material effects as the USD's share in Sino-Russian trade settlement dropped from 90% in 2015 to only 40% in 2020, while RMB/RUB currency trading surged by 1,067 between February and May 2022. Similarly, Indian and Russian exchanges have been actively discussing the creation of new financial infrastructures to increase connectivity and reduce dependency, and the success of broader efforts towards de-dollarization – and thus reduce the US's ability to weaponize financial interdependence – also depend on the existence of alternative infrastructural arrangements to facilitate capital market-based investments.

Importantly, how these markets function as well as their internationalization process are fundamentally different from the profit-driven approach followed by Western stock exchanges (Petry, 2021a). Increasingly, exchanges in many pockets of global capital markets have developed their own ways of organizing financial infrastructures in ways that differ from neoliberal logics and have even challenged the current global hierarchy of exchanges.

6 Conclusion: Towards Fragmented Global Markets?

This chapter illustrated the role of exchanges as providers of financial infrastructures in global capital markets. While exchanges are one of the institutional foundations of contemporary capitalism, they have received comparatively little attention in existing scholarship. In part, this was because their source of power was unrecognized. Focusing on their role as providers of financial infrastructures thus provides us with a novel conceptual lens to understand their importance

as powerful actors within the global financial system. Rather than investors who are active within a market, exchanges play a much more architectural role for capital markets as they create the infrastructural arrangements that enable the functioning of these markets: from market data, indices, financial products, trading platforms to clearing, exchanges create the rules according to which market transactions take place. By deciding the 'rules of the game' and acting as gatekeepers, deciding who gets in, what is traded, and how trading is conducted, exchanges are crucial for shaping capital markets, their development, characteristics, and dynamics.

While all exchanges have this in common, there are also important differences between exchanges. First, exchanges are embedded within specific institutional environments that inform exchanges' organization of capital markets. Secondly, the chapter illustrates the hierarchical nature of exchanges within the global financial system where a handful of Western exchanges dominate the most important financial infrastructures globally and influence how other exchanges organize capital markets. Thirdly, the chapter discusses the growing importance and international reach of non-Western exchanges as potential contestations of the existing global hierarchy.

While this chapter provided a brief overview, more research is needed to analyse exchanges and their role within the global financial system. More in-depth case studies of exchanges are warranted to better understand the nuances of how exchanges create financial infrastructures and correspondingly shape markets, especially by exploring more closely their relationships to market regulators and participants as well as state actors in different contexts within this process. Furthermore, the synergistic effects that emerge from individual financial infrastructures that exchanges create or control should be analysed in more scrutiny. This, for instance, includes the relationship between market data, indices, and index futures; the increasing relevance and interplay of post-trading infrastructures such as central clearing, central securities depositories, and

collateral management; as well as the growing infrastructural eco-system for ‘sustainable investment’ like ESG (Environment, Social, Governance) data, analytics, ratings, indices, or futures (also Fichtner, Petry, and Jaspert, this volume). More research is also needed to investigate the global dissemination/diffusion of financial infrastructures propelled by exchanges. What is the nature of the influence that global exchanges can exercise through the provision of infrastructural arrangements to developing and emerging markets, and what determines its size and reach?

Finally, it is noteworthy that the macro context in which exchanges operate has been rapidly changing with growing geopolitical tensions in recent years (Petry, 2024). On the one hand, security considerations might impact the previously profit-driven business model of Western exchanges. US financial sanctions against countries like Russia or China, including the forced de-listing of companies and denying access to cross-border infrastructural arrangements certainly had a big impact on Western exchanges, which now have to navigate these more political waters in their search for profit. On the other hand, we can observe increasing efforts from non-Western countries to circumvent US financial hegemony. De-dollarization and multi-polarity thereby rest on the creation of alternative financial infrastructures which might be informed by different institutional logics. Overall, exchanges and their provision of financial infrastructures must continuously adapt in the face of an increasingly politicized and fractured global economy.

Notes

1. Roscoe (2023), for instance, highlights the importance of early stock exchanges for political actors and their subsequent influence in the corridors of power.
2. Hence, the power of exchanges closely resembles what Susan Strange (1988, p. 31) defined as structural power – the ability of powerful actors ‘to change the range of choices open to others without apparently putting pressure directly on them’.

3. Other institutional differences might also impact the functioning of (some) exchanges; one example for this would be how capital markets in Indonesia, Malaysia, or Abu Dhabi are strongly influenced by religious norms (Islamic finance).
4. At the 5th National Financial Work Conference (Beijing, 14 July 2017), Xi Jinping, for instance, noted that the main tasks of China’s financial sector were ‘[to] better serve the real economy, containing financial risks and deepening financial reforms’.
5. CME, ICE, Nasdaq, and Cboe are US-based, while London Stock Exchange and Deutsche Börse are headquartered in Europe; but all of them are integral to Anglo-American finance.
6. By connecting ever more investors, providing them with more investment opportunities, and internationalizing financial products and markets, global exchanges facilitate the globalization of disintermediated financial practices in a way that increases the structural power of finance over states and societies (Pike and Pollard, 2010).
7. <https://business.nasdaq.com/market-tech/> (accessed 1 June 2023).
8. www.lseg.com/en/capital-markets/market-infrastructure-business-development (accessed 1 June 2023).
9. See: https://deutsche-boerse.com/resource/blob/31764/2ae61c511fef41b901e2656b4ce9f90/data/db-dbg-p-z-v-hp_en.pdf (accessed 1 June 2023).
10. See: www.cmegroup.com/international/ (accessed 1 June 2023).
11. For example, the BRICS accounted for 53.9% of global futures trading and 23.1% of global stock market capitalization in 2020, up from 4% and 5% respectively in 2000, growing even more rapidly than their share of global GDP, which increased from 8.1% to 24.2%.
12. Notably, only one out of fifty registered high-frequency traders in Japan is a domestic company, whereas the rest are well-known global hedge funds; www.fsa.go.jp/menkyo/menkyoj/kousoku.pdf.
13. ‘Trading by Type of Investors on Japan Exchange Group (JPX)’ (2022); www.jpx.co.jp/english/markets/statistics-equities/investor-type/00-02.html.
14. ‘Shareholding at Market Value by Investor Category on JPX’ (2022); www.jpx.co.jp/english/markets/statistics-equities/examination/01.html.

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Financial Infrastructures in the Context of Financial Development

The Case of Brazil's Stock Exchange

Giselle Datz

Financial infrastructures provide services that facilitate the clearing, settlement, and recording of financial transactions. Insofar as they can allow for these transactions to be made safer and cheaper, infrastructures can boost trading liquidity, which, in turn, tends to reduce price volatility. Far from a static background to financial transactions, financial infrastructures are “spaces for action” constantly in motion (Hall et al., 2023, p. 923). That this constant motion is mostly “unseen” speaks to the efficiency of systems which, like the swimmers in Warren Buffett’s famous quote, only notice that they are lacking their swim suits when the tide goes out (Berkshire Hathaway Inc., 2001).¹

Thanks to inspired efforts combining insights from international political economy, the sociology of finance, and science and technology studies, financial infrastructures have gained more attention as the protagonists, themselves, of the prevalence of financial logics, products, interest, and operations in economic life, known as financialization (Bernards and Campbell-Verduyn, 2019; Petry, 2021; Tan, 2021; Braun and Koddenbrock, 2022; Hall et al., 2023). One

of the fruitful contributions of this scholarship is the separation of “infrastructures” from “markets.” Despite their mutually constitutive relationship, a focus on financial infrastructures (their technological evolution, limitations, champions, and competitors) allows for the rethinking of “markets” beyond a dominant transactional metaphor that privileges exchange as the cornerstone of the economy” (Pardo-Guerra, 2019, p. 11). Financial infrastructures “shape the way core [financial] functions are undertaken” (Bernards and Campbell-Verduyn, 2019, p. 777), creating “the facilities and rigidities within which relational and spatial [financial] reorganization takes place” (Hall et al., 2023, p. 3). In this vein, we add, they can enable or constrain the development of domestic financial markets.

Financial market development is not necessarily about more subordination to foreign financial market forces (Bortz and Kaltenbrunner, 2017) or the unfettered financialization of the local economy. Beyond the diversification of sources of credit, improving access, liquidity, and reducing costs, financial market development also involves stronger

investor protection and corporate governance. In the same vein, a deeper and more “diversified domestic institutional investor base with domestic currency liabilities can [...] help offset international capital outflows,” soothing the blow of exogenous economic shocks (CGFS, 2019, p. 5; Sahay et al., 2015; Svirydzhenka, 2016).² Furthermore, the development of a local investor base can be a (partial) shield to the kind of price sensitivity to global financial shocks that large foreign holdings of domestic assets tend to trigger (IMF, 2014, p. 69). To be sure, financial development provides no assurance of financial stability. Yet, as argued by the Committee on the Global Financial System (CGFS, operated within the Bank for International Settlements), financial infrastructures “with sufficient transparency on pricing and volumes can help maintain confidence in periods of financial market stress, provide information on the build-up of risks, reduce market abuse, and deter other predatory practices in capital markets” (CGFS, 2019, p. 54).

It is well known that “financial institutions and markets around the world differ markedly in how well they provide” key financial services (Čihák et al., 2012, p. 5). Yet the extent to which financial infrastructures not only differ among one another but are differently constrained in how much they contribute to the (further) development of financial markets, has not been explored much by either the emerging literature on financial infrastructures or the broader literature on the international political economy of development.

In this chapter we argue that thinking about the correlation between financial infrastructure and financial development as linear can be too simplistic. Even when they *are* present, up-to-date, and reliable, financial infrastructures’ contribution to promoting singular markets may not translate into a deepening of the domestic financial system. That is, technological innovations can advance data gathering and analysis, increase the speed of financial operations, produce and distribute more reliable information on investment options, yet not necessarily enhance and broaden the domestic financial

system in ways that contribute to financial deepening. The latter (a term often used interchangeably with “financial development”) refers to the “increase in the depth, liquidity, efficiency, and volumes of financial institutions and markets,” along with the diversification of domestic sources of finance (Dabla-Norris et al., 2015, p. 141; Kiyotaki and Moore, 2005).³ Hence, the deterministic assumption that more developed infrastructures lead to more developed markets begs scrutiny. In this chapter we ask: To what extent do financial infrastructures shape markets in middle-income, developing economies? The question not only probes the contingent relationship between infrastructural changes and financial development, but also explicitly acknowledges “the variegated nature of empirical financialization processes” in developing countries (Petry, Koddenbrock, and Nölke, 2023, p. 147).

The empirical focus here is on Brazil: the largest economy in the region, the country with the highest level of financialization (Karwowski, 2020), and the largest stock exchange among its neighbors. Brazil’s financial system, like that of other Latin American countries, is bank-based. Yet, the country has been responsible for most initial public offerings (IPO) activity in the region (OECD, 2019, p. 15), has encouraged high-frequency trading (B3, 2022; Petry, Koddenbrock, and Nölke, 2023), and is home to “one of the best-known initiatives in the region for strengthening investor confidence in equity markets,” the Novo Mercado segment of the Brazilian Stock Exchange, created in 2000 (OECD, 2019, p. 44). It is hence, among regional peers, a crucial case in the effort of understanding financial infrastructures in the context of financial development. If such development is constrained in Brazil, then it is also less likely to materialize elsewhere in the region.⁴

Advances in Brazil’s financial infrastructures have been hard to miss, even if backgrounded in analyses of the country’s financial sector. From the electronic interdealer platform for sovereign bonds (SELIC), the consolidation of a central stock exchange (B3), the successful launch and surprisingly rapid

adoption of a digital payments platform, known as Pix⁵ to the blossoming of financial technology companies in less than a decade, it is clear that the Brazilian public and private sectors have embraced financial technology enthusiastically (CGFS, 2019; Duarte et al., 2022; Bakker et al., 2023; Banco Central do Brasil, 2023; see Kaltenbrunner and Orsi's chapter, this volume). Among these efforts, those which were not designed and executed by the government and are most closely related to the diversification of sources of credit for domestic firms are the centralization and modernization of the Brazilian Stock Exchange.

Through a brief analysis of the Brazilian Stock Exchange since the early 1990s, this chapter highlights both advances in and constraints to capital market development *in spite of* significant technological strides toward creating up-to-date financial infrastructures. It is argued that infrastructural advances may be necessary but insufficient steps toward that goal in developing economies. Structural characteristics of domestic capital markets – such as the availability of subsidized credit and the crowding-out effect of public securities on private ones – constrain domestic capital markets. In the same vein, conjunctural factors, such as persistently high interest rates, also run counter to private and public efforts to increase competition and dynamism in domestic credit markets, even in the presence of an ever more sophisticated domestic stock exchange.⁶

The chapter is organized in three sections. Section 1 discusses what is meant by an understanding of financial infrastructures within the context of financial development in particular, and situates the Brazilian case in its region. Section 2 describes attempts to modernize Brazil's financial infrastructures with a focus on the national stock exchange. The section also highlights the ways in which both structural and conjunctural factors have constrained local capital market development, which, in turn, has shaped the role of the stock exchange in the country's financial system. The conclusion in Section 3 suggests skepticism about deterministic expectations when it comes to linking advancements in

financial infrastructures with capital market development. Instead, more productive to understanding the nature and impact of financialization in developing countries is to further inquire about how such financial infrastructures adapt to and evolve in spite of lingering context-specific constraints.

1 Financial Infrastructures in the Context of Financial Development

Despite the growth in middle-income economies' government and corporate securities markets, corporations in these countries still have less access to longer-term, local currency financial streams, and fewer small firms access equity markets than is the case in advanced economies (Didier and Schmukler, 2013; IMF, 2018). In Latin America, in particular, credit to the private sector and liquidity in the domestic equity market are still relatively restricted (Didier and Schmukler, 2013). Capital markets are bank-based and have a short-term horizon. The region has not benefited from the global shift in capital allocated toward developing countries' markets, which in Asia, for instance, has led to a greater volume of IPOs. Even though Latin American listed companies' market capitalization (i.e., the value companies trade in the stock market) as a share of GDP rose from 28% of GDP on average for the period of 1995 to 2000 to 52% of GDP between 2005 and 2010, the blow from the global financial crisis of 2008 (OECD, 2019) and then the pandemic of 2020, along with political cycles, have led to an overall slow recovery.

According to Schneider's depiction of the Latin American variety of capitalism (what he calls "hierarchical capitalism"): "in the absence of deep equity and credit markets, business groups, along with [multinational corporations] MNCs, have been the main private institutions for mobilizing large-scale investment," relying mostly "on retained earnings, international loans, or loans from state agencies" (Schneider, 2013, p. 43). Furthermore, Latin American markets are characterized by a high level of ownership

concentration and the existence of large industrial and financial conglomerates which impair liquidity in stock markets, increasing transaction costs and inhibiting investment. From 2009 to 2019, Latin American countries recorded the lowest liquidity ratio compared to other regions. Concentration is present in two forms: “trading concentration in which only a few and large companies are actively traded, usually those included in the local index,” and in the form of the “concentrated ownership structure” of the listed companies (OECD, 2019, p. 24).

Brazil’s financial market is, according to the IMF (2018, p. 30), a “liquid and sophisticated” one. Approximately 475 companies are listed in the Brazilian Stock Exchange, B3, recording an aggregate market capitalization of USD 836 million (in depreciated Brazilian real exchange rate values of May 2023; see B3 2023). The number is widely acknowledged as unimpressive for a country with an economy the size of the Brazil’s (Forbes, 2020). Yet is this evidence that capital markets in Brazil are overregulated and/or financial infrastructures lacking? The answer is “no” on both counts.

Petry, Koddenbrock, and Nölke’s (2023, pp. 144–145) comparative study of exchanges in Brazil, Russia, India, China, South Africa, and South Korea suggests a conceptual continuum between neoliberal and state capitalist capital markets. In the first, profit creation is the organizing principle and private investors the dominant actors. In state capitalist institutional settings, in contrast, exchanges “organize capital markets to facilitate state objectives” (p. 145), thereby “reproducing state capitalism through financial means” (p. 148). The authors find that Brazil stands out as diverging from the path that points to a state capitalism-based capital market. The ownership structure of the Brazilian exchange is not only private but largely foreign. High-frequency trading is encouraged by domestic financial authorities and the Brazilian Stock Exchange allows for offshore trading of its indices. The authors conclude that investment in Brazil is “relatively liberalized with only a few restrictions” (p. 153).

In fact, within their sample of six middle-income economies, Brazil and South Africa are the “most neoliberal in their approach to governing capital markets” (p. 158).

Petry, Koddenbrock, and Nölke’s (2023) valuable exploration of domestic financial infrastructures contributes to the broader discussion of variegated capital markets by including non-neoliberal logics into the functioning of these markets and their facilitating infrastructures. Given the intentionally simplistic typology (whether neoliberal or state capitalism-based capital markets), variation *within* the neoliberal “model” remains presumed, but not discussed. In particular, still to be understood are the ways in which neoliberal logic may indeed predominate as the organizing principle of capital markets, which, nonetheless, remain relatively underdeveloped *despite* financial liberalization. To be sure, studies that explore “subordinated financialization” highlight “the growing but subordinate nature of [developing countries’] financial integration, which is dominated by short-term capital flows that remain funded in [advanced economies’] currencies.” Even though global financial integration, in this perspective, is understood as “fundamentally shap[ing] the financial practices of domestic agents, such as the holding of financial assets by non-financial corporations” (Bonizzi, Kaltenbrunner, and Powell, 2020, p. 184), such integration has done little to transpose the structural obstacles that still restrict domestic capital market development. These obstacles, in turn, shape the extent to which domestic financial infrastructures, such as stock exchanges, not only operate as marketplaces, but can influence local financial life as actors of financialization themselves (Petry, 2020, 2021; and see Petry’s chapter in this volume).

In this vein, here we are interested in grasping the extent to which financial development can remain a truncated process amid steady financial integration, growing financialization (Bonizzi, 2017; Karwoski, 2020), and notable digitalization (Paraná, 2018; Bakker et al., 2023) – in large part boosted by modern financial infrastructures. Applying an “infrastructural gaze”

(Westermeyer, Campbell-Verduyn, and Brandl in this volume) to financial development allows for not only the unpacking of micro and macro relations, but even more specifically, for an understanding of the ways in which micro-financial processes are *contingent* on macrostructural and conjectural dynamics in ways that differentiate developing from advanced economies. In this sense, beyond “subordination” (evocative of hierarchical ordering and likely dependence), financial *development* is indicative of particular contingencies related to exogenous dynamics as well as path-dependent and endogenous (domestic) policy directions, as specified later in this chapter.

In the Brazilian case, a neoliberal operating logic in the financial sector is nonetheless shaped by the ubiquitous presence of the state (Taylor, 2020). In 2018, public banks provided 55% of total bank credit. As stated in the 2018 International Monetary Fund's (IMF's) Financial Assessment Report for Brazil, “government debt securities are the centerpiece of the fixed income market and are the single most important asset class held by investment funds, pension funds and insurance companies.” Moreover, “the role of public banks and state-owned firms, the critical importance of repos collateralized by government securities as the main instrument for conducting monetary policy and carrying out interbank transactions, and the centrality of government securities as the main liquid financial instrument in Brazil are distinguishing features” of the Brazilian financial system (IMF, 2018, p. 19; see also Lazzarini, 2011).

In order to better understand these dynamics, we turn next to a brief empirical analysis of the Brazilian Stock Exchange, B3.

2 The Brazilian Stock Exchange as a Contingent Financial Infrastructure: Micro Innovations and Macro Constraints

Until the early 1990s, prevailing high inflation was a deterrent to Brazilian economic growth and stability, but also “an important

source of financing both for the government, in the form of inflation tax, and of self-finance for investing companies – especially for those with strong market power and capacity to increase mark-ups rapidly” (Studart, 2000, p. 21). In this context, private financial institutions focused on providing short-term loans and intermediation of the foreign savings. As a result, despite the creation of an independent regulatory body for domestic financial markets (the Brazilian Exchange Commission, or Comissão de Valores Mobiliários – CVM) in 1976, as well as the updating of legislation about duties and liabilities of financial intermediaries and issuers, capital markets “remained fledgling throughout the 1980s and 1990s” (de Mello and Garcia, 2011, p. 26; Taylor, 2020). The many financial crises originated in developing countries affecting Brazil in the 1990s further discouraged advancements in the domestic financial sector.

With the price stability brought about by the Real Plan of 1994, regulatory shifts helped shape a new Brazilian financial landscape given: capital market liberalization, the banking reform in 1988, and government bailout programs targeting state banks after the 1995 crisis. Add to these the entry of new foreign investors attracted by the appreciation of the *real*, more flexibility in regulations involving investment funds and other institutional investors, relatively high interest rates, and the growth of government debt. Capital and financial derivatives markets grew. Foreign financial institutions and domestic institutional investors gained a prominent role in Brazilian capital markets (Studart, 2000). However, between 1995 and 2003, there were only six IPOs in the country. Rather than access funds through the Brazilian Stock Exchange, domestic firms relied on foreign markets, through American depositary receipts (*World Finance*, 2014).

Indeed, while sovereign bond markets underwent a major shift from foreign currency-denominated bonds to local currency bonds, diminishing significantly the exchange rate risk of public debt (Didier, Hevia, and Schmukler, 2012), equity markets experienced a bumpier evolution. Between

2004 and 2021, the number of IPOs rose substantially, but not consistently (*Folha de São Paulo*, 2023). The rise was in part the result of the establishment of the then-Brazilian Stock Exchange, Bovespa's, Novo Mercado in 2000, a listing segment with rules in line with international standards for corporate governance, meant to enhance corporate disclosure, transparency, and accountability (Didier and Schmukler, 2013). After the initial period of macroeconomic instability in the early 2000s, Novo Mercado caught on. Total market capitalization increased more than sevenfold from 2003 to 2011. New amendments to the standards were approved by companies on the special listing segments in June 2017, entering into force in January 2018. They included a reviewed definition of independent directors, and stricter rules related to internal audits and audit committees (OECD, 2019).

Among the changes taking place since 2019, by far the most significant were the ones that transformed the stock exchange itself. As part of a number of mergers among Brazilian firms, clearing houses were integrated. In particular, the São Paulo Stock Exchange (Bovespa) merged with the main futures exchange (BM&F) to form BM&FBovespa in 2008. In 2017, BM&FBovespa purchased Cetip, the country's largest central depository for over-the-counter private securities, and derivatives, becoming B3, the abbreviation for Brasil, Bolsa e Balcão (*Agência Brasil*, 2017). Its clearing and settlement services are part of a plan to promote "a single set of rules, a single participant structure and register, unified processes for position allocation, clearing and control, a single settlement window, a single risk management system, a single collateral pool, and a single safeguard structure." The logic was "to provide better liquidity management, more efficient capital allocation, more efficient margin calculation and lower operational risk for participants," along with a cost reduction of about 30% (CGFS, 2019, p. 40; *Agência Brasil*, 2017).

B3 is a private firm whose own stocks are traded in the Novo Mercado segment of the exchange, and which is regulated by the National Monetary Council, Brazil's central bank, and the Brazilian Securities and

Exchange Commission (CVM.gov.br). B3 manages the Brazilian stock and derivatives markets. Its total amount negotiated in fixed and variable income reached approximately USD 437 billion in 2022 (B3, 2023). Among its newer products, B3 lists exchange-traded funds (ETFs), albeit the "numbers are still modest," given low liquidity relative to international markets. According to B3, as of 2020, there were twenty-two ETFs listed on the exchange, "16 referenced to stock indexes, two of them foreign (referenced to the S&P 500), and six tracking fixed income indexes" (*Focus*, 2020). The number of investors in ETFs grew 141% from 41,468 in December 2018 to 100,029 in November 2019, revealing that these funds became a port of investor entry into stock markets in light of "the improvement in the country's macroeconomic scenario and the low interest rate" (*Focus*, 2020). Indeed, B3's role in the Brazilian financial system is contingent and adaptive. We move next to explaining both the nature of this contingency and B3's efforts to adapt and expand in spite of it.

2.1 B3 Boxed In: Constraints to Stock Market Growth

Capital market development in Brazil has been constrained by the country's long battle with high inflation, the primacy of state sources of long-term credit, and persistently high interest rates. These macro dynamics have determined the extent to which diversification of investment outside of government bonds is both feasible and attractive to private investors. By the same token, the nature and scope of the role and impact of the country's stock exchange is delimited by these characteristic obstacles to the growth and variety of private credit sources and investment opportunities outside of the state and traditional banking system.

Monetary stability has been Brazil's long-term battle. That is despite the adoption of an inflation-targeting regime and much more solid economic fundamentals, "stress-tested" through many a global crisis (Barbosa-Filho, 2009; Segura-Ubiergo, 2012; de Gregorio, 2019). The combination

of political risks, particularly prevalent in electoral cycles, and a history of inflationary challenges have led to contractionary monetary policies which have positioned Brazil's interest rates among the world's highest. Their impact on local markets is unescapable, as we explain in what follows.

Another key structural constraint associated with Brazil's institutional and economic development has been the role of public (development) banks like the Banco Nacional de Desenvolvimento Econômico e Social (BNDES), which provides relatively cheap (earmarked and subsidized) credit to local firms. Since around 2014, earmarked credit in Brazil corresponded to approximately 40% of total credit in the country, most of it distributed by the BNDES (Barroso and Nechio, 2019). Although this trend was partially reversed during the Bolsonaro presidency (2016–2020), particularly when it came to subsidized (below market) interest rate loans, returning President Lula da Silva has promised to get the BNDES back to its role as a key source of financing for national firms (*InfoMoney*, 2023). This role, however, has historically discouraged capital market development, while the particularly concentrated ownership structure of most Brazilian firms made them more reluctant to go public, fearing the loss of internal managerial control (Lazzarini, 2011; Schneider, 2013).

In contrast, regulators have attempted to introduce leaner rules when it comes to stock exchange activities in particular. In mid-2022, as a result of consultations between the public regulator and market participants, a new resolution (No. 160-1) by the national Securities and Exchange Commission was instituted, aiming at simplifying IPOs. Retail investors will have access to more transparent and standardized information about IPOs, in an attempt to both protect investors and spur further capital market development (Anbima, 2022).

With monetary instability diminished but not defeated, the benchmark interest rate (SELIC) in Brazil, remains high, well above the European (0.75%), and US rates (2.5%) (Banco Central do Brasil, 2022). In the last 18 years, from 2004 to 2022, the

average Brazilian real interest rate was 5% per year (Banco Central do Brasil, 2022). Therefore, investors are highly compensated for their investment allocations in public securities without having to incur in much risk. Shorter-term floating rate or inflation indexed securities are Brazil's predominant asset class (IMF, 2018).

In fact, a lingering “conjunctural” factor (because some periods of decline have been experienced), high interest rates are a notorious deterrent of growth in domestic capital markets (IMF 2018; OECD, 2019). These rates are mostly the product of iterated and largely successful price stabilization attempts. They also help finance the government deficit. Yet such high interest rates, as explained, make relatively low-risk public securities continuously attractive, crowding out private securities. In addition, the Tesouro Direto platform, launched in 2002 (similar to the TreasuryDirect program offered by the US Department of the Treasury), makes purchasing government bonds easily accessible to individual investors (Miranda, 2018). That is even easier now that the system has been connected to the PIX platform of mobile/digital payments (Ministério da Economia Brasil, 2022).

It is difficult for capital market products to compete with such broadly available and advertised federal securities (Miranda, 2018). The volume of stocks traded in the Brazilian stock market only surpassed that of fixed income investments (bonds) between 2007 and 2010 – excluding 2009, when the impacts of the financial crisis of 2008 were felt. More recently, the volume of investments in stocks beat bonds in 2022, when interest rates were at their lowest level in recent history (ANBIMA, 2022).⁷ The presidential elections in the end of 2022 have since reversed this brief reprieve. Figure 15.1 displays the evolution of nominal interest rates in Brazil over the past twenty-seven years.

Moreover, Brazilian individual investors “favor bank paper over stocks and corporate bonds.” Banks' certificates of deposits are extremely popular since they offer returns comparable to those on government bonds with similar maturities (Miranda, 2018).

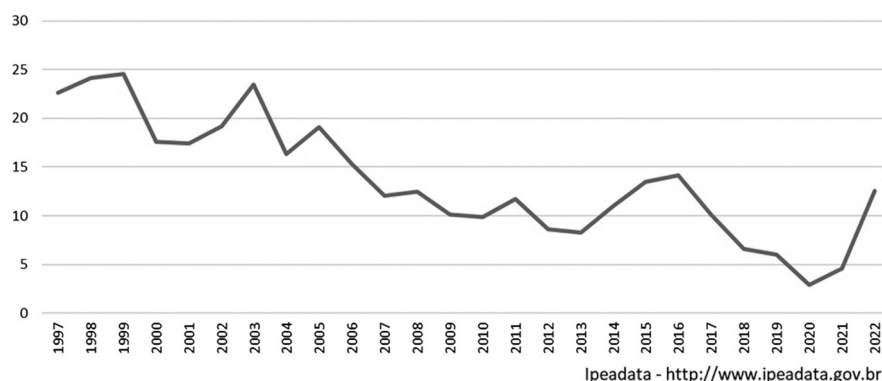


Figure 15.1 Brazilian interest rates, 1996–2023.

Source: Author's elaboration based on data by Ipea, 2023.

Institutional investors are also attracted to the high returns on government bonds. Not unlike their peers in the region, Brazilian pension funds concentrate their portfolios on public bonds; they buy and hold assets, adding little liquidity to secondary markets and not contributing significantly to capital market expansion (Stallings and Studart, 2006; Park, 2012; Didier and Schmukler, 2013; Datz 2014). In a relatively high interest rate environment, investing in low-risk domestic bonds is a conservative but also profitable bet for these large domestic investors (Abrapp, 2022; Previ, 2022–2019; Petros, 2022–2021). Hence, despite the substantial growth of Latin American institutional investors, their role in the stock market and in fostering financial development more broadly has been relatively limited (de la Torre, 2012; Datz, 2013).

2.2 Adaptation, Expansion, and Competition

Despite the significant constraints to the further development of domestic capital markets, such as fiscal instability, subsidized credit, and high interest rates, B3 continues to adapt and expand. According to B3's CEO, the exchange is "engaged in the evolution and transformation of the Brazilian financial market, which has more demanding and sophisticated clients than ever before, powered by technological innovation" (Finkelsztain quoted in *Focus*, 2022). That ambition is indicative of B3's engagement in

broadening the variety of financial services and investments it can provide to investors, such as domestic and international ETFs, including cryptocurrency ETFs (*Focus*, 2022). In this sense, the stock exchange not only "regularize[s]" financial activity (Hall et al., 2023), facilitating financial investment and diversification, but contributes directly to the (further) digitalization of (Brazilian) financial life (Paraná, this volume).

Indeed, as the number of individual investors engaging with the Brazilian Stock Exchange increases so does B3's drive toward its own technological updating. In 2022, the exchange created B3 Digital Assets (B3 Digitas), whose mission is to offer market infrastructure to digital assets. After acquiring data analysis firm Neoway in 2021, B3 also bought Neurotech3, a firm that specializes in artificial intelligence, machine learning, and big data. Fueling these moves is the stated goal to develop new products and services based on B3's proprietary databases (Reuters, 2021; B3, 2022). Such efforts by the Brazilian Exchange have not remained unnoticed. After being selected Global Exchange of the Year in 2019 and 2020, B3 was awarded Best Technology Innovation by an Exchange by London's *Futures and Options World* magazine (*Focus*, 2022; B3, 2023). The accolades situate B3's efforts positively among its competitors, rewarding its technological prowess in particular.

Global competition among security exchanges pushes these infrastructure providers to constantly modernize their platforms

(*American Banker*, 2023). In middle-income countries' markets this competition is less pressing, but far from absent. The Brazilian Stock Exchange, in particular, faces competition from the New York Stock Exchange (NYSE), where newer fintech companies have preferred to list given that they are more easily compared to other technology companies in that market, leading to more generous valuations (*Euromoney*, 2022). Yet, more recently, some Brazilian companies have started to make the move from Nasdaq, a New York-based stock exchange, back to Brazil. Delisting is a rare move once a company has gone public in the USA. Yet higher US interest rates and the risk aversion that those incite in stock trading have led to lower liquidity in US stocks. Of the eighteen Brazilian IPOs issued in the NYSE since 2017, only four, all linked to the financial industry, have daily liquidity (i.e., are traded among investors). Trading at less than USD 1 million daily, ten other Brazilian companies are off the funds' radar. These "low cap" companies are also less covered by global analysts and hence attract less investor interest. In this context, competing with 8,000 other companies in the NYSE becomes unsustainable, given the considerable fixed costs involved (*Valor International*, 2023). Should they return to the Brazilian Stock Exchange, these companies will find a financial infrastructure that uses technological innovation as a key adaptive strategy to expand its impact on a still-constrained domestic financial system.

3 Conclusion

Financial infrastructures are not merely a set of static foundations on which financialization is played out. As new studies have established, they are actors dynamically engaged in the competitive process of further expanding financial activities. Technological advances are believed to potentialize this role of financial infrastructures, expanding modes and strategies for investing, as well as connecting local and global markets.

Focusing on the largest economy in Latin America, with the largest capital market and stock exchange, we have argued that the extent to which financial infrastructures shape markets in middle-income economies is a function of structural (path-dependent) and conjunctural conditions (cyclical and less unique to the case). Despite significant technological and managerial advances in the operationalization of the national stock exchange, amid an increasingly more enabling regulatory environment, Brazil's fundraising in capital markets is still relatively limited and greatly affected by macroeconomic cycles, particularly fiscal policy uncertainties – a structural characteristic of the local economy in spite of notable improvements since the 1990s. Persistently high-yielding public bonds still crowd out private securities for the most part. The country's modern stock exchange hence operates within constraints that make evident the nonlinear connection between the growing technological mastery and ambition of financial infrastructures and the deepening of financial markets. Indeed, infrastructural advances may be necessary but insufficient steps toward this end.

Once we dismiss the deterministic assumption that the development of infrastructures leads to the development of capital markets in the aggregate, we can better understand not only "the facilities and rigidities" created by financial infrastructures in financial (re)organizing, as Hall et al. (2023, p. 3) suggest, but also the "facilities and rigidities" within which they operate. What happens despite or even as a result of existing constraints, as well as what fails to materialize given enduring structural obstacles and unfavorable conjunctural trends inform our understanding of financial "development" beyond teleological expectations. This is not just about finding out how infrastructures can help overcome obstacles to (macro)financial development – they simply may not – but, rather, how different platforms are continuously modernizing given domestic obstacles to more robust market development, in a progression that is more adaptive "evolution" than partial equilibrium (thwarted growth).

Notes

1. The full quote reads: “you only find out who is swimming naked when the tide goes out.” This was mentioned in reference to “assessing the soundness of reinsurance protection” and the need to apply a “stress test to all participants in the chain,” being sure to “contemplate a catastrophe loss occurring during a very unfavorable economic environment” (Berkshire Hathaway Inc., 2001).
2. As Heng et al. (2016, p. 12) point out, “recent economic studies document the existence of a certain threshold of financial development beyond which additional deepening generates decreasing returns to growth and stability. One possible explanation is that large financial systems divert resources from productive activities to speculative and risky financial investments. Also, excessive leverage and risk-taking can lead to increased economic and financial volatility with potentially negative consequences for long-term growth, especially if regulation and supervision are inadequate.”
3. The World Bank defines “financial depth” more narrowly as “domestic private credit to the real sector as percentage of local currency GDP,” deliberately excluding “credit issued to governments, government agencies, and public enterprises.” Also excluded are credit issues by central banks. See: www.worldbank.org/en/publication/gfdr/gfdr-2016/background/financial-depth (Accessed September 24, 2024).
4. The second-largest economy in Latin America, Mexico, also features a bank-based financial system. Banks account for half of the whole Mexican financial system, which remains “relatively small.” With assets of about 100% of GDP, the Mexican financial system is smaller than that of peer developing economies and has not grown much in size and complexity since 2016. In particular, the use of capital markets for firm financing is “limited” (IMF, 2022, p. 15).
5. In just over a year since its launch in November 2020, Pix recorded 114 million users, or 67% of the adult population (Duarte et al., 2022). It is used by more than 800 financial institutions, and dominates all forms of retail payments, including credit and debit cards (Banco Central do Brasil, 2023).
6. The analysis developed here on the below-expectations development of the Brazilian capital markets despite marked technological

advances in the country’s stock exchange complements Ionnou and Wójcik’s (2022, p. 65) study of fintech firms in Latin America. Notwithstanding the sector’s much-landed and quick growth, fintech firms “have not challenged but contributed to an already high level of concentration in the geographies of financial services in Latin America.” These firms have not displaced bank incumbents, making clear that contextual, structural conditions go a long way in explaining the “gulf between the expectations that FinTech will decentralize finance in spatial terms, and the reality of FinTech enhancing the power of established financial centers.”

7. Even though some authors have associated high interest rates with greater financialization in developing countries (Kaltebrunner and Paineira, 2017; Karwoski, 2020), that was linked to capital inflows, not domestic capital markets.

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TARGET₂-Securities

Europe's New Financial Infrastructure

Troels Krarup

1 Introduction

There is something peculiar about economic transactions that has to do with the gap between their agreement and settlement. Signing a contract means the parties enter a mutual obligation to deliver and to pay, respectively. Later, when both delivery and the corresponding payment have taken place, the trade has been “settled.” The interval in time and space between agreement and settlement may be large, as when you pay in advance for goods that need to be shipped and even produced – or it may be very small, as when some contemporary financial transactions are settled in “real time” (Riles, 2004; Krarup, 2021). However, in all cases, there’s a gap between agreement and settlement that must be handled. What if payment takes place, but delivery fails? Or vice versa? The question is not pure theory. In 1974, due to time differences, a German bank (Herstatt Bank) that had famously engaged in foreign exchange trade ended up declaring bankruptcy after having received Deutsche marks in Frankfurt but before having paid out the corresponding dollar position in New

York. The example showed that there was an implicit credit involved in the gap. How do we close the gap between the entering of financial transactions, for example, at a stock exchange, and the actual delivery of assets versus payment of cash among the relevant accounts? Financial infrastructures play a structuring role (cf. Pinzur and Coomb’s chapters, this volume), but my analytical and empirical focus offers a perspective that is both broader (money and credit) and narrower (the European Union (EU)) than generally seen in the literature.

In this chapter, I offer an overview of the biggest European financial infrastructure project to date – the TARGET₂-Securities (T₂S) settlement platform – and situate it in the *longue durée* of money and finance (cf. also Roitman’s chapter, this volume). The analysis is motivated by the broader question of how the kind of seemingly fundamental problems of agreement and settlement of economic transactions outlined relate to the historically specific settlement technologies in the EU today. The literatures on money, finance, and financial infrastructures share a broad partitioning among

scholars who ascribe priority to the historical contingencies of technologies, regulations, and broader social formations on the one hand (e.g., Callon, 1998; MacKenzie, 2006; Muniesa, 2015) and, on the other, those who emphasize the universal nature of money and its problems (e.g., Mehrling, 2010; Ingham, 2016). While thus raising serious difficulties, the question is paramount to our understanding of contemporary financial infrastructures and lurks in the background of most endeavors in this discipline (Petry, 2021; Pinzur, 2021).

Like most other financial infrastructures, T2S remains little known outside the closed circles of the sector and academic specialists. Nevertheless, T2S is a major achievement of its kind, costing some half a billion euros plus the expenses of adapting the existing national systems – private and public. Unusually for this kind of project these days, the settlement platform was created by the European Central Bank (ECB) and implemented between 2015 and 2017. A few years later, by 2020 it settled almost 177 million transactions representing a total value of €173,000,000,000,000 – plus liquidity transfers, probably of a similar order of magnitude (ECB, 2021). As of 2022, T2S connected twenty European countries, with more in view of joining soon (ECB, 2022). T2S thus marks a high point of European financial infrastructure integration.

When the euro was introduced in 1998, there was a need for an integrated *real-time* payments system for the Eurozone (on “real time,” see also Riles, 2004). This allowed instant arbitrage among national money markets and hence supported the single monetary policy. It was introduced in 1999 under the name TARGET, which stands for Trans-European Automated Real-time Gross Settlement Express Transfer System (see ECB, 2016). In 2007, a new version was launched, unsurprisingly called TARGET₂ (Lucas, 2008). As detailed later in this chapter, with TARGET₂, the accounts of the national central banks in the Eurozone were directly connected, meaning that payments could be made cross-border in central bank money and hence as fast and as

safe as domestic payments. By contrast, the settlement of financial transactions, involving not only money but also securities (stock or bonds), T2S, was only operable about a decade later (Quaglia, 2010; Porter, 2014). Whereas the need for European central banks to build an infrastructure supporting the common monetary policy was almost self-evident, for long the view prevailed that integration of securities settlement infrastructures should be market-driven, that is, provided by private companies.

T2S is situated in the broader program for single market integration in the EU. A central principle in EU treaty law is the elimination of any “prevention, restriction or distortion of competition” (EUR Lex, 2016, §101). The T2S project – and more broadly the creation of financial infrastructures by EU bodies – must be seen in light of this ideal of free and frictionless competition across borders in the EU. As I have analyzed elsewhere, the T2S project can thus be seen as a response to a general problem in the EU of securing competition understood as a “level playing field” (Krarup, 2019a, 2021, 2022, 2023). Paradoxically, the buttressing of private competition requires harmonized and centralized market infrastructures. This provokes problems about when a service – such as the settlement of transactions – is a commodity to be offered by private companies on a competitive basis, and when it is a necessary infrastructure for the level playing field of the single market that demands strong centralized governance (Krarup, 2019a; Brandl and Dieterich, 2023).

However, at the same time, T2S and other contemporary financial infrastructures appear to reflect older and far more widespread problems of credit and settlement than the context of EU law would suggest. In this chapter, I outline these two ways of understanding T2S. First, there is the historically contingent perspective of European integration. Second, we may adopt a more universal perspective on settlement that emphasizes the fundamental dynamics of money and credit. I ask what the relationship between the two perspectives is and whether they conflict with each other. Specifically,

I trace the origins and design of the T2S securities settlement platform and use this as a background to address the relationship between the universal and fundamental problems of credit and financial infrastructures, on the one hand, and the specific political and technological context of European market integration on the other. I begin by offering an overview of securities settlement systems (SSS), relating them to general problems of credit and financial infrastructures. I then outline the history of the T2S project, explaining its functioning and construction, showing how T2S relates to the general problems. On this basis, I discuss how the specific technopolitical contingencies of the T2S project, the legal and discursive determinants of EU market integration, and the universal problems of credit and financial infrastructures are related.

2 The Strange World of SSS

When a financial trade takes place, for example, on a stock exchange, that transaction needs to be settled, meaning that the cash must be paid and the financial assets delivered in exchange (cf. Petry’s chapter, this volume). Today, both payment and delivery are essentially digital accounting operations. However, despite digitalization, agreeing on a deal and signing a contract remains different from the actual delivery of the purchased asset and corresponding payment in money. Where and how does payment and delivery take place when it comes to contemporary financial products? The question

leads us to SSS. These are parallel and complementary to payments systems, often connected to them in order to be able to effect payment and delivery simultaneously. SSS thus provide essential infrastructural services to contemporary financial markets (see also Golka and Swartz’s chapters, this volume). The present European standard is for settlement to take place two days after the trade (“T+2”). As I detail in the sections that follow, instantaneous settlement is possible, for example, in the highly advanced domestic bookkeeping systems and on the T2S platform, but the standard deference is often employed because complexity and the number of “custodian” institutions that have to be in concert demand it – especially in the case of cross-border transactions.

The “settlement chain” illustrated in Figure 16.1 is a concept used by professionals to describe the three main steps of trading, clearing, and settlement. What happens in the first step – trading – is generally well known: trading can take place on stock exchanges, bilaterally (“over the counter”), or in open market operations, where central banks buy or sell sovereign bonds to affect the short-term interest rate in markets. Some transactions go from here directly to be settled in “real time.” Others (especially those from stock exchanges) pass by a “clearinghouse” that accumulates the multilateral positions of each participant throughout a period of time (such as a day), netting in- and outflows before settlement. Clearinghouses allow participants to save liquidity and plan their financial flows (see also Riles, 2004; Millo et al., 2005). Finally, in settlement the

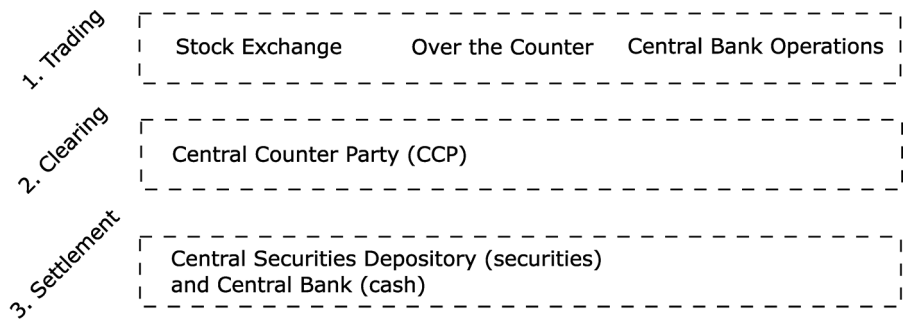


Figure 16.1 The settlement chain.
Source: Author

actual exchange of money and securities takes place on the accounts of the counterparties (traders). Often, such final settlement takes place in the central bank for cash and in so-called central securities depositories (CSDs) for securities. Like clearinghouses, CSDs are regulated as infrastructures, meaning that they can have little exposure in the market.

Settlement is thus removed from what we usually imply when talking about financial markets (trading floors, stock exchanges, banks, monetary operations), in terms of regulation, institutions, and time. It is therefore important to remember that, when we begin to discuss credit, money creation, and securities later in this chapter, one should not draw too hasty conclusions from the insights gained in the domain of infrastructures back to financial markets. Nevertheless, there are important analytical and conceptual insights to be gained from this which I will discuss in the sections that follow.

3 The Payment Infrastructures of International Finance

Instruments of credit are virtually as old as the available written records, and so basic operations of financial infrastructures, such as clearing and settlement of credit instruments, have a very long history. In ancient Babylonia and Egypt, credit instruments were used for collecting taxes and governing the seasonality of agriculture (Davies, 2010). In the twelfth century, the great fairs in the Champagne region connecting Northern and Southern European industries involved extensive use of agents, partnerships, and professional freighters and couriers, forming a system “based entirely upon credit” with net clearing and settlement (*pagamentum*, “making peaceful”) at the end (Face, 1958). In the nineteenth century, London bankers organized the multilateral clearing of checks as follows. When a client of a bank made a payment by check, the receiver would take that check to his bank, which in turn would have to get the money from the payer’s bank. To facilitate this process, every day the London banks would send delivery boys with

checks they received to the Bankers’ Clearing House where, by the end of the day, the net position of each participant (between cash receivable and cash payable) was calculated (Babbage, 1963 [1832]). As for today, Perry Mehrling has shown how the basic principles of finance remain highly stable across widely different financial instruments and that there are striking parallels between the fundamental logics of nineteenth century and contemporary finance, including such modern creations as “shadow banking” (Mehrling, 2010; Mehrling et al., 2015).

In all of these cases, the instruments of credit and finance are closely connected to the infrastructures designed to safely and efficiently generate, trade, transfer, and settle them. In fact, I would claim it is impossible to separate money and credit from financial infrastructures because money and credit are themselves such financial infrastructures, at least in part. This claim diverges from the definition of money by its “functions” found in contemporary economics textbooks (but dating back to Aristotle’s *Nicomachean Ethics* vol. 5): a *store of value* (“a way to transfer purchasing power from the present to the future”); a *unit of account* (“the terms in which prices are quoted and debts are recorded”); and a *medium of exchange* (“what we use to buy goods and services”) (Mankiw, 2012, p. 82). The standard definition dislodges from view the deep and indeed foundational contradictions immanent to the concept of money. The paradox becomes more evident by saying that money is, simultaneously and often conflictually, commodity and credit (Krarup, 2021).

To the extent that money has historically been a material commodity, such as cattle or gold (a view advanced by economists such as Menger (1892) but historically misleading according to Davies (2010)), money was created when that commodity was created (e.g., when gold was mined). Pure commodity money would be highly inefficient because market participants have to earn before they can pay. A merchant who wants to sell goods at a high profit in a distant market needs credit to pay for the goods now in the home market collateralized with the expected future return

on the trading. However, when banks extend credit, they do not take material commodity money (such as gold) from their vaults and hand it over. Today, money is created when banks make loans – that is, money is simultaneously commodity and credit (Bank of England, 2014). The bank does not take the money from somewhere else and give it to the borrower. Instead, it simply enters the deposit on the debtor’s account corresponding to the loan obligation. Using simple T-balance sheet notation for economic entities (individuals, firms, or other) with assets (what the entity owns or has a right to) on the left side, and liabilities (what the entity owes to others or to its owners) on the right, money creation can be illustrated, as in Figure 16.2.

Both the balance sheet of the bank and of the borrower thus expands with lending. Indeed, the credit goes both ways in the sense that the bank has just promised to pay out the deposit *on demand*, while the borrower has promised to pay back the loan (plus interest) within a specified period. The bank makes money from the loan on fees and on the interest rate gap between loan

and deposit, while the borrower may make money from being able to invest (i.e., to buy before they sell).

In this way, credit supports the division of labor in society, with the bank specialized in credit rating and in credit risk management, and borrowers exploiting their capacities more fully by being able to invest in their market of expertise, as well as to ride out unforeseen liquidity fluctuations. Borrowers rarely cash out more than small change, but the bank will need a reserve to be able to make payments on behalf of the borrower to counterparties using other banks. In Europe today, such interbank payments pass through the national central bank (via the “reserve deposits” that the private banks, in turn, hold there). This is illustrated in Figure 16.3. Of course, the central bank can grant credit (reserve deposits) to banks in the same way as in Figure 16.2 – and does so almost automatically against legible collateral, especially government bonds, opening up the whole question of state–market relations, which I shall leave aside here (Gabor and Ban, 2016; Krarup, 2019b).

Bank				Borrower			
Assets		Liabilities		Assets		Liabilities	
+ Loan						+ Loan	
		+ Deposit		+ Deposit			

Figure 16.2 Money creation through lending.
Source: Author’s elaboration.

Payer		Bank 1		Central bank		Bank 2		Payee	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
- Deposit		- Deposit			+ Deposit (Reserves)	+ Deposit (Reserves)	+ Deposit	+ Deposit	
		- Deposit (Reserves)		- Deposit (Reserves)					

Figure 16.3 Payment example.
Source: Author’s elaboration.

The T2S is essentially a system of inter-connecting national central banks to form a pan-European system where payments are ultimately settled in central bank money. Because central banks don't involve the same risk of bankruptcy and default on payments as private banks do, payment in central bank money is considered safer and more efficient.

The banking sector can thus be conceptualized as a bookkeeping system. But at the same time, the banking system creates money on a competitive basis by making loans. In this way, banking is *both* a market and a market infrastructure. Indeed, we have a paradox – a conceptual contradiction: money is both a system of bilateral credit relations and the universal medium in which exchange takes place. It is both market and market infrastructure.

Bookkeeping money ideally requires a fully integrated, but also centralized and hierarchical, system where central bank money has a “higher quality” than commercial bank money (Mehrling, 2013). First, the central bank cannot go bankrupt because what it owes to the commercial banks is its own liabilities and these it can create at will (however, it can go bankrupt if it cannot pay other central banks what it owes them, creating an international hierarchy with the US Federal Reserve Bank at the apex). Second, the fact that the liabilities of all other banks in the system are “promises to pay in central bank money” means that the credit of different banks take on the *exact same* value – at least in “normal times,” when a crisis does not threaten to make a specific bank illiquid. Today, we take this for granted, but historically and logically there is no reason why this has to be so. In a horizontal system of binary relations (“free banking”) the value of the liabilities of each bank would be different. In the “wildcat” years of largely unregulated US banking without a central bank, geographical distance between banks and varying quality of the banks issuing not only deposits but also their own dollar banknotes meant that banknote brokers – like foreign exchange brokers today – exchanging “foreign” notes

for local ones could charge discounts of sometimes more than 40% (Dillistin, 1949; see also Haveman, 2015).

3.1 Money and Credit on the T2S Platform

We are now in a position to appreciate how the money side of T2S – payments – functions and how it relates to historical problems of financial infrastructures. T2S, which is connected to TARGET2, runs both deferred net settlement and real-time settlement. One challenge with real-time settlement is the coordination of liquidity flows – does the payer have enough money in their settlement account so as to not deadlock the flow of transactions? In order to avoid participants holding large liquidity buffers in the settlement system, T2S has a function called “auto-collateralization” whereby payees are automatically credited with the cash they need to settle transactions in real time. Auto-collateralization can be either “on stock,” using securities that the payee has available in the system, or “on flow,” using the very incoming securities that the credit is used to buy. The latter option may strike the reader as almost magical at first. However, the logic is in fact similar to that of a mortgage – and to many other forms of collateralized credit – where the real estate purchased serves as collateral for the very credit used to finance the purchase.

As illustrated in Figure 16.4, in auto-collateralization everything happens at once as a simple bookkeeping operation: the cash never actually goes to the buyer's account, but goes directly to that of the seller. The buyer has opened a free-of-charge intraday credit with the central bank that they will have to pay back before the end of the day. The historical overview and the introduction to balance sheet analysis should make clear that auto-collateralization is “just” a sophisticated implementation of basic principles of money and finance. T2S thus manifests the virtually infinitely flexible and fully integrated role of credit-commodity money as a market infrastructure (Krupp, 2021).

The takeaway message in this section is, firstly, that by offering a highly integrated

Buyer Bank		Central bank		Seller Bank	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
(+ Pledged securities)				- Securities	
	+ Intraday credit	+ Securities (pledged)			
			+ Deposit	+ CB Reserves	

Figure 16.4 Auto-collateralization on the T2S platform.
Source: Author’s elaboration.

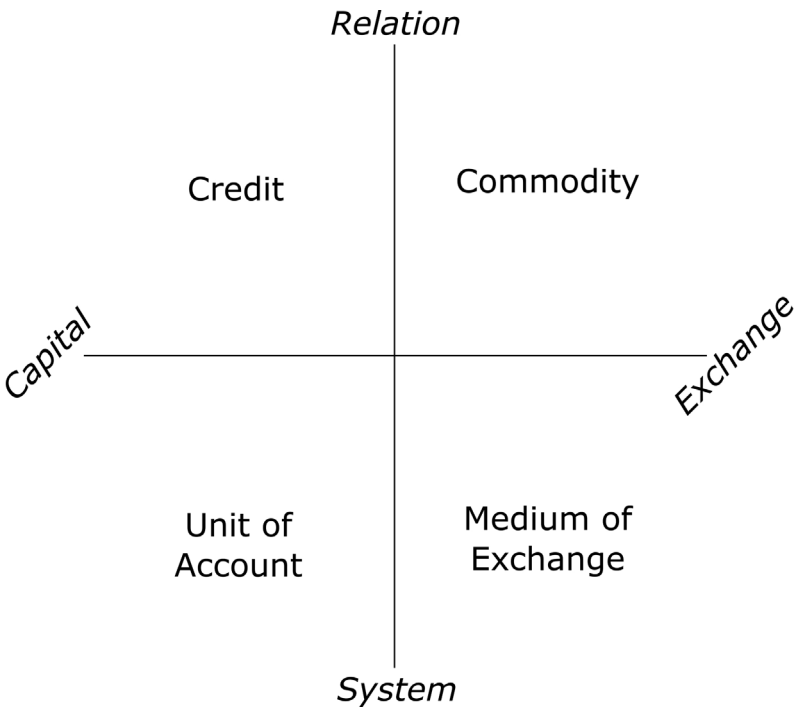


Figure 16.5 Money as credit and commodity.
Source: Author’s elaboration.

and efficient settlement system at the apex of the “hierarchy of money” (Mehrling, 2013) in Europe, T2S offers a favorable situation for the participating financial institutions. Both real-time and deferred net settlements are possible; however, the distinction between the two becomes blurred due to the affinity of automatic settlement credit and clearing. Indeed, the temporal gap between trade and settlement can be conceived as a kind of outstanding credit where the checks received by the payees are still only *promises* to pay (the

payer’s bank may default on it, or even go bankrupt in the meantime), which introduces the complexity of risk and capital into the seemingly trivial settlement process and blurs its separation from the market (Millo et al., 2005; see also Riles, 2011). Second, we should appreciate that banks are inextricably both market players (granting credit on a competitive basis) and market infrastructures (operating payments). Finally, as a public settlement infrastructure, T2S cannot be decoupled from credit creation, even if the credit is not

money, officially (Millo et al., 2005; Krarup, 2019b, 2021). All in all, the attempt at separating settlement from markets through the creation of infrastructures like T2S does not escape the double nature of money and credit.

Figure 16.5 summarizes the analysis of money and the problems that the paradox of money poses for clearing and settlement. As a contractual relationship between market agents, money is either credit (capital, “producing” rent or interest) or a commodity (used in exchange). But at the same time, money is a system or infrastructure. As the generalized commodity for payment, money is the “medium of exchange,” whereas as the generalized measure of credits it is the “unit of account.” As we have seen, these “functions” do not simply add up, but produce distinct problems – which the TARGET systems can be seen as attempts to handle at the European level.

4 Securities and Custody across Borders

I now turn to the securities side of settlement, having dealt with the liquidity side. Historically, when stocks and bonds were material sheets of paper held by the owner, it could take much longer than the present European standard of two days (T+2) to settle a securities transaction, not least due to the need for physical transportation. Professional “custodian” banks are generally used to take care of the practical aspect of settlement. In the case where the transacting parties are clients with the same custodian bank, the sheets of paper do not need to move at all – perhaps not even to a different box in its vaults – but can simply be ascribed to another account (Norman, 2007, p. 11). This is the principle of *immobilization* of securities: if all transacting parties – directly or indirectly through other banks – had deposited their securities in accounts with the same custodian, then settlement would in principle be simple bookkeeping, as illustrated in Figure 16.6. In addition to *immobilization*, over the years the dramatic increases in the computational power of information

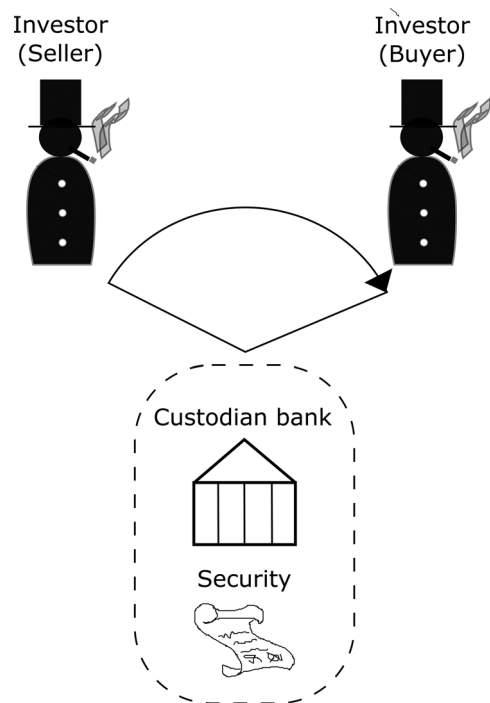


Figure 16.6 Custody (immobilization) of securities.

Source: Author's elaboration.

technology allowed for the complete *dematierialization* of securities, which would no longer be issued in physical form, but only as numbers in electronic accounts – as pure bookkeeping (ECB, 2007c, p. 7). Physical existence and movement of paper was thus eliminated altogether.

However, custody is also a competitive business and the differences between national jurisdictions, technical standards and systems, language, and even culture means that many banks only provide custody services within their domestic context, or only across a few countries in a particular region. But even the biggest and most specialized custodian banks can get into trouble. For example, with financial internationalization growing rapidly, the apex of the global financial system in New York experienced a severe *paperwork crisis* in 1968 (Norman, 2007; Wolkoff and Werner, 2010). Executing a single transaction involved some thirty different documents with hundreds of messengers – which one trader describes as “low paid, incompetent and seemingly non-English speaking” (quoted

in Norman, 2007, p. 21) – traveling around Wall Street (Wolkoff and Werner, 2010). Stock exchanges reduced opening hours and even closed on Wednesdays to give back-offices time to unload, yet they were unsuccessful in preventing settlement and delivery failures, with losses reaching some 4 billion dollars and about 160 broker-dealers closing, merging, or filing for bankruptcy (Wolkoff and Werner, 2010). Other important overload crises in international settlement infrastructures include Euroclear's electronic jam around 1978. Indeed, the exponential growth from a literally nonexistent international bond market in 1965 to \$18 billion outstanding by 2006 (BIS figures reported by Norman, 2007, p. 34) could not have taken place without continuous development and integration of financial infrastructures.

In New York, the paperwork crisis eventually led to the establishment of a CSD, owned by the stock exchange and the securities dealers, where all domestic securities could be immobilized and transferred by book entry (Norman, 2007, p. 41). The CSD would only occupy itself with the actual settlement – all the services related to trading, issuing, and holding securities – such as credit provision, dividend payments, cross-border settlement, and underwriting – would still be the domain of commercial banks. Some European countries already had CSDs (Norman, 2007, p. 39), but, like their US counterpart, they were not linked across borders. The continuous rise in cross-border financial activity, therefore, also provoked important developments in “global custody.” Major US banks like Chase Manhattan, State Street, and the Bank of New York pioneered this business by offering their clients “a single access point to national CSDs through a network of intermediaries” (Norman, 2007, p. 86). One of the major US custodian banks, JP Morgan, set up a so-called international CSD, or ICSD, in Brussels. The ICSD later became Euroclear and was sold off to its users – primarily international custodian banks, such as BNP Paribas and Société Générale. Together with its main competitor Clearstream – set up in Luxembourg a

few years later by a consortium of European banks (ECB, 2007c, p. 10) – Euroclear played an important role in the events that led to the T2S project about three decades later, as we shall see.

Many CSDs were initially set up in close collaboration with – and sometimes based on strong pressure from – central banks to allow settlement in central bank money. For example, in France, a CSD for government bonds was created by the central bank (later merging with the CSD of the stock exchange), and in Denmark a CSD with cutting-edge technology was set up by the financial sector, pushed by the central bank. Now, delivery of securities in the CSD and payment of cash in the central bank could take place simultaneously to eliminate any risk that the one would settle without the other. The technique became known as *delivery versus payment* or DvP, first introduced in the 1980s. Nevertheless, even if national CSDs are directly linked (which they are in some cases) or if banks hold securities in one of the ICSDs, they will need a custodian bank to handle all the legal and technical aspects of custody.

As depicted in Figure 16.7, the landscape of cross-border settlement in Europe thus remained complex even after the euro was implemented, compared to the streamlined domestic systems. This meant that cross-border settlement was substantially more expensive, less efficient, and less safe than domestic settlement (Giovannini Group, 2001). Contrary to domestic settlement, cross-border settlement is not always in DvP mode, nor does it use central bank money. Even settlement between the two ICSDs, Euroclear and Clearstream, could be complicated before they relaxed mutual animosities and established efficient accounting relations with each other (Norman, 2007).

In the words of economists, post trade is highly concentrated because it is a *network* industry: the more clients you have, the more you can settle internally, and the cheaper it can therefore be done. The global custodian will seek to constantly optimize liquidity across the different countries and systems in which it is active – avoiding surplus in one country and deficit in another (at a penalty

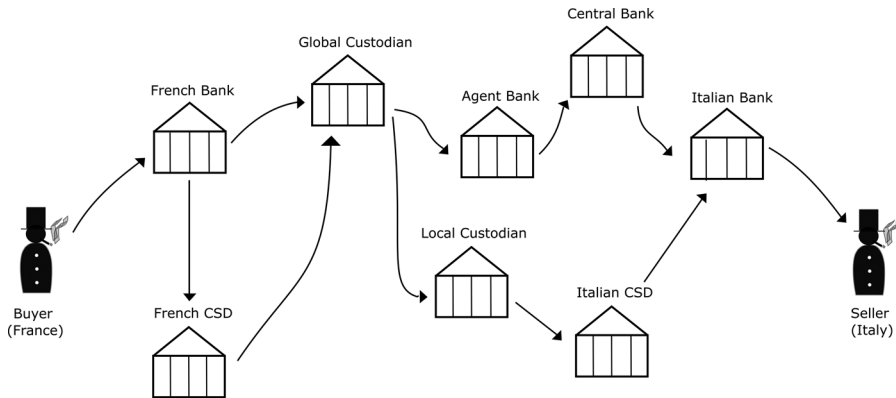


Figure 16.7 Cross-border settlement in Europe before T2S.

Source: Author's elaboration.

overdraft rate of interest). Custody is also a *fixed cost* industry with large economies of scale: if a custodian bank settles between two countries, it needs experts to deal with the differences in things like legislation. But once a system is in place, it is comparatively inexpensive to treat 1,000 transactions instead of 100. What the sterile language of utility and costs neglect is that these features are rooted in deeper structures of clearing and settlement which are simultaneously characterized by a problem of *fragmentation* and a logic of *centralization* (Krarup, 2019a).

5 Toward T2S

Already the Treaty of Rome (1957, Article 3.c) had established the objective of “the abolition, as between Member States, of the obstacles to the free movement of [goods], persons, services and capital.” The free movement of capital attracted increasing political efforts from the mid-1980s on (Grossman, 2012, p. 195). But for capital to move – as we have seen – post-trade infrastructures need to be in place. Discussions on clearing and settlement of securities in Europe dates back at least to the late 1970s, but change was slow until the introduction of the euro made progress more urgent.

Around 2000, there was widespread optimism about the integration of securities settlement infrastructures making leaps toward integration. An Action Plan (European

Commission, 1999) was adopted, followed up by the Markets in Financial Instruments Directive (MiFID) in 2004, which effectively harmonized securities trading (but not settlement) across Europe and thereby created competition between stock exchanges, leading to a wave of mergers and acquisitions in the field (Haan, Oosterloo, and Schoenmaker, 2015, pp. 90–94). Two reports commissioned by the European Commission estimated that the cost of settlement of cross-border securities transactions in Europe was about eleven times higher than domestic settlement and defined a strategy for private and public action to remove “barriers” by 2006 (Giovannini Group, 2001, 2003). Looking back on a process that would eventually take another ten to fifteen years, the challenges and complexities were clearly underestimated.

Indeed, there was no sign of anything like the ECB-led T2S project around 2000 because financial infrastructure integration was seen as a private-sector responsibility. Market-driven integration, supported by legal harmonization, was widely believed to be within reach (Norman, 2007, p. 103) and more in line with the principles of an open-market economy with free competition enshrined in the treaties and in the Statute of the ECB and of the Eurosystem of central banks (EU, 2012, Art. 2; see also Giovannini Group, 2001; Lamfalussy Committee, 2001; European Commission, 2004). As late as 2006, Commissioner McCreevy stated that “an industry-led solution is the best outcome

for improving the efficiency of clearing and settlement in the EU” (McCreevy, 2006, p. 4).

However, we have seen how money and credit require integrated and indeed centralized institutional structures in place. Economists speak of network externalities and economies of scale pushing for strong centralization and possibly even a natural monopoly because the biggest firm will have a competitive advantage and drive out all its competitors. Once the monopoly is established, however, the firm will have “monopoly power” and therefore be able to charge a higher price and make a “monopoly profit.” Indeed, the national CSDs were monopolies, including the US CSD, which served as a reference in the Giovannini reports.

Economists claim that without competition the pressure for innovation will be lost – disregarding (as economists so often do) the historical fact that many CSDs were originally public or created on the background of strong central bank demand (Van Cayseele and Mededinging, 2004, p. 3; Serifsoy and Weiß, 2007, p. 3038). So they advocated for “contestable quasi monopolies” for European settlement (Van Cayseele and Mededinging, 2004; see also Rochet, 2006; Kempainen, 2007; Milne, 2007a, 2007b; Serifsoy and Weiß, 2007). According to these authors, such regulation would mitigate barriers raised by: (1) firm-to-firm hostilities, such as the missing

link between Euroclear and Clearstream or (2) by exclusive technical standards, such as in most integrated domestic systems where the CSD, stock exchange, and central bank formed a close-knit whole – “silos” where you have to either buy the whole package or not be connected at all.

The strategy of contestable quasi-monopolies, supported by legal and technical harmonization, was essentially the vision adopted by the Commission in the early 2000s. Indeed, a number of mergers took place. The Scandinavian CSDs attempted to merge in the late 1990s, and there were proposals of merging the French and the German CSDs, but they failed (Norman, 2007, pp. 141–149). The big question was what would happen with the two ICSDs, Euroclear and Clearstream. The German CSD and Clearstream merged in 1999, owned by Deutsche Börse. Shortly after, Euroclear acquired the French, Dutch, and Belgian CSDs with the explicit ambition to create a “single shared platform” for the three countries in close corporation with their common stock exchange, Euronext – the so-called ESES (Euroclear Settlement for Euronext Securities) platform. This was “the first attempt to establish a truly cross-border marketplace for securities” (Panourgias, 2015, p. 3).

Euroclear’s idea was to integrate not only settlement, but also the other elements of

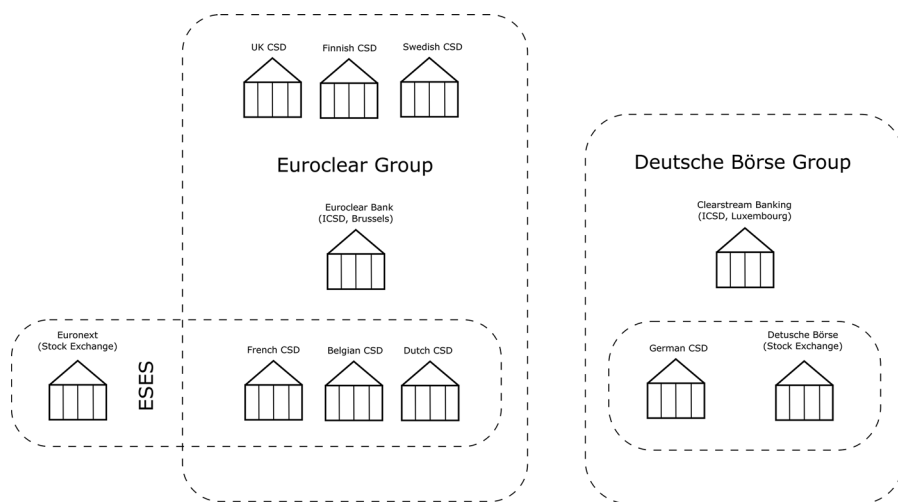


Figure 16.8 Euroclear and Clearstream groups.

Source: Author's elaboration.

the CSD business – notably issuing securities and servicing the various events that occur during the “life” of a security, such as coupon and dividend payments, tax claims, splitting, and so on – all summarized under the term “corporate actions.” With this project well underway, Euroclear continued acquiring further CSDs – the UK (2002) and the Finnish and Swedish (2008) (Euroclear Bank, 2024). Euroclear was moving toward a successful first step in its overall ambition for a “single settlement engine” for all its CSDs (see Panourgias, 2015). The result of the principal mergers is depicted in Figure 16.8.

But the wave of mergers soon died out again. Clearstream did not pursue expansion any further. The Euroclear project was unprecedented, but stagnated due to a growing list of difficulties and, it seems, lack of support from local market players and regulators.

6 The T2S Project: Resigning from the Market to Save the Market

Then, in 2006, the ECB decided to force a new way ahead (for details on this turning point, see Krarup, 2019a, 2021). The ECB announced that it was “evaluating opportunities to provide settlement services for securities transactions” by setting up a new service “which may be called TARGET2-Securities” (ECB, 2006). Following a feasibility study (ECB, 2007a) and a public consultation (ECB, 2007b), the T2S project was launched by the Governing Council of the ECB on July 17, 2008 (ECB, 2008). In the press release, the ECB stated that “T2S constitutes a major step forward in the delivery of a single integrated securities market for financial services ... T2S will provide a single, borderless pool of pan-European securities, as well as a core, neutral, state-of-the-art settlement process” (ECB, 2008).

The ECB essentially set out to create a single securities settlement platform not only for the Eurozone, but for the whole of the EU, owned and operated by the Eurosystem (composed of the ECB and the national central banks). However, there was

now an appreciation that the vision faced a long path ahead and that considerable work of legal harmonization would be required (McCreevy, 2007). Elsewhere, I have analyzed the series of controversies that played out before T2S was in fact implemented from 2015 onwards, including the difficult legal harmonization (Krarup, 2019a). Here, I simply note that the apparent U-turn in strategy from private to public initiative seems to have been made possible not simply by the fact that settlement is a natural monopoly, but more profoundly by the paradoxical nature of money and credit instruments as, simultaneously, market and infrastructure.

The simple principle of T2S is to bring all securities accounts from the national CSDs onto the same pan-European settlement platform where transactions can be settled in DvP mode and in central bank money via a connection to the T2S. This is illustrated in Figure 16.9. A bank will thus have a cash account with its central bank, which in turn is connected to the whole Eurosystem of central banks via TARGET2, and a securities account with its CSD, which in turn is similarly connected with the whole Eurozone via T2S. The idea is that, in this way, the Eurosystem-operated T2S platform will provide cheap, safe, and efficient settlement in DvP mode and central bank money for the whole Eurozone.

According to the ECB’s online introduction to T2S, the platform has the following benefits:

- making it easier for investors to buy securities in other EU countries
- reducing the cost of cross-border securities settlement
- increasing competition among providers of post-trade services (i.e. clearing and settlement services) in Europe
- pooling collateral and liquidity, meaning that banks no longer need to keep these in various locations and can quickly move them to where they are needed
- reducing settlement risk and increasing financial stability by using central bank money for transactions on the platform. (ECB, 2022)

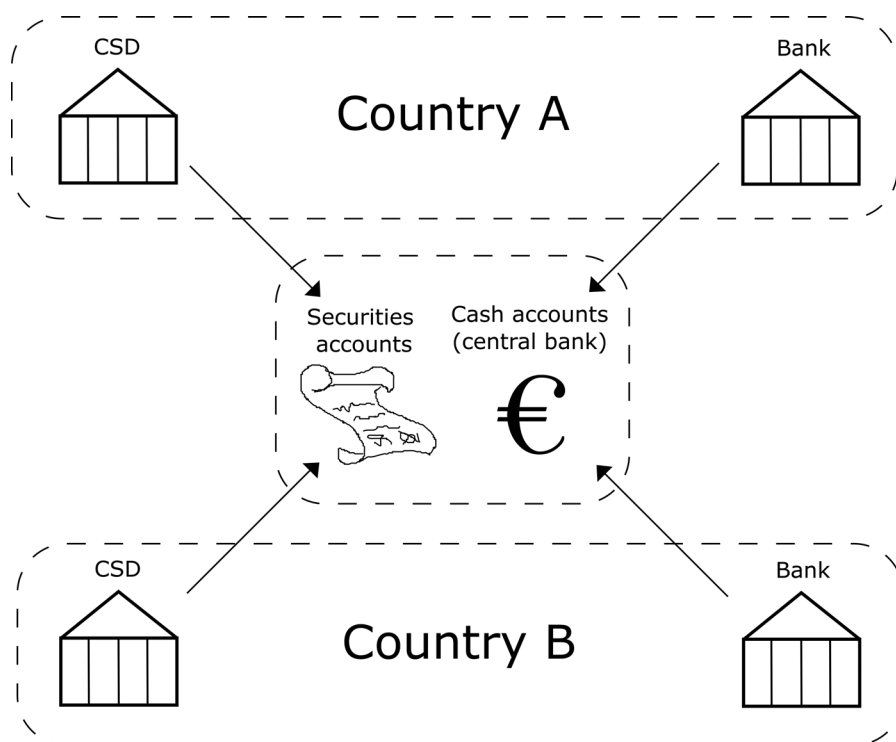


Figure 16.9 T2S: A pan-European settlement platform.

Source: Krarup (2019a), Taylor & Francis Ltd, <http://www.tandfonline.com/>; see also ECB (2024, p. 21).

In brief, T2S connects all the CSDs of the participating countries and hence offers an integrated DvP system for cross-border settlement using central bank money. Financial institutions holding securities accounts in a national CSD can hold a dedicated cash account on T2S to settle transactions on the platform. Moreover, T2S offers optimization tools such as auto-collateralization and other algorithms, which are particularly interesting to large institutions. It is even possible for direct participants to make instructions directly in T2S, circumventing their CSD and central bank. T2S connects twenty-one CSDs from twenty European countries, including one non-euro country, Denmark, with the option to settle in the Danish krone (ECB, 2022).

Following the 2008 financial crisis, it was realized that T2S had the additional benefit of unlocking securities held passively in different countries as buffers (collateral) by international financial institutions through pooling and optimizing the “liquidity” of collateral (Krarup, 2019b). Moreover, T2S

was later acknowledged to constitute an important prerequisite for the Commission’s new plans for the next steps in financial market integration, such as the Capital Markets Union and various new regulations (European Commission, 2015).

7 Concluding Discussion: A European or a Universal Problem?

Theoretically, T2S confronts us with a dilemma. On the one hand, we have seen how the paradoxes of credit are age-old and, in that light, the T2S project appears almost natural. On the other hand, we have seen how T2S constituted a break with the dominant strategy for financial market integration in Europe around 2006, and that the road from conception to implementation was long and difficult. How do we square the quasi-universality of the logic of credit and settlement with the contingencies of the EU? The question is obviously fundamental and hence very difficult to answer. However,

even raising it and offering some initial observations about it affords a contribution to contemporary social studies of finance.

T₂S is more than the robinsonade of a new technology. It responds to, literally it seems, universal problems of credit and settlement, as well as to the telos of market integration enshrined in EU treaty law, understood as the removal of all barriers to free competition (Krarup, 2022). Perhaps the relationship between the two mechanisms is that markets have been made central to the European integration project via treaty law since the Treaty of Rome (1957). Indeed, it is not obvious that the paradox of money as market and as infrastructure, respectively, should become a central problem of European governance, except for the fact that it has become a cornerstone of European integration via the objectives of removal of barriers to competition and trade. Paradoxically, the removal of such barriers became the motivation and legitimation of the T₂S project, although it at least resembles a public monopoly (Krarup, 2019a).

In this account, the pursuit of market integration understood negatively as the removal of barriers to competition runs into paradoxes about what that “market” is, raising questions about the provision of adequate (harmonized, centralized, efficient) market *infrastructures*, notably of clearing and settlement. For example, we have seen how clearing and settlement

cannot be isolated from credit and hence some sort of money creation.

In my previous work on T₂S (Krarup, 2019a, 2019b, 2021, 2022), I have emphasized the distinctively European side of these problems. However, more work is needed to settle the question of the relationship between the specifically European and the broader, ancient problems of money and credit between market and market infrastructure. For now, based on the analysis given, I propose what I call the “amplification thesis”: that the inscription of a distinctly competitive conception of the market in core treaty texts amplifies the problems of credit and settlement and market infrastructures in European integration policy.

T₂S was not a predetermined fate of the Treaty of Rome. Besides all the contingencies of history and politics, the problems inscribed at the core of the European project of defining “the market” and delimiting it from “market infrastructures” and from “government” means that new responses to the paradox of money must be developed and replace old ones when these break down. T₂S was such a new response in a contingent situation and has, so far, been a largely successful one. However, the fundamental conceptual problems are far from settled.

For example, I do not think that the problem of government is simply imposed upon the paradoxes of credit and financial infrastructures by European treaty law. I call it the “amplification thesis” and not the

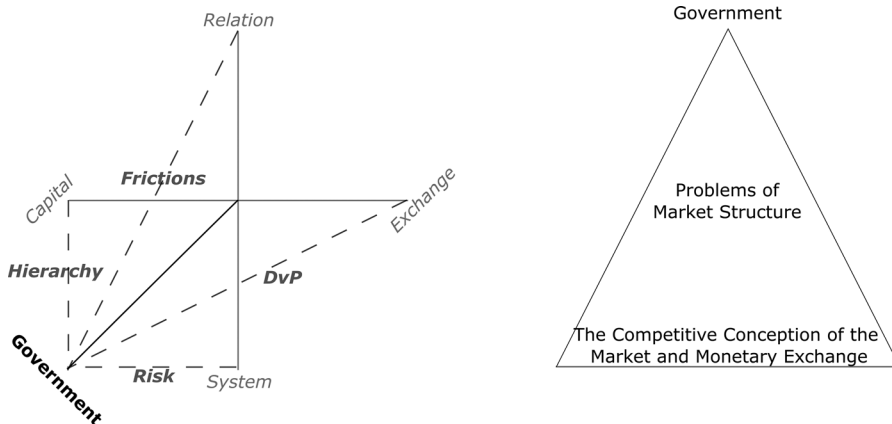


Figure 16.10 Government in the competitive conception of the market.

Source: Author’s elaboration.

“imposition thesis” because the problem of governance emerges from within those paradoxes, but are amplified in Europe, it seems, because afforded a central legal and political position. In this perspective, T2S represents a technopolitical response to ancient problems or paradoxes of credit and settlement – the most recent response in a long lineage of responses and probably not a final solution to the problems (Krarup, 2021). Returning to Figure 16.5, we may thus add a third dimension – that of governance or government (public or private in the sense of centralized power of organization), as in Figure 16.10.

Government emerges from four types of problems in the original plane: (1) problems of “frictions” in the *relations* of exchange and capital circulation; (2) problems of “delivery versus payment” in *exchange*, such as default risk or technical barriers to transactions; (3) problems of “risk” in the system of exchange (market) and capital (economy), such as the risk of liquidity and credit “freezing up” (Krarup, 2019b); and (4) problems “hierarchy” with credit as capital. I have not developed the fourth point here, but I’m referring to the “hierarchy of money” (Mehrling, 2013) and the way it leaves different types of institutions with different sources of rent in a hierarchical structure of credit and payment infrastructure institutions, as we have seen – rather than establishing a “level playing field” for all.

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Opportunities and Barriers to Regional Payment Systems

The Case of the SML

Annina Kaltenbrunner and Bianca Orsi

1 Introduction

The subordinate position of developing and emerging countries' (DECs) currencies in the international monetary system is an important constraint on autonomous development and structural change. Currently, DEC currencies hardly fulfil any functions of money on the international level (and at times not even the national level).¹ If DEC currencies have been demanded by non-residents or non-nationals, this demand has been largely for purposes which do little to support – or even undermine – development and sustainable structural change. Specifically, as of 2023, hardly any DEC currency – potentially with the exception of the Chinese renminbi – acts as an international unit of account (both for trade and financial transactions), means of payment, and store of wealth. The recent increase in demand for DEC currencies has been largely driven by short-term, speculative carry-trade purposes to take advantage of favourable interest rate differentials and exchange rate dynamics (Orsi, 2019).

This international monetary asymmetry, however, fundamentally shapes and at

times constrains macro-financial dynamics and policy-making in DECs, a phenomenon also known as monetary or international financial subordination (Alami et al., 2023). For example, DEC currencies' limited use as an international trade invoice and settlement currency generates a structural need for foreign exchange to pay for imports. The inability of DEC agents to borrow long term in domestic currency (act as a long-term store of wealth) or use their currencies as international funding currency (means of payments in financial transactions), on the other hand, increases their vulnerability to international monetary and financial conditions. Thus, reducing monetary subordination through supporting a more broad-based and resilient demand for DEC currencies is an important element of a sustainable development strategy.

The existing critical political economy literature on the asymmetric international monetary and financial system (e.g., Prates and Andrade, 2013; Kaltenbrunner, 2015; Bonizzi, 2017; Alami, 2019; Koddenbrock, 2020) has so far largely focused on the broad macroeconomic (e.g., balance of payments)

and financial (e.g., the extent of financial integration) structures that both underpin and would need to change to increase monetary sovereignty in DECs. So far, this literature has paid little attention to the infrastructures, which both underpin and could be used to build monetary sovereignty from the bottom up.

The small literature on local currency payment systems in DECs (e.g., Khiaonarong, 2013; World Bank, 2014; Arner et al., 2022) is largely policy-focused rather than conceptual, emphasizes their ability to stimulate regional trade rather than build monetary autonomy, and highlights their technical and regulatory constraints rather than complementary policy measures and political economy dynamics. It thus presents infrastructures as mere technical devices and depoliticizes the profound politicalness of payment infrastructures. The few exceptions are Trucco (2012), Fritz and Mühlich (2014), and Caldentey, Tomassian, and Melo (2022), who present comparative analyses of different regional payment systems in Latin America as a means to reduce the region's excessive dependence on the US dollar and create some more policy space for autonomous development. Yet, these contributions are largely based on quantitative data which allow limited insights into the specific technical, macroeconomic, and political constraints on using these systems to reclaim monetary sovereignty.

The role of payment infrastructures for both underpinning and building international monetary power has received some recent attention in international political economy and critical infrastructure studies (e.g., Dörny, Robinson, and Derudder, 2018; de Goede, 2020; Westermeier, 2020; Eichengreen, 2022; Nölke, 2022). However, this literature largely focuses on the top of the monetary hierarchy, that is, the dollar (SWIFT: Society for Worldwide Interbank Financial Telecommunication) and its potential contenders (e.g., the Chinese CIPS: Cross-border Interbank Payment System). Those writings which have analysed monetary and financial infrastructures in DECs have largely interpreted them as colonial

devices, which impose systems developed in and for the Global North to subordinate financial spaces (e.g., Davies, 2015; de Goede and Westermeier, 2022). As of yet, little attention has been paid to whether and how local currency payment and settlement mechanisms can be used to build monetary sovereignty in DECs from the bottom up. Put differently, the question arises whether states in DECs can use and indeed build their infrastructural power (both in the more 'macro' sense as in Coombs (this volume), or in the more 'micro' sense laid out in Pinzur (also this volume) to reclaim autonomy over their monetary space in a hierarchic and structured international monetary system.

This chapter attempts to generate some initial answers to these questions using the Local Currency Payment System (in Portuguese *Sistema de Pagamentos em Moeda Local* or in Spanish *Sistema de Pagos en Moneda Local*), the SML, between Argentina, Brazil, Uruguay, and Paraguay as a case study. The SML is a unique regional payment system that encourages the use of local currencies as trade invoice and settlement currencies in regional trade and service operations.² It was initiated by the Brazilian Central Bank (BCB) in June 2007 and started operating between Brazil and Argentina in September 2008. Uruguay joined in October 2014 and Paraguay followed in July 2018 (Zayas, 2020). However, despite some initial successes, the adoption of the SML has stalled over recent years and the use of regional currencies remains limited.

This chapter generates initial insights into why the attempt by regional central banks to foster the use of their currencies by using their 'infrastructural power' has had limited success. Using this infrastructural lens, it identifies some of the political, economic, and technical constraints of a more extended use of the SML. It draws on two main empirical sources. First, primary data in the form of twenty-nine semi-structured interviews with policymakers (the BCB), users (companies and trade associations), and financial intermediaries (banks) of the SML conducted between August 2017 and August 2019 (Orsi, 2019).³

Secondly, presentations and discussions at the first multi-stakeholder policy summit on the SML held at the Pontifical Catholic University of São Paulo on 2 March 2020, organized by the Universities of Leeds and Liverpool. The summit brought together representatives from all three SML stakeholders – users, financial intermediaries, and policymakers – and focused explicitly on identifying the current barriers that stall a broader use of the SML. The empirical analysis focuses on the period between 2008 and 2019, when the COVID shock hit and affected global trade relations worldwide.

On an empirical level, the results provide a detailed discussion of the operational, macroeconomic, and political constraints on establishing DEC regional currency payment systems. These include: on the operational level, issues such as high transaction costs, the inability to remove the counterparty risk, and the lack of affordable trade credit in regional currencies; on the political economy level, the unwillingness of cross-border banks to offer and advertise the system, and finally persistent macroeconomic challenges which undermine the willingness of local agents to receive and hold regional currencies.

On a conceptual level, the detailed insights into the decision-making of SML stakeholders point to three issues. First, the experience of the SML shows that to increase the acceptance of DEC currencies in the context of international financial subordination, the use of infrastructural power by the state (in a wide definition which also includes the central bank) might be a necessary condition to build monetary sovereignty from the bottom up. Indeed, as will be discussed in more detail later in this chapter, the SML has been conceived, implemented, and operated by the regional central banks, given the unwillingness of private financial institutions to provide local currency services (for a discussion of the role of the state in international financial subordination see, e.g., Santos (2023) and Alami et al. (2023)).

Secondly, however, our results also show that given the heightened external vulnerability, macroeconomic instability, and general

economic uncertainty – and the specific class interests attached to those – the use of infrastructural power is also fundamentally more circumscribed in financially subordinate economies than in advanced economies. This also means that in this context, fixing technical and operational issues will be important, yet not sufficient, to create a stable demand for DEC currencies. Instead, addressing the political relations – which an infrastructural lens helps us to unearth on a ‘micro’ level – and the hierarchic macro-financial structures, which underpin the global economy, remain essential to both understanding and potentially mitigating international monetary and financial subordination.

Finally, and related to the above – yet more focused on monetary theory and practical implications – our results also show that whilst important, bottom-up attempts to encourage DEC currency use through payment infrastructures will not be sufficient to establish a more comprehensive and sustainable demand for this currency. Instead, what is needed is a comprehensive and complementary development of all money functions at the same time. Supporting solely the unit of account function in trade transactions, as envisaged by the SML, will not be sufficient. Indeed, recent literature on the dominant currency paradigm in economics has shown that international money functions are complementary and need to be developed in a comprehensive and complementary way (Gopinath and Stein, 2021; Gopinath and Itskhoki, 2022). The conclusion of our research supports this statement. However, in contrast to this literature that – in line with neoclassical economic tradition – highlights a currency’s primary role as a medium of exchange, this chapter adopts a Post-Keynesian/Minskyan perspective and shows the fundamental importance of denominating agents’ liabilities in local currencies, that is, to make DEC currencies a funding currency (Kaltenbrunner, 2015). Indeed, as Minsky argued in 1993: ‘as eventually international indebtedness will be denominated in the currencies of the countries with large offshore assets, they must also accept that their currency will be a reserve currency of

their debtors, for it is convenient to hold liquid assets in the currency in which your debts are denominated' (Minsky, 1993).

Following this introduction, Section 2 will give a very brief overview of the aims, objectives, and workings of the SML. Section 3 presents a snapshot of its recent empirical developments in the four major user countries: Argentina, Brazil, Uruguay, and Paraguay. Section 4 discusses our findings with regard to the main barriers to greater use of the SML, and Section 5 concludes with some conceptual and policy considerations.

2 Aims, Objectives, and Workings of the SML

The SML was created with the primary purpose of providing exporters and importers with the use of local currencies through quicker and cheaper operations than in the foreign exchange market, thus lowering demand for the US dollar and stimulating regional trade. Before the SML, nearly 100% of regional trade was conducted in the US dollar. Although the SML was an initiative of analysts and technicians from the BCB, its creation also served the greater political objective of promoting the currencies of Mercosur countries and strengthening regional integration. It had significant support from the then presidents of Brazil and Argentina, Luiz Inácio Lula da Silva and Cristina Fernández Kirchner.

On the firm level, the SML was conceived to address the failure of cross-border correspondent banking to provide affordable or even any foreign exchange services to local companies, in particular small and medium-sized enterprises (SMEs). SMEs face structural difficulties in accessing normal foreign exchange services and are particularly exposed to detrimental exchange rate movements. The provision of less bureaucratic,⁴ low-cost, local currency financing that mimics domestic payments rather than cross-border foreign exchange services, was thought to be particularly beneficial to these smaller actors. Financial institutions,

on the other hand, were thought to be able to provide such cheaper funding, because they did not have to access dollar-funding markets and/or assume exchange rate risk themselves.

Operationally, the SML allows both parties in a cross-border trade (or service contract in some countries) to pay in their respective local currencies, whilst the ultimate settlement of net operations is done in foreign exchange (usually the US dollar) by the respective central banks.⁵ As discussed in more detail later in this chapter, the currency of denomination of the operation between exporters and importers depends on the specific bilateral agreement between the participant countries. In order to conduct the SML operations, the respective central banks establish a competitive local currency rate of exchange, the SML rate. The conversion rate is calculated using triangulation of the local currencies to the US dollar exchange rate and must be used in all SML operations. In general, this SML rate, which does not include the spread normally charged by private financial institutions, is more competitive than the market rate for SMEs (less so for big firms) and independent of the size of the foreign exchange operation.

Figure 17.1 illustrates the working of the SML with the example of an Argentinean company which uses the SML to pay for an imported product from a company in Brazil. Both of the companies need to have a bank account in a financial institution in Argentina and Brazil that is authorized by their respective central banks to operate with the SML. To pay for the imported product, the company in Argentina will send the equivalent amount in Argentinean pesos to its bank in Argentina. This financial institution sends the money in Argentinean pesos to the central bank in Argentina, which communicates with the central bank in Brazil through the SML system. When the central bank in Brazil receives the payment in its reserves, it sends the equivalent amount in Brazilian real (BRL) to the bank in Brazil, which credits it to the account of the company in Brazil.

It is important to draw attention to two facts. First, at the moment, neither central

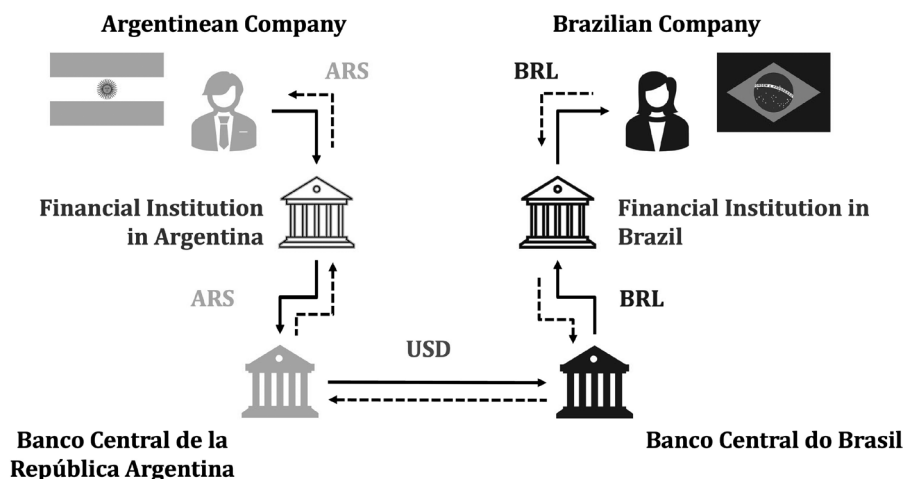


Figure 17.1 The working of the SML.
Source: Authors' elaboration.

bank is willing to hold the currency of the other in their foreign exchange reserves. For this reason, the transaction between the two central banks is settled in a foreign currency, normally the US dollar. As will be discussed later in this chapter, this means that whilst the SML removes the foreign exchange risk for the private actors, on the macroeconomic level it only lowers the need for reserves to the extent that the central banks could net some of the operations.

Finally, it is important to note that in contrast to previous regional payment systems – in particular, the Reciprocal Payment and Credit Agreement (CCR) between central banks from the Latin America Integration Association – in the SML the central banks only assume very limited credit risk. Whereas in the CCR central banks acted as a payment guarantor for the counterparty countries, in the SML the central banks' risk is limited to a 'contingency margin' (which only exists with Argentina and Uruguay). Credit risk is limited by the fact that payments are organized in a sequential order; that is, the respective central banks only transfer money which they have already received. The contingency margin is only given to other central banks when the value of the transfer is below the transfer costs and/or when specific problems arise during the operation through SML.⁶

3 The SML and the (International) Use of DEC Currencies

As discussed in Section 1, local currency regional payment systems as key financial infrastructures could be one way of increasing monetary sovereignty from the 'bottom up' by increasing demand for DEC currencies and thus reducing dependence on the US dollar. Specifically, the use of local currencies in cross-border regional trade as envisaged in the SML supports their role as regional trade invoice and domestic settlement currencies. In this context, two questions arise: (a) whether such systems are successful, that is, whether private agents adopt local currencies to conduct regional trade operations and (b) whether the increased use of local currencies as a means to invoice and settle regional trade also fosters the use of local currencies for other money functions, in particular that of store of wealth and means of settlement also in financial operations.

Table 17.1 summarizes the different international functions of money, drawing on the existing international political economy and Post-Keynesian literature on currency internationalization and currency hierarchy.

The first function of money, to act as a means of payment, refers to the ability of a domestic currency to facilitate international

Table 17.1 International functions of money and the SML

<i>Function of money</i>	<i>Role of money</i>	<i>Type of currency Internationalization private</i>	<i>Type of currency Internationalization public</i>
Means of payment	Avoid the ‘double coincidence of wants’	(1) Vehicle currency	(1) Intervention currency
Unit of account/ means of financial settlement	Denominate contractual obligations and fulfil these obligations	(2) Trade settlement currency	(2) Exchange rate anchor
		(3) Invoice currency (denominator of cross-border trade contracts)	
		(4) Funding currency (denominator of cross-border financial contracts)	
Store of wealth	Preserves value through time	(5) Investment currency	(3) Foreign exchange reserves
		(6) Speculative investment currency	

Source: Authors’ elaboration of tables in Cohen and Benney (2014).

trade. A currency is an international means of payment when it is employed as a vehicle for foreign exchange operations (vehicle currency) and/or an instrument for trade settlement (trade settlement currency). The second function of international money measures the relative price of assets, goods, and services in the international market – the unit of account function. A currency is internationalized as a unit of account when foreign investors use it to denominate both cross-border trade contracts (invoice currency) and financial contracts (funding currency). Lastly, the third function of money in this framework is the store of wealth function, which indicates the ability of an asset denominated in a certain currency to preserve (investment currency) or even appreciate (speculative investment currency) its value through time. Economic agents store their wealth by investing in assets that not only serve as a store of value themselves but, most importantly, in assets that are denominated in a stable currency, both with regard to domestic inflation and exchange rate volatility (Orsi 2019).

One major benefit of the SML is that it substitutes the US dollar as the main trade invoice and domestic means of payment for regional trade operations. As discussed

earlier, whereas importers can use their local currency to settle the transaction, the ultimate settlement of the operation takes place by the respective central banks in US dollars. Though this maintains the macroeconomic need for foreign exchange (as discussed in more detail later in this chapter), the ability of DEC agents to pay for cross-border regional trade in local currencies reduces their exchange rate risk and, in the case of importers, their need to acquire the US dollar for payment. According to the neoclassical dominant currency paradigm, the increased use of local currencies as a regional trade invoice and settlement should also foster their use for other money functions, such as the unit of account in financial transactions and the store of wealth. For example, the provision of a direct local currency exchange rate (rather than triangulating via the US dollar as is current practice) was envisaged to contribute to promoting regional currencies as units of account and creating an active market for regional currencies to reduce the dollar’s role as a vehicle currency.

Yet, as discussed in more detail in the next section, despite these advantages the uptake of the SML and use of regional currencies in regional trade has remained rather limited.

Even less so we observe the increased use of regional currencies for other money functions. The infrastructural lens adopted in this chapter allows us to identify both the specific technical and operational limits of the SML, and the bigger political economy and macro-structural barriers to increasing monetary sovereignty in financially subordinate economies.

4 Usage and Uptake of the SML

The SML has legislative authorization to operate within countries in the Mercosur: Brazil, Argentina, Paraguay, and Uruguay. It works differently for each country. For instance, the agreement with Argentina states that the trade operation must be denominated in the currency of the exporting country. In Uruguay and Paraguay, the invoice currency can be either the currency of the importer or the exporter. Additionally, whilst the SML with Argentina only allows users to send and receive trade-related transactions (and retirement pensions), with Uruguay and Paraguay users can also send and receive

service payments and unilateral transfers, that is, remittances. Due to data reasons and the dominant position of Brazil in the SML, this section will focus mainly on the bilateral relations of Brazil.

According to data retrieved from the BCB website, nearly 100% of the SML operations consist of exports from Brazil to Argentina, as shown in Table 17.2, and are thus denominated in BRL. As indicated, in the case of Argentina, SML operations are denominated in the currency of the exporter. Brazil generally holds a trade surplus with Argentina, and the figures in the SML are even more asymmetric. Given that most exporters in Argentina have a strong preference for holding US dollars, many companies do not engage in trade using local currencies. Concerning its dynamics, one can observe a steady increase in the value of SML transactions from its inception in 2008 until around 2013, when it started to stagnate. A similar trajectory can be observed in the number of operations, which reached a peak in 2015 and have declined since. As a share of total exports, SML exports from Brazil to Argentina reached a peak of nearly 7% in 2014 and

Table 17.2 Brazilian imports and exports in the SML with Argentina

Date	Exports			Imports*			
	No.	Amount (millions R\$)	% Total exports	No.	Amount (millions R\$)	% BRL	% Total imports
2008	31	9.88	0.11	10	1.31	88.3	0.07
2009	1163	451.06	1.82	72	4.30	99.1	0.97
2010	3353	1,252.70	3.86	40	9.00	99.3	2.18
2011	487	1,623.20	4.27	50	8.74	99.5	2.46
2012	7431	2,277.90	6.48	83	17.25	99.2	3.40
2013	9041	2,581.45	6.08	47	10.53	99.6	3.33
2014	9190	2,313.26	6.91	38	5.03	99.8	3.47
2015	10788	2,504.49	5.88	38	37.57	98.5	3.32
2016	8264	2,469.91	5.30	34	21.77	99.1	3.19
2017	7619	2,341.90	4.16	22	4.09	99.8	2.72
2018	7454	2,499.33	4.64	33	3.26	99.8	2.65
2019	6141	1,999.49	5.18	17	8.17	99.5	2.50

Source: Brazilian Central Bank – SML; (*) the value of imports is the sum of SML transactions, which is set in Argentinean pesos, converted to BRL using the SML rate.

Table 17.3 Brazil's imports and exports in the SML with Uruguay

<i>Date</i>	<i>Exports</i>			<i>Imports*</i>		
	<i>No.</i>	<i>Amount (millions R\$)</i>	<i>% Total exports</i>	<i>No.</i>	<i>Amount (millions R\$)</i>	<i>% Total imports</i>
2015	115	12.14	0.13	22	15.36	0.21
2016	278	40.71	0.43	105	31.09	0.52
2017	424	65.69	0.88	247	34.45	0.85
2018	787	126.20	1.15	174	60.69	1.23
2019	862	159.30	1.63	111	146.64	2.16

Source: Brazilian Central Bank – SML; (*) the value of imports is the sum of SML transactions, which is set in Uruguayan pesos, and it was converted to BRL using the SML rate.

Table 17.4 Brazil's imports and exports in the SML with Paraguay

<i>Date</i>	<i>Exports</i>			<i>Imports*</i>		
	<i>No.</i>	<i>Amount (millions R\$)</i>	<i>% Total exports</i>	<i>No.</i>	<i>Amount (millions R\$)</i>	<i>% Total imports</i>
2018	72	8.02	0.16	15	2.74	0.14
2019	841	118.16	1.21	69	76.80	1.30

Source: Brazilian Central Bank – SML; (*) the value of imports is the sum of SML transactions, which is set in guaraní, and was converted to BRL using the SML rate. This is the amount charged by the financial institutions.

have declined to slightly over 5% since. The share of Brazilian imports from Argentina via the SML reached its peak at 3.47% also in 2015 and currently stands at 2.5%.

Table 17.3 shows the volume and number of SML operations between Brazil and Uruguay. The numbers are far below those with Argentina. As a share of total exports and imports, SML operations reached 1.63% and 2.16% respectively. However, in contrast to Argentina, we can observe a steady increase in operations, both with regard to volume and number of operations. Between 2018 and 2019, the amount of exports and imports from Brazil to Uruguay via the SML has increased by 26% and 141%, respectively.

According to our interviews, these lower numbers are due to the smaller economic size of Uruguay and lower trade operations

with Brazil, and the more recent nature of the SML agreement. Interviewees also noted that Brazil's trade with Uruguay is much more balanced than that with Argentina.

Finally, Paraguay was only incorporated in the SML with Brazil in 2018 and, by that time, policymakers from the BCB believed that it was still too early to draw any conclusions regarding the participation of the BRL in the operations. The data available is presented in Table 17.4. The total trade with Paraguay under the SML accounts for 9% of the total trade with Argentina, which is almost the same level as Uruguay. The exports and imports increased by 14% and 27%, respectively, from August 2018 to December 2019. With regards to exports and imports as a share of total exports and imports, SML operations reached 1.21% and 1.30% respectively.

Similar to Uruguay, interviewees did not expect that operations using the BRL would turn out to be as asymmetric as they are with Argentina. Also in line with Uruguay, agents from both countries can freely choose which local currency denominates the contracts, which gives more scope for other currencies in the Mercosur to become more regionalized.

With regards to the objective of the SML to support trade by regional SMEs, the discussion and data presented at the SML policy summit showed that the SML has been of limited success. For example, according to Barra de Castro (2020), the share of SMEs in the SML was only 10% in the case of Brazil–Argentina operations, and a little below 25% in the case of Brazil–Uruguay. Instead, data show that SML operations are dominated by the processing industry (in particular in the case of Brazil–Argentina) and the automobile sector. These insights are also confirmed by regional data. For example, data on the users of SML by location show that trade is mostly done with the Brazilian states that are geographically closer to Argentina. One reason for this geographic bias is that the south-east of Brazil, where São Paulo is located, concentrates most of the industries in Brazil, in particular regarding regional automobile value chains.

In sum, this data showed that after an initial increase in the uptake of the SML, usage had already stagnated before the COVID-19 shock, particularly in the case of operations between Brazil and Argentina, which dominate the system by size. With regards to the type of usage, the evidence seems to point to a relatively high share of large companies rather than SMEs. Although general economic conditions have an important role to play in these dynamics (e.g., the economic downturn in Brazil since 2013), the next section uses its infrastructural lens to identify some of the specific constraints which have weighed on a more extended uptake of the SML. It draws on extensive SML stakeholder interviews conducted between 2017 and 2019, and general insights from the first multi-stakeholder policy summit on the SML held in March 2020.

5 Identifying the Barriers and Constraints of Building Monetary Sovereignty using an Infrastructural Lens

5.1 Operational Costs, Risks, and Limits

The first set of constraints identified in our research pertains to operational costs, risks, and limits. The SML was designed to provide quicker, cheaper, and less paperwork-heavy currency payment in regional trade, addressing some of the shortcomings of (dollar) foreign exchange operations. Linking domestic payment systems, the hope was that SML operations could be conducted like simple bank transfers, removing the need for extensive anti-money-laundering documentation. However, in frustration with these expectations, anti-money-laundering requirements are still present in the SML and the *speed of operations* remains low (around three days); at times even lower than normal spot foreign exchange operations, which take around two days. These additional delays in the SML are caused by the lack of an automated system or platform, which requires banks to complete the documentation manually, and the lack of a more extended and flexible messenger system that allows participants to check, verify, or amend the information.

Secondly, banks still charge companies, in particular SMEs which have little bargaining power, considerable *transaction fees*. Indeed, according to one interviewee in a financial intermediary, the fees charged for SML services can be three to five times higher than normal foreign exchange services. According to the same interviewee, this is related to two interconnected reasons. First, due to the small volume of SML operations, banks cannot take advantage of economies of scale in the processing of the relevant documents. Secondly, because of the lack of an automated payment system, the manual handling needs and costs are higher than in a normal foreign exchange transaction, where artificial intelligence is increasingly applied.

Thirdly, the fact that the SML rate is published only once per day creates some

potential *exchange rate risk* for financial intermediaries and/or end-users (depending on who ends up bearing the risk). Financial institutions that need to operate with the SML before the official exchange rate is available on the BCB website must use a proxy, which is normally the exchange rate of the previous day. Once the SML rate is published, the financial institutions must negotiate the difference with the customer, which can be a source of exchange rate risk, particularly in large transactions. To compensate for this potential risk, these financial institutions often collect a deposit from their clients in order to process these adjustments, increasing the cost of operating in the SML.

Fourthly, one risk mentioned by several interview and policy participants is the potentially *higher credit/counterparty risk* (risk of non-payment of the importer) in the SML. In the Brazilian case, export operations in foreign exchange are subject to a foreign exchange contract (*contrato de câmbio*), which can be used to obtain a letter of credit from a bank (*carta de crédito*). A letter of credit shifts the credit/counterparty risk from the exporter to the bank. Thus, the seller relies on the credit risk of the bank, rather than the buyer, to receive payment. According to our interviews, such a letter of credit is not available in the SML, and is likely one of the reasons why the SML is currently dominated by intra-industry trade operations of large regional firms, which either have long-standing relations or conduct trade within the same firm.

Fifthly, in particular at the SML policy summit, participants noted the additional costs and complications created by the *use of different procedures, forms, and standards*. In addition, all SML operations are currently on a bilateral basis, which creates little benefit in terms of economies of scale and/or network effects.

Finally, several *existing restrictions* limit the usage of the SML by design. For example, a precautionary measure adopted by the BCB to reduce the credit risk in the SML was to limit the time horizons of operations to 365 days. This inhibits large transactions of long-term investments, such as cross-border

investments in infrastructure. Moreover, specific restrictions in member countries limit the type of operations (e.g., unilateral transfers and restrictions to goods trade in the case of Argentina) or counterparties that can be financed through the SML. One interviewee also mentioned the inability to receive early payments, which deters potential users who already know the system.

5.2 Lack of Low-Cost, Domestic Currency Financing

Another key limiting factor recognized by almost all interviewees was the lack of low-cost, local currency credit and export financing. Given the structurally high interest rate in Brazil, export companies have difficulty financing the production of goods or services. This is particularly the case for domestic currency credit, which is often prohibitively expensive. To circumvent this limitation, exporting companies in Brazil normally access subsidized credit programmes or credit denominated in US dollar through instruments such as Advances on Export Exchange Contracts (ACC) or Advance on Export Shipment Documents (ACE). The ACC and ACE offer lower interest rates that are obtained by Brazilian banks in the international market. However, according to our interviews, ACC and ACE financing require a foreign exchange contract (*contrato de câmbio*) that is currently not available for local currency SML operations (see discussion earlier in this chapter).

Even if exporters could obtain foreign currency (US dollar) trade financing, in the case of local currency export receipts this creates a currency mismatch in exporters' balance sheets, which further weighs on the attractiveness of the SML. Indeed, given the resulting currency mismatch, as long as trade financing (funding) is denominated in foreign currency, the advantages of using local currencies as trade invoice currencies are limited. This is particularly problematic for SMEs, which do not have enough internal resources to pre-finance the required investments and are thus particularly dependent on trade financing.

5.3 *Lack of Information and Capacity to Use and Provide the System*

One key limitation to a further expansion of the SML is a lack of information about the SML. Our results suggest that particularly smaller companies, which generally trade locally and thus lack a foreign exchange department, are unaware of the possibility of trading with other countries in the Mercosur using local currencies. One of the reasons identified for the lack of information about the SML is the reluctance of financial institutions to advertise the system. For financial institutions, operating in the foreign exchange market is more profitable than operating with SML, because they can take advantage of the exchange rate spread and higher transaction fees. This is particularly the case for larger (foreign) banks with extensive cross-border operations and favourable access to international funding markets. For smaller, local banks, which cater more frequently to SMLs and are less involved in cross-border operations, staff were frequently unaware of the SML themselves.

In addition to a lack of information, our research and the discussions at the policy summit also raised potential capacity issues in using the system, both on the side of the users and financial intermediaries. Several policymakers noted that a relatively high share of SML operations are returned and cannot be completed, though the SML system did not allow them to investigate further what went wrong. This raises two issues, further discussed in the policy recommendations. First, the lack of capacity on the side of the SML users (and potentially smaller banks) to complete the necessary documentation. Secondly, a certain degree of inflexibility of the SML system vis-à-vis the possibility of communicating with participants of the system.

5.4 *Macroeconomic Challenges*

The final key obstacle to a further extension of the SML confirmed in our research is the macroeconomic conditions in the region. Persistent exchange rate volatility

and external vulnerability have meant that domestic agents do not want to receive and hold local currencies. This reluctance to earn local currency in regional trade has been particularly marked in the case of Argentina. According to our interviews, Argentines do not have confidence in the ability of the peso to function as a store of wealth. In contrast to Brazil, where current financial and foreign exchange regulations do not allow any foreign currency to circulate in the economy, in Argentina this money function is nearly entirely fulfilled by the US dollar.

Related to this, on the macroeconomic level, the SML does not remove the need to generate foreign currency (the US dollar) as the (net) settlement continues to be done in US dollar by the respective central banks. Although the amount needed is lowered through the netting of transactions, settlement continues to be denominated in US dollar, which requires the respective central banks (in particular those with a regional trade deficit) to generate foreign exchange reserves somewhere else. If 'financed' with volatile portfolio flows, this maintains the region's external vulnerability and exchange rate volatility. In other words, on a macroeconomic level, the SML does not use the promotion of regional trade as a channel to lower the region's foreign exchange constraint.

In addition to monetary and financial factors, interviewees identified the current trade structure of the SML countries as another factor in the low uptake of the SML. Commodities still constitute a large share of the exports of Southern Cone economies. Commodities, however, are largely priced globally and in US dollars, which limits the space for local currency-denominated exports. Some interviewees argued that in order to expand the SML, as well as to internationalize the BRL, Brazil would have to export more technology-intensive products instead of primary products. In this vein, it is interesting to note, though, that, as a proportion of total trade, industrial trade is higher in the region, highlighting the potential for local currency trade.

More importantly though, in our mind, is that not only exports but many imports are denominated in the US dollar. This means that companies whose production has a large import content outside the region, have a significant share of their cost structure denominated in foreign currency. Similar to the argument about financing, the denomination of firms' cost (liability) structure (in foreign currency, usually the US dollar) reduces the attractiveness of receiving local currency for their exports given the resulting currency mismatch.

6 Conclusion: Conceptual and Policy Considerations

The discussion in this chapter has shown the opportunities, but also significant constraints, on setting up regional payment systems that foster the use of DEC currencies as cross-border invoices and – at least partial – settlement currencies. On the operational and technical level, our results point to a range of potential measures which need to be considered to enable the success of such endeavours. These include, among others: efficient, flexible, and compatible communication, messenger, and anti-money-laundering systems, which can compete with those used by private banks for foreign exchange services; frequent publication of the exchange rate used in the payment system to reduce the exchange rate risk and contribute to building a market in local exchange rates; and the harmonization of existing procedures, protocols, and practices. Our results also pointed to significant capacity constraints both on the side of the users – in particular smaller ones – and the banks, which could be addressed with targeted training campaigns. From an infrastructural perspective, these results show the importance of focusing on the persistent human relations underpinning seemingly automated systems. Indeed, just because new relations are set up, this does not mean that old relations disappear, potentially slowing down innovations (what Star (1999) calls an installed base).

These technical and operational issues aside, the infrastructural lens adopted in this chapter pointed to three key potential constraints on using infrastructural power to build monetary sovereignty in internationally subordinate spaces. First, our research pointed to important informational and political economy constraints. Indeed, given the potential loss of lucrative foreign exchange services, local banks – which continue to be the intermediary between central banks and the ultimate users of the SML – have little interest in offering the service, or do so at excessive transaction fees. Here, increased transparency requirements on the banks, competition from other payment system providers, and targeted information campaigns might be essential to ensure that the regional payment systems are offered more widely and comprehensively. As discussed further later in this chapter, the substitution of private financial services through state operations – for example, the use of state banks to provide regional currency payment system services, or indeed the use of central bank digital currencies (CBDCs) – might be necessary.

A second key constraint identified in our research is the inability to access low-cost, local currency trade financing and the higher counterparty/credit risk for exporters in the SML. Indeed, financing in local currency, that is, the denomination of agents' liabilities in that currency, is an important precondition to remove currency mismatches in cross-border balance sheets and take advantage of the ability to denominate trade in those local currencies. Given the structural upward pressures on interest rates in many DEC, this type of credit might have to be provided by public and/or regional banks in the face of lacking private sector willingness. Similarly to low-cost and local currency trade financing, credit/counterparty risk insurance could be provided by public institutions if the private sector is not prepared to assume the risk.

Finally, our research pointed to the substantial macroeconomic constraints on setting up regional payment systems, and hence regional DEC cross-border currency use.

Persistent macroeconomic and exchange rate volatility undermines agents' ability and willingness to receive local currency in cross-border trade, as has been observed in Argentina, for example. Thus, macroeconomic management to preserve the value stability of DEC currencies will be an important counterpart to infrastructural innovations, such as a payment system that attempts to enhance the use of DEC currencies.

On a more conceptual level, these three constraints point to two important issues when trying to build monetary sovereignty from the bottom up through the establishment and promotion of regional payment systems. First, they show the complementary role of (international) money functions which feed into, and support each other. Setting up payment systems which enable the use of DEC currencies as invoice currencies and means of payment in cross-border trade will not be successful if not supported by measures which also support these currencies as store of wealth and unit of account in financial transactions. This complementarity of international money functions has been highlighted in mainstream economic research (e.g., Gopinath and Stein, 2021; Gopinath and Itskhoki, 2022). Yet, whereas this mainstream literature emphasizes the crucial role of currencies as a medium of exchange and payment in cross-border trade, our results show that unless DEC agents can also denominate their liabilities in local currencies – that is, unless DEC currencies can also be used as funding currencies (e.g., through the provision of affordable local currency trade credit), DEC agents will have little incentive to accept these currencies as means of payment. These findings are in line with a Minskyan interpretation of international cross-border relations which emphasizes the inter-relation between agents' assets and liabilities and the driving role of liability structures (e.g., De Conti, Biancarelli, and Rossi, 2013; Kaltenbrunner, 2015; Bonizzi, 2017; Murau and Pforr, 2020; Pape, 2020; Bonizzi and Kaltenbrunner, 2021).

Secondly, our results confirm the important role of the state in enabling and supporting the creation of monetary sovereignty

from the bottom up in subordinate financial spaces. Given the structural and systemic subordination of DEC currencies in the international monetary system, market-based mechanisms or the provision of private infrastructures will not be sufficient to enhance the demand for these currencies. Instead, the state needs to play an active role in supporting and enabling all money functions at the same time. This includes the use of infrastructural power, for example, through the set-up and management of payment infrastructures as shown by the experience of the SML in this chapter, but also the complementary macroeconomic management and provision of low-cost credit to support the store of wealth and means of financial settlement (funding currency) role respectively. Even in the case of payment infrastructures, state provision might be essential in the face of a lack of incentive from the private financial sector. This state provision could, for example, come through the use of CBDCs, in which cross-border payment services would be provided by the central banks directly rather than through financial intermediaries. More research is needed in this area, but rather than an option, in subordinate spaces CBDCs might become a structural necessity to build monetary sovereignty from the bottom up.

Notes

1. As discussed in more detail in Section 2, the three main functions of money are to act as means of payment, unit of account, and store of wealth. In most economies, domestic money fulfils these three functions in the national economy. On the international level, that is, in cross-border relations, so far only very few currencies act as general means of payment, unit of account, and store of wealth. Most of these functions are assumed by the US dollar, which is by far the most dominant currency in the international monetary system.
2. As discussed in more detail in the main text, the SML allows private users of the SML (companies, service providers, etc.) to pay for and receive local currencies for their cross-border operations. However, the final (net)

settlement of the operations is done by the respective central banks in the US dollar. In that sense, strictly speaking, the SML does not internationalize regional currencies as a means of payment but allows payment for imports in domestic currency. Final settlement remains in dollars.

3. These semi-structured interviews with policy-makers at the Brazilian Central Bank, as well as other key stakeholders, were mainly part of the research methodology applied in the doctoral thesis developed by Orsi (2019).
4. Due to money-laundering concerns, cross-border operations require banks to complete extensive documentation and monitor the operations. The hope was that the SML would not require these procedures.
5. The SML effectively integrates the national payment systems, e.g., the Sistema Brasileiro de Pagamentos with the Argentinian Medio Electrónico de Pagos using multi-local currencies, to circumvent the need for foreign exchange transactions.
6. For example, central banks use the contingency margin when it is a bank holiday in New York, which prevents central banks from sending payments denominated in US dollars from their respective correspondent bank in the United States.

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Blame Game

Illicit Finance, De-risking, and the Politics of Private Financial Infrastructure

Mark Nance and Eleni Tsingou

1 Introduction

In this chapter we apply a financial infrastructural framework to analyze the politics of global correspondent banking relationships (CBRs), the agreements by which a bank in one country agrees to provide financial services to clients on behalf of another bank elsewhere in the world.¹ CBRs are a vital aspect of the global economy, enabling institutions and people access to global financial markets and services (Rice, von Peter, and Boar, 2020). They are especially important for the sending and receiving of remittances, the lifeblood of survival and development for people and countries around the world (World Bank, 2022). Banks have maintained CBRs at least since the eighteenth century and, until recently, have consistently expanded the network of CBRs globally (Schenk, 2021).

In the early 2010s, however, banks in the Global South began raising an alarm. Banks in wealthier economies, they said, were unceremoniously severing these agreements, leaving banks in the Global South with fewer financial service providers. The potential

impact was considerable: higher costs for remittance inflows, slower service times for financial services, limited access to global capital markets, or even an inability to fund vital imports like food and energy.

For their part, banks culling these relationships blamed overzealous regulation targeting money laundering and terrorism financing. Soon, global financial institutions, the financial press, and policymakers all were echoing the same refrain. The rising costs of compliance and the risks of non-compliance meant that relatively low-profit correspondent accounts were not worth the trouble. De-risking, they argued, threatened to increase the cash intensity of developing economies, thereby reducing regulatory oversight. De-risking showed that the Anti-Money Laundering and Counterterrorism Financing (AML/CFT) regime had gone too far and was possibly even counterproductive (see, e.g., *The Economist* (2014) for a summary of this position).

Despite little evidence that the roots of de-banking lay in AML de-risking, the critique appeared to shift the global AML/CFT agenda. Global meetings of

AML experts focused less on assessing the regime's effectiveness and more on alleged unintended consequences. Put differently, for the first time in the AML/CFT regime's twenty-five-year history, the AML agenda focused on whether there was too much regulation. Why was this critique so effective, when other, more established critiques about the regime's fairness (e.g., Naylor, 2001; Vlcek, 2018; Gilmour, 2022) and effectiveness (e.g., Findley, Nielson, and Sharman, 2014; Gutterman and Roberge, 2019) had less impact?

An infrastructural framework helps us understand this case and sheds light on the politics of global correspondent banking more broadly. Efforts to reassess regulation really only gained traction once banks flexed their infrastructural power and began cutting CBRs: de-banking under the guise of de-risking. The result was a powerful coalition: global banks seeking to roll back regulation, de-risked jurisdictions seeking to maintain access to global financial markets, and political actors in the Global North who for various reasons were interested in maintaining North–South financial relations.

The case also provides useful insights regarding the politics of global financial infrastructures. While Mann's infrastructural framework and much of the resulting literature stresses the state's far reach into civil society, this case, like Braun (2020) and Braun and Gabor (2020), highlights how the state's entanglements in liberalized global financial markets can limit the state's own power vis-à-vis banks. Much of the global financial infrastructure is not a public good, but a private one. The social and material ties that make up financial infrastructures are not accidental but carefully cultivated and often colonial in origin and practice. They are not friction-free pass-throughs but power-laden relationships. They are not always in the background, at least for those to whom access is not guaranteed. Finally, the social relationships and material connections that comprise CBRs are path dependent. There are moments at which the right drivers can create critical junctures and generate more fundamental change in the system. We

discuss two such potential drivers: alternative payment systems and the “indigenization of finance” (Griffin and Martin, 2023, p. 4). The overwhelming signal from the case, however, is that banks in the Global North retain primary control over the infrastructures of global finance and the financial and political power that comes with it.

In the following section we briefly review the literature on global financial infrastructures, stressing those aspects on which this research can shed the most light. In Section 3, we provide a primer on global correspondent banking and an analysis of the debate over de-risking, emphasizing the predictions made about its impact and how those claims shifted the political agenda relating to AML/CFT. In Section 4, we show that the predictions regarding de-risking were not very accurate. In Section 5, we analyze this disconnect – unrealized impact that led to an agenda shift – as a case of infrastructural power. We also examine what responses have developed that might lessen the control over finance that Global North banks currently have. In Section 6, we conclude by considering the lessons of the case of de-risking for our understanding of global financial infrastructures.

2 Financial Infrastructures and Infrastructural Power

As the editors of this handbook note in Chapter 1, financial infrastructures “make possible the movement of other elements that are vital for the economy, including services, capital, or know-how” (Westermeier, Campbell-Verduyn, and Brandl). The servers and computers and networks that comprise the informational backbone of global finance are a vital part of the story. Procedures or processes are part of the infrastructure, as are relationships. In other words, the global financial infrastructure comprises a set of relationships, made active by sets of material objects, relationships, and ideas that define how finance can and should flow.

Bernards and Campbell-Verduyn (2019, p. 777) argue that infrastructures, which “are

as much a heuristic device as a specific set of objects,” display five key characteristics.

1. Facilitation – they make other actions possible.
2. Openness – they are nonexcludable.
3. Durability – they persist over time.
4. Centrality – they shape how markets function.
5. Obscurity – they operate in the background and generally remain unnoticed.

Insofar as infrastructures are the way things get done, change must happen in and through infrastructures. At the same time, both the physical and social aspects of infrastructures generate positive feedback dynamics, creating path dependence and some inherent resistance to change – especially radical change – as new technologies (and new ideas and new participants) must interface with preexisting ones (Bernards and Campbell-Verduyn, 2019).

Given the basis in Mann’s (2012) foundational work, much of the literature on global financial infrastructures emphasizes the power of the state. Control of, and through, infrastructures is one of the key ways that modern, liberal states exercise power beyond what older, more overtly despotic forms of the state were able to exercise (Carruthers, 1999). Financial infrastructures can protect or even extend hegemonic power (Konings, 2010). In this volume, Coombs distinguishes among four types of infrastructural power, all of which underscore the power of the state to shape the actions of market actors and, thus, the market itself.

The case of global CBRs also highlights, however, that the accrual of power by the state is only part of the story. To begin, control of infrastructure can lead to an accrual of power by nonstate, that is, market, actors, as well. This power gain is especially dramatic when it entails control over “public” goods, or perhaps better said, over goods on which the public depends (Mann, 2012; Busemeyer and Thelen, 2020). When a firm or group of firms become necessary in the provision of supposedly public goods, those firms can restrict and monetize access to

that necessary infrastructure. This power is not dependent on a firm’s complete control of the infrastructure, but is likely more a question of whether market actors are functionally dependent on a firm’s services. For example, to be maximally competitive, market actors need to pay national stock exchanges for access to a series of mutually reinforcing products, making the exchanges “global providers of financial infrastructures” (Petry, 2021, p. 576) and granting them significant market power.

This enhanced role for market actors can also mean that state actors face limitations on their ability to act as they might otherwise prefer. For example, the actions of central banks give rise to financial innovation and the increasingly important shadow banking system, creating an “infrastructural entanglement” (Braun, 2020, p. 396; see also Braun and Gabor, 2020). Market governance is now dependent on that shadow banking, especially as market-based banking has become a more prominent tool of market governance (Braun, 2020; Braun and Gabor, 2020). The state’s strategies for shaping market actors simultaneously create a dependence on those same actors. The result is a curtailment of the state’s reach and an extension of the reach of market actors. The case of CBRs, then, at least raises the possible outcome that market actors can control global financial infrastructures and thus gain power vis-à-vis the state. The politics of global financial infrastructures is not, in other words, only a question of which state has power or how much power a given state has vis-à-vis civil society, but rather which actors – state or nonstate – have what power and over whom?

This political dynamic is especially true of the global payments infrastructure, which is “profoundly political and was historically built through colonial violence and political struggle” (de Goede, 2020, p. 353; see also Westermeier and de Goede and Atme, this volume). These power dynamics have only intensified with the mutual financialization of security and the securitization of finance (de Goede, 2020; see also Amicelle and Jacobsen, 2016; de Goede and Sullivan,

2016). Especially relevant to our case study, de Goede, citing Bedford, argues that infrastructures “operate as ‘hard-wired’ forms of regulation, that ‘incarnate’ legal measures and give them force *beyond* normative codification” (Bedford, cited in de Goede, 2020, p. 354). CBRs are the backbone of this system. A necessary question, then, is who, if not the state, controls the global payments infrastructure?

Much has been made of the changing landscape in global payment systems, to be sure. The advent of blockchain technology might boost the potential for decentralized finance, enhanced capacities for person-to-person lending, and the disintermediation of banks. We return to this later in this chapter, but note here that these changes arguably still represent more potential energy than kinetic.

A second contender for the largest landlord in the global payment space is SWIFT, the Society for Worldwide Interbank Financial Transactions. Scholars very recently have begun taking up the task of understanding SWIFT, especially from an infrastructural perspective (see, e.g., Robinson, Dörny, and Derudder, this volume). As the group’s involvement in sanctions enforcement against Iran and Russia show, SWIFT is not a “neutral payment network,” but rather “is inscribed with power and security politics from their beginnings, and remain important but overlooked sites of political-economic power” (de Goede, 2020, p. 352). The case of SWIFT, de Goede argues, is a reminder that infrastructures have agency, embody political rationality and sediment power relations, and construct and enable collectivities. Particularly relevant to our research, de Goede finds that: “Infrastructures hard-wire core-periphery structures, routings, and dis/connections, with profound effect on the space of (political) community” (de Goede, 2020, p. 356). More specifically, SWIFT, through an unequal internal power structure, reinforces preexisting external power structures, lending additional power to just a few international financial centers (Dörny, Robinson, and Derudder, 2018).

While we do not dispute that SWIFT reinforces preexisting power asymmetries, the case of de-risking reminds us that banks, distinct from the states in which they operate, are also powerful actors and remain so even in an era of shadow banking (Nosrati et al., 2023). In fact, banks ultimately were able to use their infrastructural power to push states in a direction that states previously had resisted. In the case study that follows, we consider all of these dynamics: private ownership of a global infrastructure, the political power stemming from that ownership, and which actors, ultimately, have the greatest share of that political power.

3 The Debate over De-risking: Claims and Consequences

Correspondent banking relationships are “an arrangement under which one bank (correspondent) holds deposits owned by other banks (respondents) and provides payment and other services to those respondent banks” (BIS, 2003, p. 16). Put most directly, “correspondent banking requires the opening of accounts by respondent banks in the correspondent banks’ books and the exchange of messages to settle transactions by crediting and debiting those accounts” (BIS, 2016, p. 9). The relationships are generally reciprocal and normally entail different currencies. They are essential elements of the global economy, facilitating investor access to global financial markets, and ensuring global trade and remittances can continue to flow. For decades, reaching back to the Herstatt crisis in 1974 (Mourlon-Druol, 2015), the system has worked without any apparent crisis caused by correspondent banking, even as various rounds of globalization and technological shifts meant a massive increase in the system’s complexity.

In the early 2010s, this long period of stable growth hit a pothole. Financial institutions in the Global South voiced concern over a pattern that saw banks in the Global North cutting off CBRs or, in some cases, pulling out of countries or territories entirely, even in cases where there was long

tradition of business relations.² Banks in the Global North pointed to what they claimed was overzealous anti-money laundering regulation: regulators and bank examiners required not just “Know Your Customer” policies, but also, they argued, that banks “Know Your Customer’s Customers.” In addition, banks argued that the fines for violations were increasing dramatically. The Customer Due Diligence required to meet such a standard, and the risks of failing to do so, were simply too costly to make maintaining CBRs worth it.

Not everyone accepted this connection. The global standard setter for the AML/CFT regime, the Financial Action Task Force (FATF), provided a direct counternarrative. FATF defined de-risking as “terminating or restricting business relationships with clients or categories of clients to avoid, rather than manage, risk in line with the FATF’s risk-based approach” (FATF, 2014). It also underscored the variety of possible drivers beyond AML: “De-risking can be the result of various drivers, such as concerns about profitability, prudential requirements, anxiety after the global financial crisis, and reputational risk. *It is a misconception to characterise de-risking exclusively as an anti-money laundering issue*” (FATF, 2014, emphasis added).

Despite FATF’s counterclaims, ultimately the discourse linking AML to de-risking took hold. Think tanks like Oxfam International and the Center for Strategic and International Studies echoed the claim (Durner and Shetret, 2015; MacDonald, 2019). It was repeated in hearings on de-risking held by the US House Financial Services Committee (FSC Majority Staff, 2018). The international financial institutions joined in, although they also allowed for the possibility of other drivers (World Bank, 2015, p. 9). In the summer of 2016, when the de-risking discussion was arguably at its peak, the World Bank and the Association of Certified Anti-Money Laundering Specialists (ACAMS) hosted a two-day stakeholder workshop to discuss the problem. Their report on the findings and recommendations of that workshop

reflect all of the discussions mentioned (World Bank and ACAMS, 2016). ACAMS and the World Bank hosting the workshop is reflective of the dominance of the discourse that de-risking was a problem and AML was the cause.

Not only did this discourse become a consensus in public discourse, it changed policy discussions, too.³ In the wake of the de-risking debate, efforts started in both Europe and the USA – the two strongest proponents of the AML/CFT regime – to reconsider elements of the project. Following two calls for comments in 2020 – one on a proposed rationalization of AML regulation, the other on the drivers and impact of de-risking – the European Banking Agency published an opinion on de-risking which explicitly links de-risking to poor AML risk management and acknowledges that there are ways in which regulatory and supervisory authorities can discourage de-risking with clearer guidance and less categorical judgments (EBA, 2022). In the United States, also in 2020, a law ostensibly designed to strengthen AML/CFT regulation – the Improving Laundering Laws and Increasing Comprehensive Information Tracking of Criminal Activity in Shell Holdings Act (aka the “ILLICIT CASH Act”) – begins with a discussion of the dangers of de-risking and calls for a study of how best to address the problem. Since then, the US Treasury has published a de-risking strategy (Department of the Treasury, 2023). Perhaps the best example of the diffusion of this discourse is FATF itself. In 2021, FATF began focusing on the regime’s “unintended consequences,” with de-risking noted as a key item.

This success in changing the framing on AML/CFT is surprising. FATF was founded in 1989 and the regime it guides has advanced steadily since, creating tighter standards, developing more tools for enforcement, and working to diffuse the standards on a global scale. In short, proponents have steadily deepened and widened the regime over thirty years. This has been true despite critiques that evidence for the regime’s effectiveness was lacking. This intensification of the regime increased after the 9/11 attacks

in the United States, when members added counterterrorism financing to the regime's goals. The regime's securitization made it difficult to critique efforts. Adding to the puzzle, FATF members in 2012 decided to move away from tracking only whether the right laws were on the books and focus also on whether states' regulatory systems were actually effective at preventing laundered money from entering the financial system. So how did de-risking move to the top of the agenda? In the following section, we show that the actual impact of de-risking is likely not the answer, as the impact was not as dire as many predicted. These muted outcomes and the actual patterns of de-risking suggest that something other than concern over AML was driving the de-risking agenda.

4 The Impact of De-risking: Much Ado about a Little?

One possible explanation for the rise of de-risking to the top of the AML agenda is that de-risking was, in fact, having the predicted impact. That is, it was widespread, it was costly, and it was caused by AML rather than some other more pedestrian cause. In this understanding, moves across the regime to consider reform are, therefore, positive and surprising signs of responsiveness. To consider this explanation, we draw here on the plethora of reports that were generated as a result of this concern. The patterns of de-risking found in that body of evidence, we argue, suggest that the predicted impact of de-risking ultimately was more dramatic than its actual impact.

4.1 CBRs and Financial Flows

The Bank of International Settlements' (BIS) Committee on Payment and Market Infrastructures issued a series of reports on global CBRs using data provided by SWIFT (BIS, 2020). Insights from a report in 2020, with data covering 2011–2019, are useful in assessing the scale, scope, and sites of de-risking when the trend was deemed to be at its peak.⁴

The number of cross-border CBRs indeed dropped between 2011 and 2020: by 22%. The number of corridors – measured as a message sent from one country to another – fell by roughly 12%. CBRs have declined in every region and in nearly every country, but they have fallen more in emerging market economies than in advanced economies. Small island developing states and dependent territories have seen the largest decline. North America saw the smallest change –13.6%; the Americas otherwise, including the Caribbean, saw the largest change –34.2%. The change in the average number of counterparty countries is a rough indicator of how perilous the situation is for a country. The largest changes here were the Americas, excluding North America (–19.6%); Western Europe (–13.2%); and Oceania (–29.2%). The largest drops in the average number of direct counterparty countries were in the Caribbean (–33.4%), Polynesia (–35.8%) and Melanesia (–40.5%), which are dramatic declines.

That said, the report also shows that financial activity overall actually increased. From 2011 to 2019, the volume of payment messages increased by 45% and the total value of those payments increased by 22%. Within that category, the largest increases in volume and value were in small island nations (30% volume, 25% value) and emerging market economies (50% volume, 35% value). Again, however, those averages conceal considerable variation. Just over one-third of the jurisdictions saw a decrease in total value. The largest drops were in Cyprus (–82.1%) and Latvia (–77.7%), likely explained by money laundering and tax evasion scandals. Additionally, while offshore financial centers (OFCs) saw declines, so did Austria, Denmark, Finland, and Norway, as well as Macedonia, Mexico, Moldova, Monaco, and Morocco. Twenty out of twenty-one OFCs, according to Zoromé's (2007) definition, saw a drop in the number of CBRs. Ireland was the exception in that group. Two-thirds saw an increase in volume. Ten out of twenty-one saw an increase in value. All Caribbean states and territories on the list saw drops in transaction value, as did the Channel Islands.⁵ To

take a particularly extreme example, Vanuatu saw a 57.8% drop in counterparties abroad, but saw a 44.8% increase in volume and 65.4% increase in value!

Taken as a whole, therefore, data on CBRs do not reflect the more dramatic predictions of de-risking. The number of CBRs has dropped globally, but that decline has not necessarily meant a drop in the volume or value of transactions, which ultimately is the primary concern. There are regional variations. Polynesia, Micronesia, and the Caribbean have been the hardest hit in terms of the declining numbers of counterparties abroad. Even within those regions, variations occur. Small island states and dependent territories saw large increases in the volume (30%) and value (25%) of transactions. In short, the trend was only significant for a small number of mostly island nations that have seldom been at the root of major global regime shifts.

4.2 Bank Fines

The question of fines gets to the argument that AML in the United States in particular had become overzealous, with fines growing exponentially for relatively small offenses. Thus, banks were forced to cut ties with states that had “unreliable” AML systems. Again, there are problems with this narrative.

Declines in CBRs predate the headline-making bank fines that began in 2013 and 2014, although investigations and rumors of fines begin well before public announcements are made. But the International Monetary Fund (IMF) has argued that the pattern of declining CBRs goes back to the 2007 financial crisis, meaning it was not started by AML investigations and accompanying fines that came after that. It also bears noting that the famously large fines did not stem from small AML violations. One banking official at the 3rd Empirical Anti-Money Laundering Conference (January 2023, author’s observation) hyperbolically complained that fines came “from failing to put the right address on a Suspicious Activity Report.” The IMF in 2016 calculated that AML/CFT violations accounted for only 16% of total misconduct fines. Out of the 24 fines of more than

US\$100 million, AML/CFT-related penalties accounted for less than 20% of the total. Rather, those fines stemmed from sustained patterns of sanctions violations. As the IMF summarizes it: “High-profile enforcement actions in the United States involving global banks have focused on cases where the violations were repeated, systematic, and egregious, representing a fundamental failure of the risk management systems of the banks in question” (IMF, 2016, p. 25).⁶

Nor did those fines pose any real risk to the banks, which continued to see massive profits. This aligns with the finding that bank fines generally are an effort to respond to populist anger while protecting a politically powerful interest group, namely, banks (Macartney and Calcagno, 2019).

4.3 Impact on Remittances

Given the significance of remittances as a means of short-term survival and long-term development, many critics of AML/CFT voiced concern that de-risking would negatively affect the efficiency of sending remittances. A 2017 World Bank Group report on remittances, for example, argued that de-risking was driven by a need “to cope with the high regulatory burden aimed at reducing money laundering and financial crime” (World Bank, 2017) and argued that this AML-driven de-risking contributed to high costs of remittances. In fact, from 2011 to 2019, the price of sending remittances dropped steadily, from 9% to just over 6.9% (World Bank, 2019). The volume of remittances also continued to rise, although the rate of decline in price slowed. Notably, Latin America and the Caribbean was an outlier in this; in that region, the cost of remittances rose from 5.9% to 6.3% from 2017 to 2018 (World Bank, 2018). Those costs were still below the global average of 6.9% (World Bank, 2019).

4.4 Making Sense of the Evidence

The evidence given challenges the simplistic story of de-risking as a function of overzealous AML. There is no doubt that the cost

of maintaining CBRs is made more expensive by AML/CFT regulation, but that was true before de-risking began. Much of the evidence points to de-risking as simply de-banking: a business decision to shift resources from one sector or region to another. The IMF backs this interpretation, as well. In a paper examining drivers of de-risking, the authors located the origins of de-risking in the 2007/8 financial crisis, which led to a re-evaluation of risk appetite, a focus by global banks on key markets, and increases in capital and liquidity requirements. The report notes in particular that some of the post-2007/8 reforms, which were not related to AML/CFT, made correspondent banking a much less attractive business line (IMF, 2017).

This explanation – a shift in the business model – aligns well with what much of the banking sector itself is saying. As part of the concern of de-risking, the World Bank in 2014–2015 surveyed banks and authorities to better understand the drivers of de-risking (World Bank, 2015). The survey includes responses from 24 large international banks, 170 local/regional banks, and banking authorities in 110 jurisdictions. Ninety-five percent of large international banks named AML/CFT concerns; 85% listed a lack of AML/CFT compliance. Only 48% of authorities listed AML/CFT and only 19% of local and regional banks did. Authorities and local and regional banks were more likely to list profitability, changing business models, and risk appetite. In short, large international banks blame AML; almost everyone else blames large international banks.

5 Discussion

Predictions about the impact of de-risking were dire. To be sure, a few specific cases seem to live up to these predictions and they are important in their own right. But the evidence given suggests that the systemic impact of de-risking was either overstated, largely averted, or some combination of the two. Those dire predictions laid the blame for this coming doom squarely at the feet of AML: standards and consequences that were

too high, especially in Europe and the USA; systems that were too weak in the de-risked jurisdictions. These predictions hit their target. The AML/CFT regime had been largely immune to critique since its inception, but especially after members securitized the regime following the 9/11 attacks in the United States. The fears over de-risking shifted the agenda.

An infrastructural perspective suggests that global banks were able to achieve this by leveraging their control of CBRs. The threat of exit from the world's most valuable markets as a means of protesting AML was never a credible one. The threat of big banks to exit CBRs, however, was.

This strategy only works, however, if other important actors were interested in ensuring that banks in the Global South had continued access to CBRs with banks in the Global North. In other words, someone had to care. There are surely varying rationales for those concerns. For some, especially those on the receiving end of de-risking, the potential economic harm was the motivation. Their concern might have been necessary, but it surely was not sufficient to shift the agenda.⁷

For people and institutions in the Global North, other rationales might be at play. On the micro-level, former Chairwoman of the United States House of Representatives Committee on Financial Services, Maxine Waters, has a long-standing interest in US–Caribbean relations. As a result, de-risking was and remains a particular concern for her and she uses her institutional power to keep the issue high on the agenda. For example, it was under her watch that the Committee held multiday hearings on de-risking. In April 2022, Waters co-chaired, with Barbados Prime Minister Mia Mottley, the “Roundtable Discussion on De-risking and Correspondent Banking” (Salmon, 2022).

There are other interpretations. It is arguably in the interest of advanced economies to avoid economic meltdowns and promote sociopolitical stability in their respective neighborhoods. There are postcolonial interpretations of these interests, too. Ensuring the continued financial dependence

of other countries on US and European banks allows the USA and European Union (EU) to exercise oversight and control over those countries. In this sense, building and maintaining CBRs constructs political power for states, but also for banks who can deny those services.⁸ De-risking represented a threat to that system of control. In Europe, the European Commission is funding a correspondent banking program to address issues within the EU and collaborate with the EU AML/CFT Global Facility, which provides capacity building to non-EU countries, with meetings such as a new regular regional conference on correspondent banking in Eastern and Southern Africa (EU AML/CFT, 2022).

The ability of banks to leverage CBRs toward shifting the agenda on AML/CFT shows that banks, and especially banks in North America and Europe, still hold the lion's share of power in global financial relations. While scholars correctly have paid more attention to SWIFT in recent years, the case of de-risking shows that banks retain substantial agency. The de-risking story is also a reminder that global financial infrastructures are not, in fact, global public goods; they are not nonrivalrous and nonexcludable. It may be the case that banks are unable to completely shut off the taps; it is especially the case that no one bank can on its own exclude access, at least in the long term. Cutting off CBRs can reduce the flow to a trickle, however, unless and until alternative arrangements can be made. In global finance, this means higher costs, lower competitiveness, and less growth.

De-risking and CBRs are also a reminder that infrastructure is neither a given, nor accidental. Infrastructure is, in fact, a set of relationships. Like all relationships, these must be cultivated, fostered, and tended to. And like all relationships, there can be imbalances of power that are exploited for the benefit of one side over the other. In the case of CBRs, banks give considerable thought to CBRs. But the case also shows that states see them as a point of considerable concern. In this sense, the common refrain that infrastructures are invisible until they break down may be an overstatement,

at least for those who can be easily excluded from them. Those on the weak side of these agreements are likely more sensitive to the fact that the agreements are neocolonial and simultaneously create long-term vulnerabilities and short-term opportunities; to them they are both visible and politicized (see also Langenohl's contribution to this handbook).

In that vein, it bears watching whether any developments or initiatives may lead to a loosening of those colonial ties. We note a few possibilities and discuss those here by way of conclusion.

The continued disintermediation of banks via alternative payment systems is one such possible point of reform (see also Nölke, this volume). These systems are able to bypass SWIFT and traditional banks more generally. To date, however, they represent a small fraction of global business. In the longer term those numbers might increase. But to the extent that those technologies remain rooted in, or are routed through, international financial centers, they risk recreating or reinforcing the same power structures that shape global finance today, just as SWIFT has (Brandl and Dieterich, 2023). To the degree that these alternative systems are built around technologies that are highly energy-intensive, their use risks exacerbating the climate change that already poses an existential threat to precisely the people that the new technologies are supposed to help.

The G20 is undertaking an initiative designed to prevent this kind of problem in the future. This includes the development of multilateral payment platforms, which are designed specifically to operate across jurisdictions and thus could supplant CBRs (see BIS, 2023). It also includes the use of "liquidity bridges," agreements among central banks to allow extraterritorial branches of a bank to draw on their local central banks using collateral held in in the home office's territory. The theory is that this reduces the amount of collateral that a service provider is required to hold, thereby reducing the costs (see BIS, 2022). Both are part of a larger "G20 Roadmap for Enhanced Cross-Border Payment" system (Financial Stability Board, 2023).

A final note of optimism comes from what Griffin and Martin (2023) refer to as bank indigenization (see also Roitman's contribution to this handbook). In the eastern Caribbean, at least since 2009, some leaders have been calling for a "rationalization" of the regional financial system, moving from a multitude of small, independent economies dependent on large international banks, and toward a multicountry economy. Decisions by international banks to close CBRs have galvanized previously lagging efforts on this front, leading to the creation of consortia of indigenous banks, which together were large enough to buy assets from foreign banks that had pulled out of the region (Griffin and Martin, 2023).

That said, as Bernards and Campbell-Verduyn (2019) have argued, infrastructure is a process as much as material object. Efforts to find alternatives to the neocolonial politics of global financial infrastructure are bound to meet resistance (see also Kaltenbrunner and Orsi, this volume). Some of that resistance is the result of path dependence. Some of the resistance is more strategic, as the owners and users of that infrastructure seek to maintain the advantages that come from it. That includes banks writ large, but also political actors that are able to achieve political goals by borrowing an otherwise private infrastructure. This exemplifies Mann's idea that the same infrastructure can be used simultaneously by different social powers and toward different ends. This case raises the question of what happens when two actors are using the same infrastructure for seemingly opposite ends: one to exclude, one to include. Time will tell who "wins" that tug-of-war, but the logic of an infrastructural approach suggests that the advantage rests with those who control the infrastructure.

Notes

1. Some of this research was published initially as part of the Federal Reserve Bank of Atlanta's policy paper series, Policy Hub (Nance, Tsingou, and Kay, 2021). The authors thank Elsa Müller for excellent editing assistance.
2. For example, Scotiabank announced in 2021 that it was pulling nearly entirely out of the Caribbean, after decades of doing business in the region.
3. Nance, Tsingou, and Kay (2021) analyze discourse around de-risking on Twitter, and show both how the use of the term increased during that period but also that between 2014 and 2020 "AML" and "correspondent banking" suddenly became terms commonly associated with "de-risking" (p. 9).
4. From the report: "The statistics cover monthly payment message data for more than 200 countries and jurisdictions from 2011 to 2019. The data set lays out a network of bilateral relationships (either bank-to-bank or country-to-country). From these payment messages, the following measures can be calculated: (i) a cross-border payment message from one country to another identifies a *corridor*; (ii) a cross-border payment message from one bank to another identifies a *correspondent banking relationship*; and (iii) the count of *active correspondents* measures, corridor by corridor, the number of banks abroad that have received messages sent by banks in a given country" (BIS, 2020).
5. Bahamas, Barbados, Bermuda, Cayman Islands, Guernsey, Isle of Man, Jersey.
6. Note, however, that recent data on fines, covering the longer period of 2000 to 2021, indicates a larger share of AML/CFT-specific fines (see Cusack, 2022).
7. Another ally in the de-risking-informed AML reform push has been the third sector, highlighting the plight of nonprofit organizations (NPOs) being singled out as potentially risky for CFT. De-risking in the sector is an important component of FATF's "unintended consequences" work but NPOs have at best been able to maintain momentum on de-risking.
8. We thank Jaqueline Best for prompting us to consider this point.

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SWIFT

Trusted Infrastructure for Infrastructures

Gary Robinson, Sabine Dörny, and Ben Derudder

1 Introduction

Money and finance have been conceptualised as an infrastructure for the economy and for society (Muellerleile, 2018; Ricks, 2018). Finance has developed its own infrastructures, defined as ‘the socio-technical systems enabling basic yet crucial financial functions to be carried out, but that tend to be taken for granted and assumed’ (Campbell-Verduyn, Goguen, and Porter, 2019, p. 911). As financial activities have become more complex and speculative, centralised ordering institutions such as central banks and financial infrastructures have evolved (Norman, Shaw, and Speight, 2011) to smooth the conduct of finance and commerce across space and time. This chapter engages with SWIFT (Society for Worldwide Interbank Financial Telecommunication) as a long-standing, monopoly-like infrastructure and employs a meso-level infrastructural gaze, showing interdependencies between micro-level, often backgrounded, socio-technical systems and processes, and macro-level concerns of legitimacy and power (see Chapter 1 of this volume).

What constitutes financial infrastructure is not exactly defined. It broadly includes organisations that conduct the core financial markets’ processes and functions of risk mitigation, trading, clearing, and settlement (see Handel, this volume; Genito and Lagna, this volume). Exchanges take care of securities trading activities and have evolved into large groups, whose activities and market data shape financial markets (see Petry, this volume), while post-trade activities, like clearing and settlement,¹ are performed across a variety of actors. Every economic and financial transaction necessitates payment, with clearing and settlement of payments performed by various payment systems for different kinds of payments.

SWIFT, however, does not fit into these categories of financial infrastructure. While many infrastructures store and transfer value, whether as money or as securities, SWIFT, and this is a key distinction, *transfers data/information about value between banks and financial infrastructures internationally*. SWIFT’s original role and *raison d’être* was in providing a secure, digital, international financial messaging system for international

payments for a small group of Western banks in the 1970s. Since then, it has expanded into messaging for post-trade securities transactions, which now accounts for more of its messages than payments (SWIFT, 2021a). It has also expanded its membership globally to other financial actors beyond banks. It further offers more shared services to its member financial institutions, such as payments reference data to ensure proper routing of transactions, and for financial crime compliance, which all banks must do. SWIFT's quasi-monopoly position began with the adoption of a cooperative solution among rival banks due to distrust in a service provided by one leading bank (Citi). It then grew via network effects and standards, adding increased benefits for members. In so doing, it has become a critical 'infrastructure for infrastructures' (Robinson, Dörny, and Derudder, 2023, p. 485).

This chapter unravels SWIFT's role as trust provider by examining its workings, technologically and organisationally. Trust is integral to money and finance. Much of the sector's growth has come from extending trust from smaller to ever larger networks (Rubinstein, 2022). Given that infrastructures are, broadly, essential supporting/enabling objects and simultaneously the relation between objects (Larkin, 2013), and featuring long-term, near-ubiquitous reliability (Plantin et al., 2018), financial infrastructures are a key method of scaling trust. Styling itself as 'the most secure trusted third party' (Scott and Zachariadis, 2014, p. 38), SWIFT refers to two dimensions:

- the financial messaging infrastructure network (SWIFTNet), and
- the organisation, a cooperative, in which SWIFTNet is embedded.

Viewing SWIFT as a 'club', its purpose is not messaging specifically but *connectivity* generally, allowing it to extend trust among its members and more broadly to financial flows. Here, we combine literature on trust and clubs to study the relationship between SWIFT's organisational design and its effectiveness in bringing about strategic change

to retain its pre-eminence (Robinson, Dörny, and Derudder, 2024). Infrastructural power is usually concerned with state authority and macro-political-economic governance in national monetary networks centred around public actors, for example, central banks (see Coombs, this volume). However, SWIFT is integral to the workings of global finance, acting as a boundary object (see Pinzur, this volume) that enables cooperation and resolves tensions between local and global scales, and between public and private networks, by extending different forms of trust across space, an essential prerequisite for collaboration between financial competitors. Put differently, national networks are connected into a global network by private financial actors using SWIFT's messaging network as members of its organisation. Alongside physical networks, ideas, and standards, trust is an important component of 'the binding medium' (Easterling, 2016, p. 6) of infrastructure.

The next section explores and defines the concept of trust in finance. Sections 3 and 4 explain the architecture of global financial infrastructure as based on the account money form. Sections 5 and 6 demonstrate the significance of SWIFT's messaging network and organisational form in engendering trust among competitors and as a key relational form of agency that fosters collective action to mediate technology, geopolitical, and market challenges. The chapter closes with a critical reflection and outlook.

2 Trust in Money and Finance

Trust – or the 'social, geographical, and discursive nodal points of trust and authority' (de Goede, 2005, p. 185) – is foundational to the banking business, which is likened to 'a massive, complicated and delicate confidence trick' (Arnold, 2023, para. 1). A definition of trust, which is 'a complex and slippery notion' (Nooteboom, 2002, p. 1), encompasses several reasons and motivations for broadly having confidence or reliance that actors or things will not fail us. This can be based on control in the form

of incentives or contracts; on self-interest or assurance, such as dependence or legal coercion; or it could be a strong sense of 'real' trust based on motives beyond self-interest. As this brief list shows, the sources of trust are distinct, lying in individuals, organisations, or a system as a clear rule provider and enforcer to (better) calculate others' behaviour and action. Central bankers, for example, consider trust to be confidence that 'authorities will act predictably in the pursuit of predefined objectives and that they will succeed in their task' (Carstens, 2023, p. 6) of maintaining trust in the monetary system as a public good and foundation of an economy. Trust, however, can take forms such as behavioural, competence, intentional, and informational in people, institutions, and organisations, but is not limitless: 'someone has trust in something, in some respect, and under some conditions' (Nooteboom, 2002, p. 8). SWIFT's technological messaging infrastructure and cooperative organisational form play a crucial role in scaling trust in money and finance globally.

Representations of trust as radiating down from central banks to lower-order financial actors as well as residing in networked groups of financial experts neglect the role of the financial 'plumbing' in providing trust (Campbell-Verduyn and Goguen, 2019). Finance is a network industry, in which competitor firms must necessarily collaborate to a certain extent. This has been evident historically in financial infrastructures, from exchanges and clearing houses up to credit card schemes, which have been mutually owned by the financial actors that use them. Trust is thus also important between organisations in *enabling* relations: it reduces relational risk, or the risk of something going wrong in a relationship; is economically relevant because it reduces uncertainty, bringing material benefits for cooperation and savings on search, contracts, and monitoring because it reduces fear of opportunism; and involves an acceptance of more influence from partners. This is the purpose of governance, which acts with other governmental instruments

like contracts, incentives, reputation, and via networks (Nooteboom, 2002).

Through governance, trust is related to authority and power. The financial system comprises the combined interactions, competitive and cooperative, of its participants. Authorities and financial institutions are not the only components of the financial system. Financial infrastructures are key nodes themselves but also the socio-technical mesh (both material, like cables and network equipment, as well as immaterial, like rules and conventions for using this equipment and executing processes and functions) inter-linking nodes. Trust in the reliable working of such large, impersonal social structures at societal level, or *system trust*, is a crucial phenomenon in modern times. It builds on both 'the authority attributed to formal social positions as well as on the reliability of technical systems, standards and procedures' (Bachmann, 2003, p. 64). Private actors have been granted forms of legitimate or private authority over important domains, both domestically and internationally, usually associated exclusively with the state (Hall and Biersteker, 2004). Such authority is deemed legitimate because it is ultimately delegated by interdependent public authorities (Pauly, 2004), such as those with regulatory supervisory oversight over financial institutions and infrastructures. Legitimacy implies that those governed consent to or recognise authority, which they do without coercion, but rather for reasons like persuasion or trust (Hall and Biersteker, 2004); legitimacy is invoked in the ability to mould relationships by bundling and shaping the interactions of multiple social actors in generally accepted ways (Bachmann, 2003).

Trust cannot easily be conjured from nothing and is in some ways its own prerequisite. Once established, infrastructure's stability and durability are analogous to the confidence and reliability synonymous with trust. Embedding infrastructure in a cooperative is an important way to initially engender trust among users and subsequently spread it via shared norms and practices surrounding infrastructure usage to new users and beyond. Micro-level socio-technical

systems become thereby linked with macro-level concepts such as power.

In what follows, we show SWIFT's role in extending trust beyond national jurisdictions, within which central banks and national financial regulators/supervisors nominally only maintain trust in their own currencies. While in recent decades many financial infrastructures have been privatised, SWIFT remains a not-for-profit-maximisation cooperative, co-owned by financial institutions. We argue that the cooperative organisational form is a key enabler of trust among financial institutions and aids their collective strategic agency.

3 Money Forms and the Architecture of Financial Transactions

The architecture of financial infrastructure is contingent upon the *money form* that it supports. The two money forms for payment are physical objects/tokens, such as cash, and accounts/claims, such as commercial bank deposits. *Token money* transactions feature immediate settlement and no information exchange once the token is deemed valid (Adrian and Mancini-Griffoli, 2019). However, such transactions generally require physical proximity. *Account money* evolved from token money in medieval Europe when moneychangers transformed from custodians of physical coin to deposit banks. Instead of physically transferring coin as payment, they logged ownership of coin deposited with them in books, and then transferred ownership, thereby immobilising coin and creating account or book-entry money. This also allowed netting, or extinguishing one debt with another, leading to banks becoming *trusted* central intermediaries.

As such, banks conducted transactions for many parties across their books, with only minimal final settlement in physical money. Account money thus has two components: *value*, residing in and cleared/settled across the ledgers of financial institutions, and *data/information* about that value, requiring transmission via trusted channels (see Robinson, Dörny, and Derudder, 2023,

p. 486, figure 2, for an illustration). Value, also a kind of data, can be considered money at rest and is a representation of value inherent in and created by our ecology and societies (Scott, 2022). Data is more accurately transaction information, such as payment instructions, and manifests money in motion. Account money payments do not need physical proximity or immediate settlement; rather, they require information to verify account holder identities. Account money nowadays resides in electronic accounts/ledgers of various siloed financial institutions, for example, banks. Effecting payment means changing these accounts (settlement) in response to instructions. Instructions are communicated electronically across distance in email-like messages. This secure transmission of financial information is the purview of SWIFT and of particular significance for cross-border payments, in which SWIFT's origins lie.

4 SWIFT and Financial Messaging

There are important differences between domestic and international payments. SWIFT (Euromoney, 2019, para. 11) describes global banking as 'a network of federated payment systems, where fiat currencies are settled in different jurisdictions, each with their local regulations and requirements – independent, yet interdependent on each other'; these payment systems are connected by correspondent banking 'into a meaningful value transfer system' (depicted in a stylised manner in Figure 19.1). Domestic payments (or payments in one currency) are centralised in a national payment system,² to which banks are directly connected as members or indirectly via a member. The payment system is generally publicly run by the central bank; it has responsibility for that currency. Interbank payments are settled in the payment system in central bank money, and payment information is communicated via the payment system's messaging system. In providing both, the central bank underwrites trust in the system. However, the

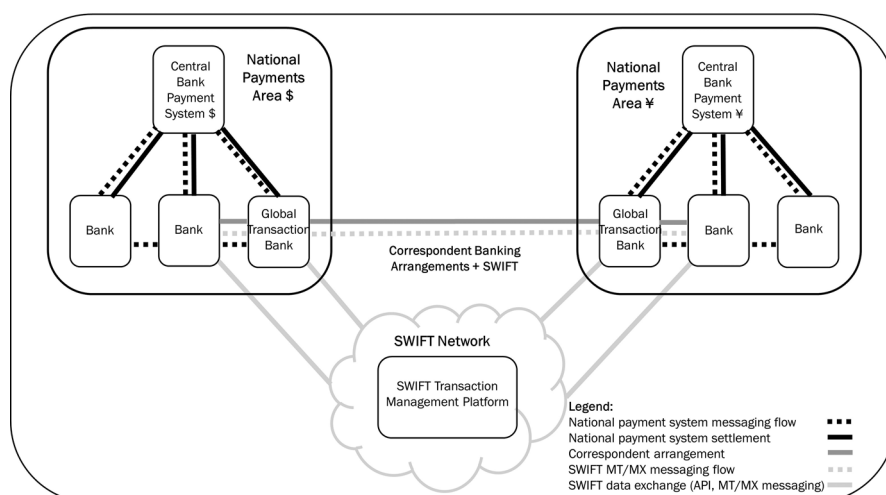


Figure 19.1 Federated global payments system.

Source: Authors' elaboration.

lack of a global currency and central bank means that there is no single global payment system and this 'banal' fact makes cross-border payments more complex (Brandl and Dieterich, 2023).

As per this description, the various national payment systems are connected to each other via correspondent banking (see Nance and Tsingou, this volume). This is a decentralised system of bilateral contractual agreements, called correspondent arrangements or correspondent relationships, between commercial banks operating in different locations. Most banks lack a physical presence overseas and so engage the services of banks elsewhere for international business. For cross-border payments, banks in different locations hold reciprocal ('nostro'/'vostro') accounts with each other from which they make payments. Banks have an arrangement for each currency they make payments in ('currency corridors'). Any bank in one place doing business on behalf of a bank in another place is technically a correspondent; however, transactions are hierarchically concentrated in a small number of mainly Western banks. These banks are called global transaction banks (GTBs). GTBs have a physical presence in many jurisdictions and direct access to payment systems there. Correspondent banking has existed for centuries and remains a mainstay

of bank internationalisation as well as a critically important mode of cross-border funds transfer, both for trade and for interbank payments, such as central bank swap lines.

SWIFT's function here, and the reason for its foundation, is providing secure transmission of payment information for correspondent arrangements between over 11,000 banks in more than 200 (para-)sovereign territories. A massive rise in cross-border funds transfers from the 1960s led to Western banks needing standardised, digital, and secure communication for the increased volume of transaction information. SWIFT's messages have become the standard for parts of the finance industry,³ and these, as well as its network and systems, have gone through various upgrades. Correspondent banking and SWIFT have been derided as legacy systems, ripe for technological disruption. In response, SWIFT has transitioned from serial transmission of messages along the correspondent banking payment chain, towards partial platformisation via a new transaction management platform aimed at helping banks to make economic use of transaction data (Robinson, Dörry, and Derudder, 2024).

While cross-border payments messaging is SWIFT's *raison d'être* and still what it is mostly associated with, SWIFT now processes more messages for securities

transactions (SWIFT, 2021a). Securities were physical, paper-based instruments until inefficiencies in trading and settlement were exposed by a paperwork crisis on Wall Street in the late 1960s, following a rise in trading volumes. This led to immobilisation and dematerialization of securities, with electronic issuing, custody, and recording and transfer of ownership in accounts at custodian banks and newly created infrastructures like central securities depositories (CSDs). Securities accounts were updated in response to transaction information communicated between parties. The account money form thus also underpins financial asset custody (Chan et al., 2007; Milne, 2016). SWIFT's securities operations began in the 1980s via collaboration with international CSDs on bond transactions. This was followed by the admission of securities institutions as SWIFT members, and the expansion of messaging standards to accommodate further securities transactions (Scott and Zachariadis, 2014), allowing SWIFT to further extend trust beyond payments and serve as an obligatory infrastructural component of international financial flows.

5 Facilitating Trust in Cross-Border Payments

Payment settlement has evolved over time to become consolidated in public central banks (Norman, Shaw, and Speight, 2011). Unlike private entities, states can guarantee the stability of their money's value across space and time (Pistor, 2019). The perceived credibility of this promise makes money 'essentially a relationship of trust' (Brandl and Dieterich, 2023, p. 538). Central bank money is therefore the safest settlement asset and is at the top of the monetary hierarchy (Mehrling, 2013). Beneath central bank money, the majority of money in use is credit money created by commercial banks in a kind of monetary public-private partnership (Ingham, 2020). Private commercial banks have accounts with the central bank where payments are settled: the payment system links public and private money (CPSS,

2003). Lack of trust in money would mean a loss of ability to reliably and confidently conduct everyday social and economic activities that we take for granted, for example, to safely effect payment and to exchange cash for the same amount of money at different commercial banks.

Trust in *domestic* payments is anchored in the central bank as the provider of the unit of account, the final means of settlement, and the guarantor of the smooth operation of the payment system (BIS, 2021). *Cross-border* payments that can include multiple 'long chains' of correspondent arrangements (Campbell-Verduyn, Goguen, and Porter, 2019) are different. In this tightly intertwined network, banks are interdependent by reciprocally holding balances and extending credit (Wandhöfer and Casu, 2018). In the past, based more on reciprocity (Molteni, 2021), trust in the intentions and behaviour of partner banks is now more transactional and controlled via contracts (Lyddon, 2012). Only those banks directly connected to each other have established 'trust' relations over time. Trust, for example, erodes when regulatory violations in a payment chain, for example, anti-money laundering, mean that *all* parties in the chain are liable. The reputational and financial costs of entering into a 'bad' correspondent relationship has led to a decrease in correspondent banking services in a process of de-risking (Prentice, 2019) in recent years. In light of this and other challenges, SWIFT has spearheaded efforts to reorganise its network and correspondent banking to maintain trust in both.

SWIFT's standing is based not on asset transfer, but on security, reliability, integrity, and confidentiality in proprietary financial data, a non-trivial undertaking with the technology available when it was founded. SWIFT's ability to achieve and subsequently maintain this is a key element perpetuating trust in both the organisation and its systems. The quasi-monopoly international payments messaging system, SWIFT also relays *domestic* payments messages for some central banks (CPSS, 2005). It additionally offers them a shared backup generic payment settlement system, the Market Infrastructure

Resiliency Service (MIRS), in case of a failure of their system, for example, due to natural disaster, cyber-attack, or hardware failure (SWIFT, 2014). SWIFT thereby also helps central banks underwrite trust in their domestic payments. Only the parties to a transaction are able to read messages about a transaction, which SWIFT provides for via authentication and encryption with latest generation IT security. Continuous network uptime and availability for fast and assured message delivery is guaranteed via multiple layers of data-centre resilience, redundancy, physical security, and processes for implementing critical changes, while SWIFT also accepts some liability for its messages (Scott and Zachariadis, 2014).

Trust also comes from the rules that an infrastructure's users abide by diligently. For example, correspondent banking payment messages are only sent once relevant account balances have been updated, meaning that the previous leg of the payment has already been settled (Wandhöfer and Casu, 2018). While types of some messages convey promises, both binding and non-binding, others 'are the very performance promised in the previously or concomitantly issued message' (Kozolchyk, 1992, p. 47). Banks trust that the content of SWIFT messages is correct and untampered with, that the message is genuinely from the sender, and that transactions within have been settled. In this way, individual (local) material conditions extend beyond just the immediate parties to one leg of a longer transaction chain, translating into system-wide (global) trust and performativity.

6 SWIFT: A Club

SWIFT's organisational form is pivotal in co-constituting trust. It combines trust based on established rules and practices as well as on the ability of SWIFT to *enforce* them (system trust) and trust based on individual relationships (personal trust). A way to conceptualise SWIFT is as a club (Buchanan, 1965; Keohane and Nye, 2000; Tsingou, 2014, 2015), which provides an analytical

grasp on this complex singular organisation and its relation to trust, power, governance, and its ability to change.

The *first* feature is that of *club goods*. Economics posits the theory of clubs as arrangements for the consumption of goods shared by owner-members. Network effects reduce the cost for a single member (Buchanan, 1965). Spurred by communication technologies, such goods are widespread in financial infrastructures, such as in cross-border payments.

A central driver in SWIFT's creation as a cooperative was a lack of trust among competitor banks. At the time that banks needed a secure, digital communications system, First National City Bank (now Citi) had a messaging system that it proposed all banks use. However, other banks' mistrust of competitor's intentions and of becoming reliant on that competitor's proprietary system was a key reason for a cooperative solution. In the 1980s, Citi envisioned broader usage of its private electronic funds transfer system, which other banks could use, 'but only for a fee and only on Citibank's terms' (Bátiz-Lazo, Haigh, and Stearns, 2014, p. 121). SWIFT's cooperative form engendered organisational trust in its motives and intentions beyond any individual bank's self-interest, while its ability to provide a secure messaging infrastructure created confidence in its *competence* – an important dimension of system trust – rather than in personal trust relations between individual member banks. Shared ownership-usage of SWIFT's messaging system in return for membership fees makes it a club good, while SWIFT's profits are returned to members in the form of cheaper services. For example, the cost of sending a letter of credit by telex in the 1980s was USD 10–25, compared to USD 0.50 by SWIFT (Kozolchyk, 1992). SWIFT's messages have continuously dropped in price, allowing member banks to make large profits. Overall, SWIFT creates benefits for its members by doing things that nobody else will do, such as common provision of unprofitable activities, saving duplicate work and cost. Although SWIFT is not responsible for its members' security, it has

introduced a security control framework for its users, recognising that hacking incidents are a significant security and reputational problem (Bergin, 2016).

Trust, then, is itself a club good, which generates further benefits. This takes us to the second, social and cultural meaning of clubs as distinct and powerful *communities of practice* (CoP) (Wenger, 1998). Affiliation ties granted by club admission allow the assessment of members' trustworthiness, community commitment, and adherence to norms, even without personal ties or direct interaction as members (Pak, 2013). A specific benefit is collective learning, such as in CoP, which, via an organisation's simultaneous presence in many places, allows the connection of decentralised knowledge, both tacit and codified, and local and non-local (Malecki, 2000). Headquartered in Brussels, SWIFT also has offices around the world, including innovation labs, as well as local country user groups consisting of member bank employees with direct connections to the organisation, allowing SWIFT to 'co-create' with its members (SWIFT, 2021b).

SWIFT's reputation also adds value to its annual Sibos conference, an important community hub (Scott and Zachariadis, 2014). It serves as a field-configuring event (Lange, Power, and Suwala, 2014), at which like-minded individuals from competitor banks can discuss common problems. Collective learning and community fora are thus forms of relational and social capital that help to build interpersonal and, by extension, inter-firm trust among SWIFT members and their employees. However, SWIFT's trusted reputation may not extend evenly within its member banks, but only among employees familiar with it. Operating across many different segments, financial institutions are not monoliths. SWIFT primarily services transaction banking, encompassing areas such as payments and post-trade. Investment banking activities, for example, may use different infrastructures and services.

Thirdly, *gatekeeping* as a specific form of access control is central to clubs. Club goods are not only about inclusion and availability to members. They necessarily

involve exclusion to discourage free riding. Inclusion and exclusion are normal features of all kinds of groups and organisations, which the club notion helps to illuminate. SWIFT has three main user categories with different levels of access to SWIFT services:

- supervised financial institutions are entitled to full usage of SWIFT services;
- non-supervised financial industry entities may use almost the full suite of services; and
- closed user groups and corporate entities (including some non-financial firms), which are restricted to using messaging only within certain closed groups.

SWIFT users who are involved in the same business as the other shareholders and who send financial messages are eligible to become SWIFT shareholders; in practice they are mainly licensed/supervised financial institutions such as banks, securities broker/dealers, and investment managers (SWIFT, 2020). Unsurprisingly, there are restrictions on full SWIFT membership and access, given that banking itself functions as a club, with restricted access: state-imposed entry requirements guard the reputation and trust in members, and regulations guide behaviour in a way that benefits all members (Goodhart, 1988). However, at times, powerful members defend existing club boundaries to preserve advantages they enjoy (Stearns, 2011). SWIFT's original member banks were not always keen on allowing new kinds of members to join. While securities firms and infrastructures were admitted in 1987, international fund managers' efforts to join were originally blocked until 1992, while non-financial firms were allowed access in 2002 via closed user groups (Scott and Zachariadis, 2014).

There are always limits to trust, however. While, for example, SWIFT has thousands of member banks, most only own a tiny sliver. Board membership is partly composed according to network usage. This favours the large, mostly Western, GTBs who process most transactions, send most SWIFT messages, and drive SWIFT's

revenue. Although SWIFT's network has global reach, it features asymmetries in connectivity, sedimented by the legacy of 'particular dispositions within its infrastructural setup and routes, which emerge from past political choices' (de Goede and Westermeier, 2022, p. 6).

A fourth and final aspect of clubs relates to *governance*. Clubs are a model of multilateral cooperation where negotiations and bargaining that produce compromise, decisions, and actions are obscured by being taken in a private setting (Keohane and Nye, 2000). Sheltered from outside influences, the club is a private forum allowing room for competition for influence and ideas, while avoiding conflict and ironing out differences. While this model is usually associated with elites, it is also connected with private authority, in which trust in expertise, experience, and competence leads to legitimate governance based on delegation of technical issues (Tsingou, 2014, 2015). SWIFT's legitimacy as a private authority stems from regulatory oversight by central banks, its cooperative ownership by regulated financial institutions, and from a variety of sources and roles, some of which it has performed for over forty years. These include:

- its function as standards developer/repository and role as an International Organization for Standardization (ISO) registration authority (designated as a competent body by the ISO);
- its status as an accredited market infrastructure; and
- its capacity as community hub and conference organiser for the global finance community.

SWIFT's development and diffusion of its messaging standards has enabled the industrialisation of financial services on a global scale. SWIFT's governance structure is partly organised to grant a country-level voice, from national user groups, ensuring communication between users and SWIFT to keep a global focus, to national member groups of shareholders, to the director voting formula (Scott and Zachariadis, 2014).

It is not unusual, however, that the common direction the organisation forges is likely to suit the interests of its most powerful members, in this case the very few GTBs. While SWIFT is therefore a class alliance, it represents the hegemony of a particular transnationally oriented class fraction (Bieler and Morton, 2018).

7 Conclusions

SWIFT as financial infrastructure provides communication, spatial integration, and fundamental functions of capitalism, such as the smooth functioning of exchange, and upholding property rights by keeping records and transfer of ownership. Sometimes cooperatively owned, this infrastructure demonstrates that the very core of financial markets is itself not always market-based. This chapter sought to provide an ordering mechanism to grasp the essences of SWIFT as a monopolistic infrastructure for infrastructures, by mobilising the concepts of trust.

Trust among club members is an essential precondition in mobilising collective strategic action to preserve dominance. Since 2017, in response to fintech challengers targeting inefficiencies in correspondent banking and in SWIFT's legacy messaging system, SWIFT has coordinated and rolled out changes across its network worldwide, thereby building on collective learning among its members. As demonstrated in this chapter, system trust is a key part of the connective tissue of infrastructure.

SWIFT has also been reluctantly involved in geopolitical controversies. In 'the SWIFT Affair', there was uproar that prompted a reconfiguration of SWIFT's data centre locations (Dörny, Robinson, and Derudder, 2018) after SWIFT allowed US authorities access to transaction data, including of European Union (EU) parties, following the 9/11 terrorist attacks in New York (de Goede, 2012). Financial sanctions on cross-border payments can be enacted in two ways: one involves targeting the information component, SWIFT, while the other involves targeting the settlement component by

banning correspondent banks from processing currency transactions on behalf of banks in the issuer country (Robinson, Dörry, and Derudder, 2023). SWIFT has been forced by the USA and EU to disconnect banks in, amongst others, Iran on two occasions and Russia in 2022. While SWIFT wishes to remain neutral and to avoid disconnecting members and countries, its near-monopoly messaging infrastructure is a choke point that can be leveraged as a political tool.

Due to the possibility of future sanctions, certain countries are reducing USD dependence. They use alternative currencies and clearing/settlement systems, as well as alternative financial messaging systems to SWIFT (see Nölke, this volume; cf. Nölke, 2023). Established in the 1970s, SWIFT is a child of the post-1945 Bretton Woods cementing of USD hegemony, cross-Atlantic Eurodollar flows, the beginnings of financial globalisation, and the attendant dominance of Western banks, who crafted their private financial infrastructure according to their needs. A shift towards a multipolar monetary order will see attendant new financial infrastructures and shifts in existing infrastructure (see Westermeier and de Goede, this volume).

Challenges to SWIFT's primacy in financial communications are not only about geopolitics/geo-economics, but also purportedly about economic efficiency and financial inclusion, for example, the United Nations sustainable development goals aim of reducing the cost of remittances. While SWIFT has recently upgraded its messaging infrastructure to compete in the digital platform era, other fintech challenges remain. The first is a nascent trend towards direct bilateral and multilateral interlinking of central banks' national payment systems with the aim of improving cross-border payments efficiency, but with the possible effect of bypassing correspondent banking arrangements and SWIFT. A further challenge is from a new money form based on cryptocurrency, namely digital tokens on distributed ledger technology (DLT)/blockchain. While new technologies like blockchain have raised questions about trust in finance, they have

not succeeded in their aim of removing trust entirely (Campbell-Verduyn and Goguen, 2019). Incumbent banks, infrastructures, and central banks have incorporated the technology to make financial transactions more efficient through 'tokenization' of money and securities. This money form features 'atomic' instant combined communication and settlement of transactions, without the separate processes inherent in account-based money. It may thus replace existing financial infrastructures, including SWIFT, with entirely new DLT-based infrastructures.

Infrastructure consists of both technical 'hardware' and social 'software', including organisations in which it is embedded. SWIFT's centrality as an infrastructure for infrastructures is not neutral but contingent on and enrolled in larger power struggles, which inform attempts to change it. Examining the money form(s) that financial infrastructures support allows us to speculate about potential infrastructural futures of new money forms. Change is inevitable, and understanding how this complex twin infrastructure of SWIFT and correspondent banking will navigate these challenges remains an exciting task for the future.

Notes

1. Clearing and settlement follow the execution of every transaction and vary depending on the market, instruments, parties, and infrastructures involved (Lee, 2011). Generally, clearing refers to a series of processes post-trade and pre-settlement, including establishing the parties' obligations to each other and the potential transfer of obligations to a central counterparty to mitigate risk. Settlement is an event that follows clearing, in which the agreed exchange of ownership for money happens (Milne, 2016).
2. Here, the term 'payment system' refers to an interbank payment system 'incorporating a particular set of payment instruments, technical standards for the transmission of payment messages and an agreed means of settling claims among system members, including use of a nominated settlement institution' (CPSS, 2003, p. 9).
3. Different parts of the industry use different messaging standards and protocols.

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Infrastructural Geoeconomics

The Emergence of Chinese and Russian Cross-Border Payment Systems

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1 Introduction

Since the 1970s, SWIFT (Society for Worldwide Interbank Financial Telecommunication), which is based in Belgium, has become the dominant institution for recording cross-border financial transactions.¹ However, its dominance has recently been challenged by some large emerging markets. The Bank of Russia's SPFS (System for Transfer of Financial Messages) was approved for cross-border use by the Russian Parliament in March 2019. India, Turkey, and Venezuela have expressed their interest in using the system, Belarus actually joined in 2021, Iran in 2022. China introduced its payment system called CIPS (Cross-Border Interbank Payment System) in 2015, which has seen a significant increase in transactions over the past few years, including the involvement of Russian banks. The system not only has a separate messaging system from SWIFT, but also covers a complete payment system, including clearing and settlement.

How can we make sense of the emergence of alternative financial messaging systems

and payment systems based on an infrastructural lens? Subsequently, I will link the emergence of alternatives to the discussion on financial infrastructures and argue that the emergence of alternative infrastructures can be seen as a backlash against overt political use of the dominant infrastructure. Next, I will provide some background information on the cross-border payment process. At the center of this chapter is an account about the geoeconomic conflict about SWIFT and the emergence of Russian and Chinese alternatives in response to this conflict.

2 The Argument: Alternative Infrastructures as Backlash against Overt Political Use

During the 2020s, we have seen the development of an “infrastructural gaze” in social science studies of finance (see Westermeier, Campbell-Verduyn, and Brandl, this volume). The basic idea is to marry the macro-level concerns of international political economy (IPE) with the micro-level concepts of science and technology studies

(STS). Two forms of gazing are particularly privileged. On the one side, a perspective more strongly anchored in SST attributes an agential role to infrastructures, highlighting how their technical features shape political activity (see Pinzur, this volume). On the other side, a perspective more informed by concerns of IPE departs from the macropolitical context when looking at infrastructures in finance, highlighting how these infrastructures determine the distribution of power (see Coombs, this volume). Given the point of departure outlined above, the second perspective is more relevant for this contribution.

At the core of Coombs' perspective is Michael Mann's concept of infrastructural power, a concept frequently invoked in the context of studies on the political aspects of financial infrastructures (see also, e.g., Konings, 2010; Weiss and Thurbon, 2018; Bernards and Campbell-Verduyn, 2019; Schwartz, 2019; Braun and Koddenbrock, 2022). At the core of the concept, defined in contrast to (often earlier ages of) despotic power, is the question of how the modern state has become able to wield so much power about the population within its territory. Whereas some applications of the concept use it to explain the power of finance actors over states and other financial actors (e.g., Braun and Koddenbrock, 2022, p. 17), other applications apply the concept in order to explain how the expansion of financial markets ("financialization") also increases the (infrastructural) power of the state (in particular of central banks), based on cooperation with financial sector actors (e.g., Konings, 2010).

Since Coombs (this volume) is dissatisfied about the close linkage of infrastructural power with financialization in existing research, he develops a very subtle typology of instrumental, communicative, and network-forming infrastructural power, based on other works by Michael Mann. These types of power allow for a broader infrastructural analysis. However, Coombs' typology still does not fully grasp the empirical developments described. All three types of infrastructural power ultimately go back

to the power of ideas (even in case of "instrumental"), thereby missing the brute exercise of power by financial sanctions (and the subsequent establishment of alternative infrastructures). In the end, we may not be talking about infrastructural power at all in the overt power politics about SWIFT and its alternatives, given the indirect and diffuse nature of infrastructural power, if compared to other types of power (see Westermeier, Campbell-Verduyn, and Brandl, this volume).

There are further indications that the subtle approach of "infrastructural power" may not be entirely suitable for covering SWIFT sanctions and the development of Chinese and Russian alternatives. While the focus of Mann's infrastructural power approach is upon relations between states and society (or economy), in case of SWIFT we are talking about relations between states (or geopolitical power blocs). Moreover, the focus of STS-informed approaches to infrastructural power usually is on one single infrastructure, not on the emergence of competing alternatives (for an exception see Campbell-Verduyn and Hütten, 2023). Finally, existing approaches toward infrastructural power often focus on the Global North (or on global capitalism as a whole), not on North–South or West–East struggles (for an exception see de Goede and Westermeier, 2022).

Arguably, the emergence of an alternative payment infrastructure is a geoeconomic reaction to the geopolitical power play of the Western governments. Emerging economies have been warned about potential economic sanctions in this field. The Western threat of excluding Russia from SWIFT was frequently discussed when tensions between Russia and NATO (North Atlantic Treaty Organization) increased at the start of 2021, due to a Russian military buildup near the Ukrainian border (Faulconbridge, 2021; Shagina, 2021; Smith, 2022). In September 2021, the European Parliament (EP) had stated that the "EU should be ready to use its leverage and call for the exclusion of Russia from the SWIFT payment system to deter Russian authorities from engaging in further aggressive behaviour"

(EP, 2021), echoing previous EP resolutions threatening the exclusion of Russia from SWIFT (Götz, 2021).

During the 2014 Crimea crisis, discussions about Western sanctions against Russia already included the possibility of disconnecting the country from SWIFT. This led to the creation of the CIPS and the SPFS systems. In 2020, there were discussions in the USA about decoupling China from SWIFT. The focus was on how to respond to human rights issues related to the Uyghurs in China and the repression of the protest movement in Hong Kong (O'Toole, 2020). In 2012 and 2017, smaller countries like Iran and North Korea were completely excluded from SWIFT.

Given this power play, the subtle notion of “infrastructural power” does not seem to be adequate for the analysis of the utilization of SWIFT as a sanction instrument and its repercussions with regard to the emergence of alternative payment systems. We should rather talk about “infrastructural geopolitics” (de Goede and Westermeier, 2022), or, better still about “infrastructural geoeconomics,” given that – in contrast to the Iran sanctions covered by de Goede and Westermeier – we are not only talking about (potential) war, but also (and even more so) about a long-term geoeconomic competition, particularly with regard of the US dollar as global trade currency.

Using SWIFT for “weaponized interdependence” (Farrell and Newman, 2019) by the USA has some clear costs for the latter. Many years ago, experts cautioned about the potential unintended consequences of this behavior, specifically about the emergence of alternative systems like SPFS, as noted by Jones and Whitworth (2014). Warnings have been intensified amidst the Russia–Ukraine tensions 2021/2022, emphasizing that disconnecting Russia from SWIFT could enable the Chinese government to develop strategies for handling similar challenges. According to Smith (2022), if disconnecting from SWIFT does not produce the desired results, it may result in the United States losing its related deterrence with Russia and China.

From a broader viewpoint, the decline of institutions like SWIFT could also harm the financial system of the United States, as “the extension of US infrastructural power abroad diminishes state capacity at home” (Weiss and Thurbon, 2018) – a claim which links Mann’s concern about state capacity with the geoeconomic issues of SWIFT-related sanctions. The main point being conveyed is the significance of a worldwide financial system that depends on the US dollar to fund the substantial deficit in the US current account (Schwartz, 2019). Correspondingly, even before the Ukraine war the Republicans’ think tank Defense Priorities was already “counting the cost of financial warfare” and asked for “recalibrating sanctions policy to preserve US financial hegemony” (Gjoza, 2019, p. 1), whereas the more bipartisan think tank Center for a New American Security echoed this concern and feared a “move away from dollar-based clearing and payments” (Harrell and Rosenberg, 2019, p. 2). The US Treasury has expressed similar concerns across the Obama, Trump, and Biden administrations (Wong and Nelson, 2021, p. 13; Shagina, 2022, p. 3).

Considering the recent SWIFT-related sanctions imposed on Russia, it seems improbable that these warnings will be taken into account. As a result, significant emerging markets will likely keep on building cross-border payment systems that are within their own jurisdiction.

3 Background: Infrastructures of the Cross-Border Payments Process

To comprehend the significance of the global payments message infrastructure, especially SWIFT’s role, we must examine the cross-border payment process. This is a topic that macro-level international political economy research has historically overlooked, until very recently (Farrell and Newman, 2019; Nölke, 2022a, 2022b). However, social studies of finance have been very attuned to this topic, although usually with a strong focus on the micro-level (Campbell-Verduyn, 2017; Westermeier, 2020; de Goede and

Westermeier, 2022; Brandl and Dieterich, 2023; McDowell, 2023; Robinson, Dörry, and Derudder, 2023). Correspondingly, we need to combine the “zooming in” of social studies of finance with the “zooming out” and focus of the big picture of international political economy (see Westermeier, Campbell-Verduyn, and Brandl, this volume).

The process of making a payment involves electronic messages that are exchanged between financial institutions. These messages are used to facilitate the transfer of funds from the sender (originator) to the recipient (beneficiary) of the payment (US Department of Treasury, 2006; Wong and Nelson, 2021). Unless both the originator and beneficiary use the same institution, there are usually two financial institutions involved – one for the originator and one for the beneficiary. Additionally, there is typically some type of financial infrastructure in place. When two customers of the same financial institution want to transfer funds, it is a straightforward process. The person sending the money gives instructions to the institution, which then carries out the payment by recording the transaction in its accounting system. When two separate financial institutions, typically banks, are involved, they require a system of infrastructure which might include a separate financial messaging system like SWIFT.

It is sensible to categorize various subtypes of payments and their systems because of their wide range (Bech and Hancock, 2020, pp. 22–28): Typically, there are separate payment systems for retail and wholesale transactions. The term “retail” pertains to a high volume of small payments made for purchasing goods and services. These payment systems can be either private or public. Securities trading is typically part of the “wholesale” sector, involving fewer but larger transactions.

To fully grasp the function of SWIFT, it is important to differentiate between two processes: clearing and settlement. Settlement specifically pertains to the movement of funds. Due to the high volume of transactions that are sent in groups, called batches, financial institutions often need to reconcile

these transactions with each other before they can be settled. Clearing involves reconciling and transmitting transactions, which is usually done through automated clearing houses, although it can also be done directly between two banks.

There is a third distinction between two types of settlement: “real-time gross” and “deferred net,” and there are some types that combine both. A real-time gross settlement (RTGS) system settles each payment as soon as it is received. This system needs a lot of money available, unlike a “deferred net settlement” (DNS) system, which has higher settlement risks but is less expensive. In the second system, payments are cleared at the end of a defined time period based on the net amount. Most securities trading involving wholesale payments are conducted through RTGS systems. The Fedwire Funds Service is the most significant system, operated by the US Fed since 1918 and exclusive to the United States. The main payment system used for cross-border wholesale trading is CHIPS (Clearing House Interbank Payment System), which is based in the USA. This is a private organization that was established in 1974, and it focuses on clearing and settling high-value payments, such as bank loans and securities. The system uses a hybrid DNS–RTGS system. Still, access to SWIFT is crucial for maintaining comprehensive control over the payment messages generated by both Fedwire and CHIPS, particularly in the case of cross-border transfers.

Cross-border transfers are more complicated than domestic transfers. Usually, they operate via the system of “correspondence banking,” although the latter is not exclusive to cross-border transfers: “Correspondent banking is an arrangement, where one bank (the correspondent) holds deposits owned by other banks (the respondents) and provides payments and other services to them” (Bech and Hancock, 2020, p. 32). While some origins of the principle of correspondence banking date back to about 1400, the system has been established since the late 1800s (Rice, von Peter, and Boar, 2020, p. 38). Since not all banks have a correspondence relationship, fund transfers can involve a

chain of transactions. The sender is directing their bank to utilize financial infrastructure to communicate with a bank in the beneficiary's country via a correspondent bank. The process involves clearing and settling to transfer funds to the beneficiary's financial institution.

Correspondence banking, however, is retreating slowly, but steadily. We have seen a reduction of about 20% in the number of correspondent banks between 2011 and 2018, in spite of rising values of payments (Rice, von Peter, and Boar, 2020, p. 38). One of the main reasons for decreasing profitability is the rise in regulatory requirements such as those related to money laundering, tax havens, and terrorist financing. Additionally, alternative cross-border payment systems that leverage technological advances have contributed to the development of alternatives to SWIFT.

In 1977, SWIFT was created as a means of sending payment instructions between different countries. However, it does not handle the process of clearing or settling payments. Almost half of the messages sent through SWIFT are related to securities transactions, reflecting its dominant global position for communication in wholesale operations (SWIFT, 2019, p. 3). Ripple, a fintech company, has attempted to create a quicker wholesale alternative to SWIFT and the correspondence banking system by implementing distributed ledger technology. However, this alternative only accounts for a small portion of the market. This is similar to J.P. Morgan's Liink information-sharing system (Wong and Nelson, 2021, p. 8).

This is because SWIFT introduced a faster and more transparent payment service called "gpi" (global payments innovation) to counter these initiatives. Additionally, SWIFT has implemented another platform to improve speed, which was launched in late 2022. Correspondingly, the "infrastructural power" (Weiss and Thurbon, 2018; Schwartz, 2019; Braun and Koddenbrock, 2022; Coombs, this volume) of SWIFT with regard to cross-border wholesale payments still is undisputed. In 2020, SWIFT accounted for over 90% of the cross-border

transactions totaling \$140 trillion, which is equivalent to 152% of the global GDP (*The Economist*, 2021). However, SWIFT's uncontested position may face challenges due to political conflicts in the future.

4 Geoeconomic Conflicts over SWIFT

For many years, SWIFT ran without disruption and received little attention from political economists. However, in 2012, an advocacy group based in the United States called United Against Nuclear Iran initiated a campaign against SWIFT. They claimed that SWIFT's continued dealings with Iranian banks and institutions violated sanctions imposed on Iran by the European Union (EU) and the USA. Following the passage of legislation by the US Senate Banking Committee, sanctions against SWIFT were authorized if the company continued to provide services to Iranian financial institutions. SWIFT responded rapidly by indicating its willingness to comply with any sanctions arrangement developed by the EU and the USA. In March 2012, SWIFT cut off twenty-four Iranian institutions from their global financial signaling system in compliance with an EU regulation that prohibits the provision of financial messaging services to sanctioned institutions. This decision was significant for SWIFT, as it was turned into a geopolitical weapon.

Since Iran, "de-SWIFTing" was readily recognized as the single most effective sanction currently in existence on a macro scale – or as the "nuclear option" (Caytas, 2017, p. 14). The use of this terminology is making the role of SWIFT seem greater than it is. This is also true for Iran. The decoupling was just an addition to the existing US sanctions against any bank that carries out transactions with Iran, that is, making use of its power over the system of correspondence banks and CHIPS (O'Toole, 2020; Smith, 2022). More powerful than SWIFT decoupling is the latter sanction, potentially leading to a situation where the US government imposes heavy fines or withdraws the

US license of any bank that conducts business with states blacklisted by the USA. For example, in 2014, BNP Paribas was fined 9 billion dollars (Götz, 2021).

In 2016, many Iranian institutions were temporarily reconnected with SWIFT. This was due to the “Joint Comprehensive Plan of Action” or “Iran deal” that was agreed upon between Iran, the permanent members of the United Nations (UN) Security Council, Germany, and the EU. The negotiations involved bringing Iranian institutions back into the global financial system, which was a significant aspect of the agreement (Farrell and Newman, 2019, p. 69).

The Iran situation, however, was just the beginning of the potential use of SWIFT for geopolitical purposes. This was demonstrated again during the 2014 Crimea crisis, which was further highlighted by the Russia–Ukraine tensions in 2021 and the ensuing war that began in 2022. The US government proposed disconnecting Russia from SWIFT following the annexation of Crimea, but SWIFT did not comply. However, the utilization of SWIFT as a weapon has become increasingly common. In 2017, the Belgian government ordered SWIFT to block North Korean banks from accessing its system for correspondence banking, as these banks were still using it despite being sanctioned by the UN. This move was based on a UN report and was in line with the other EU countries (Weiland, 2017). SWIFT has complied and even disconnected all other banks in North Korea (Wong and Nelson, 2021, p. 14).

In 2018, the Trump administration withdrew from the Iran deal and warned that it would impose sanctions on the SWIFT board if it maintained their collaboration with Iran. This has brought back the issue of Iran. European countries, in contrast, did not withdraw from the Iran deal (Thießen and Jehmlich, 2018, p. 4). Although the USA has no legal authority over SWIFT, it still gave in and removed Iranian institutions from its list due to concerns about the global financial system’s stability (Götz, 2021; Wong and Nelson, 2021, p. 13). The USA also imposed secondary sanctions concerning Iranian institutions, leading to a comprehensive retreat of

European banks from transactions with the latter. Subsequently, some European governments tried to resist US pressure by coming up with an alternative system for transactions with Iran (INSTEX, Instrument in Support of Trade Exchanges), circumventing the system of correspondence banks, CHIPS, and SWIFT, but this was not successful.

Finally, the by far most comprehensive utilization of SWIFT as geopolitical weapon has been taking place since the Russian war against Ukraine. After the Russian invasion, exclusion from SWIFT played a very prominent role in the public debate. Calls for an immediate exclusion of all Russian banks from SWIFT were initially countered by concerns about the practical consequences, which are difficult to overlook, given the close interconnectedness of these banks with the global financial system. So far, the EU has excluded a total of thirteen Russian (as well as four Belarusian) banks from SWIFT in three rounds. During the SWIFT exclusion on March 14, 2022, it affected the Bank Otkritie, Novikombank, Promsvyazbank, Bank Rossiya, Sovcombank, VEB, and VTB Bank. On June 14, 2022, additionally the Rosselkhozbank, Sberbank, and the Credit Bank of Moscow were excluded. Finally, the “anniversary” of the invasion was marked by the exclusion of Alfa-Bank, Tinkoff Bank, and Rosbank.

The EU has now imposed a complete transaction ban on most of these banks and has frozen their assets in the EU. Similar sanctions have been imposed by the UK. The USA has also placed relevant banks on the “Specially Designated Nationals” list. Correspondingly, US institutions may not conduct business with these banks. In contrast to the case of Iran, however, the USA have mostly refrained from imposing secondary sanctions, due to concerns of rising tensions with neutral economies in the Global South. The weaponization of cross-border payment infrastructures clearly poses a strategic dilemma to the West (Nölke, 2022b): The current payment-related sanctions on Russia are moderate in their effects, but a tightening of the sanctions could easily speed up the development of alternative infrastructures in China and Russia.

5 The Russian Alternative to SWIFT

In response to the threat of SWIFT decoupling after the annexation of Crimea, Russia launched its own cross-border financial messaging system called SPFS in November 2014. This was done as a precautionary measure and due to repeated warnings about the possibility of SWIFT decoupling in 2014 (Wenhong, 2020). The SPFS is designed similarly to SWIFT, operates alongside it, and is intended to fully replace SWIFT if Russia loses access to it (which has happened to most Russian banks since the war on Ukraine). Moreover, it was meant to have a closed payment system where transactions cannot be monitored by the USA via access to SWIFT data (McDowell, 2023, p. 85).

As of 2023, the SPFS system's usage is mostly limited to Russia. However, the Russian government is actively promoting it at international summits like the ones held by the Shanghai Cooperation Organization and BRICS (Brazil, Russia, India, China, South Africa, Iran, Egypt, Ethiopia, and the United Arab Emirates). In 2019, the Venezuelan government was reportedly considering joining the Russian system in response to concerns about facing new sanctions that may result in being excluded from SWIFT (Laya and Andrianova, 2019); still, no Venezuelan bank was listed as an SPFS participant by 2021 (McDowell, 2023, p. 102). In the same year, Russia and Turkey reached an agreement to use ruble and lira instead of the dollar in bilateral trade, and to use SPFS for cross-border financial information (McDowell, 2023, p. 98). Also in 2019, Iran announced the connection of its recently developed payment signaling system, System for Electronic Payments Messaging (SEPAM), to the Russian system (*Financial Tribune*, 2019). In 2023, Iran finally joined SPFS, after Belarus in 2021. Still, these signaling systems are limited by the fact that they do not include clearing and settlement. If foreign business partners require US dollars – the usual trade currency – Russian banks still would need correspondence banks with

access to CHIPS (McDowell, 2023, p. 85). In trade with India, however, the two governments have agreed to settle in rupees and to use bilateral settlement, in order to support the strongly growing trade between the two countries (Venkiteswaran, 2022). Alternatively, rubles or dirhams – the currency of the United Arab Emirates – are being used, with payment messages transferred via SPFS (Venkiteswaran, 2023).

The exact number of foreign banks using SPFS is unknown, since Russia has stopped publishing this information since the outbreak of the war, in order to protect SPFS cooperation partners from Western sanctions. By 2020, 400 financial institutions had joined, mostly from Russia, but also 23 foreign banks, from Armenia, Belarus, Germany, Kazakhstan, Kyrgyzstan, and Switzerland (McDowell, 2023, p. 85). This is very limited if compared to the roughly 11,000 institutions from 200 countries covered by SWIFT – but the main purpose of SPFS is not to match SWIFT, but to have a workaround in case of Western sanctions.

In addition to creating SPFS, Russia also implemented additional measures to protect itself from possible financial sanctions. These measures included building up large foreign reserves and establishing a domestic credit card system called “Mir” that lessens the impact of Mastercard and Visa being cut off for Russian consumers (Gricius, 2020). It has been reported that Russia is creating a digital version of their currency called the digital ruble, similar to the Chinese plans (see Section 6). A digital currency does not need to rely on SWIFT, but can find other ways to communicate (Shagina, 2022, p. 5; Westermeier, 2023). However, SWIFT has been very active in establishing a cross-border central bank digital currency (CBDC) platform, in order to become a leading actor in this field, too.

Although the disconnection from SWIFT due to Western sanctions in 2022 caused short-term capital outflows, currency volatility, and inconveniences for transactions with Russia (such as reverting to telex, email, or fax for financial messaging), it appears that the medium-term impact can be managed

(Smith, 2022). This is also due to the fact that the sanctions still leave loopholes. As of 2023, Gazprombank – the most important Russian bank for energy trade – is still connected to SWIFT, and two major European banks – Raiffeisen Bank International and UniCredit – still operate in Russia (Nölke, 2023). In contrast, a study of TARGET2 transaction data indicates that for those ten Russian banks that were disconnected from SWIFT in 2022, TARGET2 transactions were comprehensively terminated (Drott, Goldbach, and Nitsch, 2022). However, this development is mainly based on the blocking sanctions that the EU has issued more or in parallel with the exclusion from SWIFT, not on the exclusion as such.

6 The Chinese Alternative to SWIFT, CHIPS, and US-Linked Correspondence Banking

The Chinese response to SWIFT sanctions is more extensive. China has been using CIPS since 2015. This system is more than just a financial messaging platform like SWIFT. It includes clearing and settlement capabilities, making it a complete payment system. While it still utilizes SWIFT for most cross-border financial communications, it can also function without it if required (Friesen, 2023, p. 15). CIPS distinguishes between direct participants (under the legal supervision of the People's Bank of China) and indirect participants (many from abroad). The former have an account with CIPS (and a separate CIPS terminal), the latter may use CIPS via the direct participants.

Since the 1910s, China has undergone a global policy shift which includes the development of CIPS. The Chinese strategy is primarily focused on the idea of “global connectivity” (Godehardt, 2020). This strategy involves creating both physical and digital infrastructures that are centered on China. China has realized the potential threat of being separated from the Western financial infrastructure. As a result, they have decided that solely working within existing institutions, such as setting up a

data storage center called Finance Gateway Information Service in China in cooperation with SWIFT in 2021, is not enough. China needs to complement its strategy by developing a new set of institutions centered in China. This goes further than the Russian strategy to create an “Economic Fortress Russia,” given that China aims to create alternative (financial) infrastructures centered on China (Petry, 2023).

The amount of payments processed within CIPS is currently still limited: “The Chinese system ... processes approximately 15,000 transactions per day, amounting to the dollar equivalent of \$50 billion. Meanwhile, CHIPS, the US version, processes 250,000 transactions per day, exceeding \$ 1.5 billion” (Norrlöf, 2023). Correspondingly, China is “astute enough not to challenge SWIFT until the CIPS has matured, but no doubt one day the challenge will come” (Prasad, 2017, p. 116).

Although the Chinese alternative to SWIFT has not gained many users yet, its usage is increasing rapidly. According to a Nikkei survey, there was an 80% rise in payment settlements based on CIPS between 2017 and 2018 already. This increase was particularly observed in countries that are under US sanctions, such as Russia and Turkey, and countries involved in the Belt and Road Initiative (Kidda, Kubota, and Cho, 2019). From October 2015 to May 2021, the number of participants in CIPS grew significantly, from 195 to 1,189 (Wong and Nelson, 2021, pp. 9–10), rising to 1,280 participants from 103 countries in January 2022 (Cipriani, Goldberg, and Spada, 2023, p. 27) and, by February 2023, to 1,366 participants, 79 direct and 1,287 indirect (Friesen, 2023, p. 15). By February 2023, the number of foreign banks in CIPS was at least 613 (CED, 2023, p. 6). In addition, the faster-growing economic region where the alternative system is being used is not the traditional – and comparatively stagnating – center of the global economy covered by SWIFT.

Since several Russian banks are linked to CIPS as indirect participants (and one Chinese bank is connected to Russian SPFS),

the payment system allows China–Russia transfers, even if the Russian banks are sanctioned by exclusion from SWIFT (Cipriani, Goldberg, and Spada, 2023, p. 27). The issue of China’s payment system has resurfaced amidst growing tensions between China and the USA, which haven’t eased up after Biden became president. The bipartisan US consensus regarding the need to slow China’s rise poses a significant threat, leading the Chinese government to increase efforts to promote their alternative payment system. To avoid being hurt by potential US sanctions too badly, the Bank of China has advised the country’s banks to avoid SWIFT messaging (PYMNTS, 2020).

In addition, China has been increasing efforts to create a CBDC, which could serve as an alternative to traditional cross-border payment systems (Greene, 2021; Friesen, 2023, pp. 16–18). This type of digital currency does not rely on SWIFT or correspondence banking, which is currently dominated by US banks. China plans to expand the use of its digital renminbi (also known as digital yuan, DCEP, or e-CNY) from domestic retail payments to wholesale cross-border trading in the future. This is in line with China’s strategy to take advantage of having the first major currency to introduce a CBDC.

Many market participants believe that the digital renminbi could be as risky as the physical renminbi, due to the closed nature of the Chinese financial system (Kärnfelt, 2020; Shagina, 2021, 2022). Therefore, it is even more crucial for China to support global CBDC standards, especially a multi-CBDC arrangement (known as the mBridge project), than to expand the use of the digital renminbi. Interlinked CBDCs allow central banks to settle payments between the related countries in their own currencies, without resorting to correspondence banks and the US-controlled CHIPS settlement system.

In the future, a multi-CBDC arrangement that works efficiently could offer a cheaper and faster option for cross-border payments compared to the current correspondence bank and SWIFT-based system (Auer, Haene, and Holden, 2021), even if SWIFT

is very active in establishing a cross-border CBDC infrastructure itself. As a result, it might weaken the position of the US dollar as the primary global currency and the ability of the USA to monitor international financial transactions (Campbell, 2021; Lewis and Li, 2021). In addition, the widespread adoption of CBDCs may make it easier for governments to implement advanced capital controls due to the significant level of state oversight in the use of these digital currencies (Greene, 2021).

7 Implications: Alternatives to SWIFT and the Future of the Global Financial Infrastructure

In contrast to the subtle forms of domination discussed in the context of infrastructural power (see Coombs, this volume; Pinzur, this volume), we have witnessed an overt case of geopolitical confrontation, with long-term geoeconomic implications. The increasing use of SWIFT as a weapon has led to the creation and adoption of alternative cross-border payment systems, as a (potential) defense against Western sanctions. China, with its state-capitalist economy, is at the forefront of alternative systems, particularly in the use of CBDCs for cross-border transfers.

The increase in the number of competing payment infrastructures can also hurt the currently dominant (“financialized”) mode of the global financial system (Braun and Koddenbrock, 2022). According to Fichtner (2017), the current system has a high level of centralization in its financial infrastructures, which are controlled by Anglo-American entities. However, if there were a further development competing infrastructures, this could potentially weaken this important aspect of the current global financial order. This development is increasingly causing concern among US think tanks, including Carnegie (Greene, 2021). Similar to the USA, China one day could use its payment system in order to exercise its own “infrastructural geopolitics” against other countries (de Goede and Westermeier, 2022).

For the time being, however, the focus is on geoeconomic competition (Babic, Dixon, and Liu, 2022), most notably on the function of the US dollar as trade currency. Correspondingly, the development of Russian and particularly Chinese alternatives to SWIFT (and the related US-dominated system of correspondence banks (see Westermeier, Campbell-Verduyn, and Brandl, this volume, as well as Nance and Tsingou, this volume), should rather be counted as a case of “infrastructural geoeconomics,” that is, the pursuit of geoeconomic strategies via (financial) infrastructures.

First indications for the reduction of the role of the US dollar as the dominant global trade policy were already visible in 2023, driven by the Western sanctions on Russia after its invasion of Ukraine. Daily transactions using CIPS have increased by 50% (*The Economist*, 2023) and the renminbi's share of global trade finance has more than doubled during the first year after the onset of the war, and now nearly reaches the role of the euro (Lockett and Leng, 2023). Alternative geoeconomic financial infrastructures are clearly gaining ground.

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Derivatives Market Reforms and the Infrastructural Authority of Central Clearing Counterparties

Lorenzo Genito and Andrea Lagna

1 Introduction

At the 2009 G20 Pittsburgh Summit, global leaders agreed that over-the-counter (OTC) derivatives should be standardized and routed through central clearing counterparties (CCPs or clearing houses). This move aimed at mitigating the risk that these instruments posed to financial stability (G20 Leaders Statement, 2009; Stafford, 2017, 2018; ISDA, 2021). OTC derivatives – especially credit default swaps – played a major role in the 2008 global financial crisis (FCIC, 2011). Thus, in the period between the bankruptcy of Lehman Brothers on 15 September 2008 and the G20 Pittsburgh Summit that started on 24 September 2009, pressure had mounted on G20 leaders to address the safety and transparency of OTC derivatives markets.

Derivatives are financial instruments (or contracts) whose value derives from the value of underlying assets and variables (Hull, 2021, p. 23).¹ Professional investors use derivatives for three main reasons: to hedge against potential losses in investment portfolios; to speculate on the future

direction of asset prices and variables; and to arbitrage between the values of two or more securities (Hull, 2021, pp. 33–39).² Since the late nineteenth century, derivatives trading has occurred on both organized exchanges and OTC markets (Swan, 1999). Organized exchanges are regulated marketplaces where market participants buy and sell standardized contracts. Trades and risk are managed centrally through CCPs. By contrast, before the post-2009 reforms, OTC derivatives markets were self-regulated spaces where investors traded non-standardized derivatives (often complex ones) bilaterally, without channelling them through clearing houses (Hull, 2021, pp. 24–27). By the early 2000s, OTC derivatives trading had expanded dramatically more than trading on organized exchanges had (see Figure 21.1).³ OTC derivatives markets had become a vast, opaque, and decentralized network connecting the trading floors of major financial organizations (Schinasi et al., 2000, pp. 9–30). Quite tellingly, Frank Partnoy (2009, p. 18) referred to OTC derivatives markets as the ‘wild Wild West of trading’, because in these opaque, decentralized, and practically

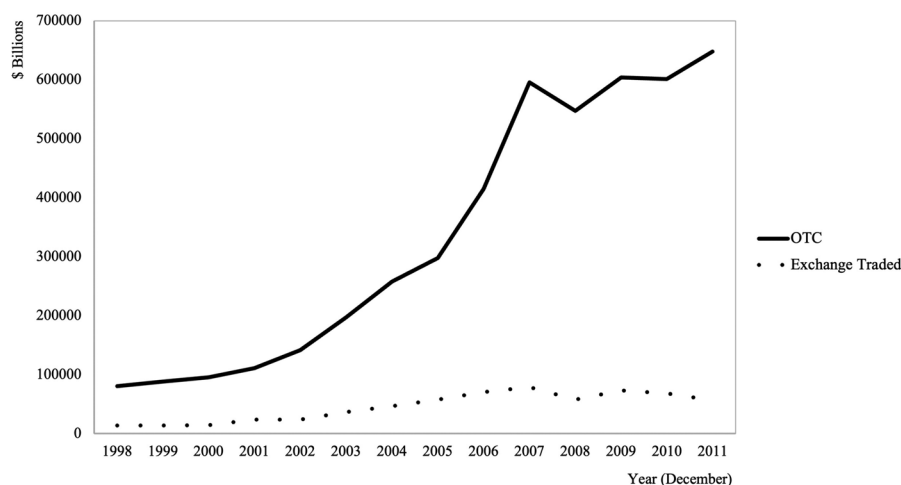


Figure 21.1 National amount (US\$ billions) of financial derivatives on global OTC markets and organized exchanges, 1998–2011.

Source: Lagna (2013, p. 14) based on BIS data.

unregulated markets traders benefited from designing a large range of bespoke derivatives contracts that were not available on organized exchanges. However, despite such benefits, OTC derivatives markets entailed a significantly higher level of risk compared to organized markets (Steinherr, 2000).

In this chapter, we delve into the transformative measures implemented by policymakers and regulators to improve security and transparency in OTC derivatives markets following the 2009 G20 Pittsburgh Summit. We explore how these efforts substantially increased the ‘infrastructural authority’ (Genito, 2019) that CCPs traditionally held over exchange-traded derivatives, which represented a smaller segment of global derivatives markets. According to Genito (2019), the concept of infrastructural authority refers to the ability of CCPs, as private organizations, to influence derivatives trading through their clearing and settlement services.⁴ As policymakers and regulators pushed for the central clearing of OTC derivatives, CCPs expanded their influence beyond exchange-traded derivatives, encompassing the majority of global derivatives trading. Importantly, while this process enhanced the transparency and safety of derivatives markets, it also transformed CCPs into what has been termed ‘the new too-big-to-fail institutions’ (Stafford, 2017) of global finance.

Our chapter is structured as follows. In the next section, we examine the infrastructural authority of CCPs before the 2009 reforms. We then trace the expansion of CCPs’ infrastructural authority resulting from the post-2009 reforms. After that, we study the implications of CCPs’ heightened infrastructural authority for financial stability. Finally, we conclude with an overview of our analysis and a call for regulators and policymakers to take into consideration the ‘infrastructural properties’ (Campbell-Verduyn, Goguen, and Porter, 2019, p. 928) of CCPs.

2 CCPs’ Infrastructural Authority over Exchange-Traded Derivatives before 2009

Derivatives were historically traded on both organized exchanges and OTC markets (Swan, 1999). Exchange-traded derivatives have a long history tracing back to commodity futures trading in the United States during the late nineteenth century (Levy, 2006). US commodity exchanges such as the Chicago Board of Trade and the Chicago Mercantile Exchange (CME, or Merc) established the foundations of modern-day derivatives trading as a risk management business that included

standardized contracts, open outcry trading pits (today almost completely replaced by electronic trading), the possibility to close out trades through cash settlement without commodity delivery, and, most importantly for the purpose of this chapter, the practices and technologies of central clearing (Moser, 2000; Millo et al., 2005; Levy, 2006; Pinzur, 2016). In the early 1970s, organized exchanges expanded their business beyond commodity derivatives to include the trading of futures and options contracts on financial derivatives (Markham, 1987).

Central clearing is the major benefit of trading derivatives on organized exchanges. It mitigates counterparty risk and provides a transparent platform for clearing, settlement, and reporting trades. Crucially, central clearing is the socio-technical construct through which CCPs historically exerted their infrastructural authority over exchange-traded derivatives (Genito, 2019). Central clearing is legally based on counterparty substitution through ‘novation’, which means that a CCP becomes the counterpart in each trade, selling derivatives contracts to buyers and buying them from sellers, while also clearing and settling such contracts (Loader, 2020). CCPs have several firewalls to protect against possible defaults of participating members. The margin system is the first and most important firewall (Norman, 2011).

In the margin system, the clearing house collects liquid collateral – for example, sovereign bonds and cash-like instruments – from traders, and such collateral is used in case of default to make up for financial losses (Genito, 2019, pp. 945–946). In derivatives markets, the margin system includes the initial margin paid into the investor’s account to enter the market; the variation margin, which reflects the daily gains and losses between traders; and the maintenance margin as the lowest amount an account can reach before a margin call is issued asking a trader to bring the margin back to the initial amount (Hull, 2021, pp. 51–52). Should the margin requirements be exhausted, CCPs can also resort to other firewalls such as default funds and, in the last instance, their own capital (LCH, 2024).

The key point is that, contrary to bilateral trading, CCPs allow investors to be individually exposed only to the clearing house, which uses multilateral netting to sum up investors’ multiple transactions (Genito, 2019, pp. 944–945). CCPs use the ‘matched book’ to offset a position taken on with one counterparty with an opposite position taken on with another counterparty (Rehlon and Nixon, 2013, p. 2). In a word, central counterparty clearing replaces multiple risk exposures among investors with a centralized network in which clearing participants are only individually exposed to the CCP (Domanski, Gambacorta, and Picillo, 2015, p. 60). Thus, clearing houses can reduce market risk by matching all positions and offsetting losses against the buyer with gains from the seller. However, as we show later in this chapter, CCPs are themselves vulnerable to the risk of counterparty default.

Thus, CCPs traditionally exerted infrastructural authority over exchange-traded derivatives through the practices and technologies of central clearing. CCPs replace by means of novation the buyers and the sellers of derivatives contracts in organized exchanges. In so doing, CCPs become legally responsible for all contractual obligations. Furthermore, CCPs both enable the trading of derivatives instruments and constrain it through the imposition of margins and the posting of collateral (Genito, 2019, p. 950).

Unlike organized exchanges, OTC markets before 2009 were decentralized networks of financial organizations tailoring derivatives instruments to fit certain requirements of their clients (Schinasi et al., 2000). Derivatives were privately negotiated between two parties without using CCPs – for example, a bank selling an interest rate swap to a local authority that wants to optimize liability costs (Hendrikse and Sidaway, 2013; Lagna, 2015). Just like derivatives trading on organized exchanges, OTC derivatives markets have a long history. For example, during the 1950s options dealers advertised premiums for equity options in the *Wall Street Journal* and the *New York Times* (Options Institute, 1995, pp. 6–7). A turning

point in the history of OTC derivatives markets occurred in the 1980s when the growing use of swaps contracts marked the expansion of OTC markets (Bryan and Rafferty, 2006).

One of the first swaps was introduced in 1981 with a famous agreement between IBM (International Business Machines Corporation) and the International Bank for Reconstruction and Development (World Bank Group) (Kapur, Lewis, and Webb, 1997, p. 1035). Initially, a group of big banks structured bilateral swap deals, but soon these banks realized the fee-earning potential and started acting as market makers (Geisst, 2002, p. 250). In 1985, they established the International Swaps and Derivatives Association (ISDA) to represent the swaps industry (ISDA, 2024). From this point onwards, swaps became the fastest growing derivatives sector, with companies using them to hedge the risk exposures to interest rates and exchange rates (Markham, 2002, p. 192). Moreover, customized swaps became the perfect unregulated instruments that corporations ‘could use [...] to avoid regulation or to hide risks’ (Partnoy, 2009, p. 47). Governments and local authorities also joined the swaps market for their debt management activities, becoming important clients of major investment banks that were packaging and selling swaps (Hendrikse and Sidaway, 2013; Lagna, 2015, 2016).

By the time of the 2008 global financial crisis, OTC derivatives markets had expanded dramatically compared to organized exchanges (see Figure 21.1). Importantly, such expansion was built upon the self-regulation of derivatives dealers (Group of Thirty, 1993; Pagliari, 2012; Tsingou, 2015). To be sure, several self-regulatory initiatives were developed to minimize risk. Notably, derivatives contracts were subject to the ISDA Master Agreement, which outlines the terms and conditions for parties engaging in OTC derivatives transactions. The ISDA Master Agreement reduced investors’ concerns with counterparty risk concentration in large financial organizations (Lockwood, 2018). However, despite the ISDA Master Agreement, OTC derivatives markets ultimately functioned in a decentralized manner

without CCPs mitigating risk and ensuring transparency. As Schinasi et al. (2000, p. 19) aptly explained:

OTC derivatives markets exist on the collective trading floors of the major financial institutions. There is no central mechanism to limit individual or aggregate risk taking, leverage, and credit extension, and risk management is completely decentralized [...] There is no centralized trading, clearing, or settlement mechanism in OTC markets. Transparency is generally limited as well [...] Information about market concentration and who owns which risks is generally unavailable; at best, a trading desk might know that some institutions are building up positions.

Eventually, the collapse of Lehman Brothers on 15 September 2008, and the ensuing global financial crisis, dealt a major blow to OTC derivatives markets. Credit derivatives – and OTC derivatives more broadly – were at the root of the crisis and necessitated radical reforms (G20 Leaders Statement, 2008, p. 7). It was clear that the decentralized practices of risk management and the ISDA Master Agreement failed to prevent the accumulation of counterparty risk in large financial organizations like Lehman (Parker and McGarry, 2009). Soon enough, the attention of policymakers and regulators turned to central clearing as useful to make OTC derivatives markets safer and more transparent. In Section 3, we turn to these regulatory actions and how they augmented the infrastructural authority of CCPs.

3 Augmenting the Infrastructural Authority of CCPs

Following the 2009 G20 Pittsburgh Summit, several crucial reforms were implemented, including: (1) the central clearing of standardized OTC derivatives; (2) organized trading of standardized OTC derivatives (where possible); (3) reporting of OTC derivatives trades to data repositories; and (4) higher capital and minimum margin requirements for non-cleared OTC derivatives (ISDA, 2021, p. 3). In a word, such

reforms rethought the historical distinction between organized derivatives markets and OTC derivatives.

CCPs rose to prominence in the aftermath of the 2008 global financial crisis when LCH.Clearnet, which in 2016 renamed itself LCH, successfully handled the default of Lehman Brothers. Lehman Brothers used LCH.Clearnet to clear trades. Lehman's collapse on 15 September 2008 left a multitrillion-dollar exposure on LCH. Clearnet's books (De Teran, 2008; Norman, 2011, p. 26). By October 2009, LCH. Clearnet settled Lehman's positions without having to rely on its default fund (Gregory, 2014, p. 43). In other words, LCH.Clearnet prevented any of its clearing members from incurring financial losses stemming from Lehman's defaulting positions. This specific event helped consolidate the regulatory and policy-making consensus on leveraging the practices and technologies of CCP to make the central clearing of OTC derivatives mandatory – in so doing, improving the transparency and stability of these complex financial markets (Lee, 2010; Wendt, 2015).

Mandatory clearing of OTC derivatives was introduced in the USA with the 2010 Dodd-Frank Act and in the European Union (EU) with the 2012 European Market Infrastructure Regulation. The Committee on Payments and Settlements Systems – later renamed the Committee on Payments and Market Infrastructures – and the International Organization for Securities Commission were mandated to establish international standards to supervise and regulate CCPs (Helleiner, 2014, p. 80; Thiemann, 2023, p. 139). Following these regulatory actions, by the second quarter of 2017, the portion of interest rate swaps cleared through CCPs represented 88.5% of the traded notional amount for such instruments. Cleared credit default swaps accounted for 79% of the notional amount (ISDA, 2017). As of the first quarter of 2023, cleared interest rate swap transactions comprised 78.4% of the total traded notional amount, while cleared credit derivatives transactions accounted for 87.4% of the traded notional total (ISDA, 2023).

Thus, prompted by G20 leaders and their objective to reduce the risk that OTC derivatives trading posed to financial stability leading up to the 2008 financial crash, policymakers and regulators profoundly reshaped OTC derivatives markets by introducing the system of central clearing (BIS, 2016, p. 5). As a result, CCPs – and particularly the world's largest clearing houses such as LCH, CME Clearing, and Eurex Clearing – have increased their infrastructural authority considerably, superintending a broad swathe of global derivatives trading through counterparty substitution and margin requirements. Whereas during the self-regulatory era, OTC derivatives users were relatively free to negotiate and customize the terms of contracts, now they must accept standard practices imposed by CCPs – above all, the collateral-based margins (Genito, 2019, p. 950).

4 Central Counterparty Clearing and Financial Stability

What are the implications of CCPs' infrastructural authority for financial stability? Let us focus on two dimensions: risk concentration in CCPs and the impact of CCPs' margins on market liquidity. Both dimensions have the potential to render the infrastructural authority of CCPs more visible to the wider financial system and economy, in the sense that market participants would become fully aware of CCPs' operations in the event of a financial meltdown caused by those clearing practices and technologies that are usually hidden in the background (Genito, 2019, p. 942). Such CCP-led crises could result in state actors reining in the infrastructural authority of clearing houses.

4.1 CCPs and Risk Concentration

Mandatory clearing shifted exposure to derivatives risk from large banks to CCPs (Banque de France, 2010, p. 34). This shift transformed CCPs into too-big-to-fail institutions (Stafford, 2017). CCPs became central to OTC derivatives markets due to their

ability to reduce counterparty risk by means of a matched book, multilateral netting, and collateral-based margin requirements. However, CCPs still suffer from risk concentration, namely an exposure to counterparty risk that is significant enough to impact financial stability negatively (Moscow, 2007, p. 44; Domanski, Gambacorta, and Picillo, 2015; Gracie, 2015, p. 2; Wendt, 2015).

Concentrating a large amount of exposure to OTC derivatives in a few clearing houses increases the possibility that the clearing members are unable to meet margin calls and ultimately default. If the CCP were to go bust, such defaults could cause problems for one or more CCPs and the entire financial system (Domanski, Gambacorta, and Picillo, 2015, pp. 60–68). Such risk exposure is also heightened by the interconnected nature of central counterparty clearing. CCPs have contractual relationships with the same clearing members – that is, systemically important financial organizations and major contributors to CCPs' financial resources. Because of this interconnectedness, if a large clearing member defaulted, such an event is likely to affect multiple CCPs (FSB, 2017; Genito, 2019, p. 953). In addition, so-called interoperability agreements between two CCPs – which entail a cross-system execution of transactions – further expose different CCPs to one another and to each other's clearing members (ESMA, 2016; Genito, 2019, p. 954).

As we explained, clearing houses have built several firewalls to protect themselves against counterparty risk. Collateral-based margin requirements are the most important line of defence. Despite these protections, there are three well-documented cases of CCPs that shut down in the past: Caisse de Liquidation des Affaires en Marchandises à Paris in 1974, the Kuala Lumpur Commodity Clearing House in 1983, and the Hong Kong Futures Exchange Clearing Corporation in 1987. All three cases occurred because clearing members failed to meet margin calls in a context of market distress, while clearing houses had insufficient default funds (Hills et al., 1999; Gregory, 2014, p. 267; Bignon and Vuilleme, 2017). Now that CCPs have

become too-big-to-fail institutions (Stafford, 2017), regulators and policymakers are addressing key questions concerning the vulnerabilities of CCPs, many of which were raised already in the aftermath of the 1987 US stock market crash, an event in which clearing houses – notably, the Chicago-based Options Clearing Corporation – weathered the storm rather well. That event also laid bare the structural problem of central clearing. In 1990, Ben Bernanke (1990, pp. 143–144) explained the structural problem in the following words:

In general, insurance arrangements are not able to cope completely with systematic [sic] risk. It is not possible, for example, to insure property against damage caused by a major war. For the same reason, while a conservative clearing house might try to prepare itself for even a very large shock, there must be some eventualities for which, ex ante, insurance is just too costly. The issue then becomes, what if a shock so large as to be judged nearly impossible ex ante actually occurs? What are the mechanisms to minimize the damage to the functioning of the market ex post? Let us put aside the possibility of government intervention for the moment. Then there seems to be a potential structural problem with the clearing house arrangement.⁵

Almost forty years later, that structural problem has yet to be solved, leaving policymakers and regulators in search of solutions that do not exist once the possibility of direct state intervention is removed (Thiemann, 2023, pp. 138–140).

4.2 CCPs and Market Liquidity

Besides raising important questions concerning systemic risk, CCPs can also negatively impact market liquidity in times of crisis. The 1987 stock market crash already exposed this problem. As CCPs of future markets in Chicago asked for over US\$4 billion in variation margins during two days, they were criticized for reducing liquidity during the crisis (Bernanke, 1990, p. 147; Genito, 2019, pp. 954–955).

The risk of CCPs impacting market liquidity is clearly shown in the case of

the Eurozone debt crisis, particularly during the 2010–2012 period. Such events did not concern derivatives markets, but rather the market for repurchase agreements (repo), which are short-term funding tools for banks and non-bank financial actors using sovereign bonds as collateral (Gabor, 2016). As a major clearing house operating in the European repo market, LCH. Clearnet destabilized European sovereign-debt markets by increasing margins on Irish, Portuguese, Spanish, and Italian government bonds as repo collateral. LCH. Clearnet issued margin calls that forced banks to sell the sovereign bonds. These sell-offs resulted in bond yield hikes and widening bond yield spreads (Gabor and Ban, 2016, p. 631; Genito, 2018, pp. 214–271; 2019, p. 955; Genito and Lagna, 2024).

5 Conclusion

In this chapter, we showed how the regulatory actions following the 2009 G20 Pittsburgh Summit bestowed considerable infrastructural authority on CCPs. First, we analysed how, before 2009, CCPs had limited infrastructural authority on global derivatives trading because they oversaw only exchange-traded derivatives. We then examined how policymakers and regulators enabled the expansion of CCPs' infrastructural authority following the post-2009 reforms. Such authority hinges on the mandatory clearing of OTC derivatives, counterparty substitution by means of novation, and CCPs' use of collateral-based margins. Finally, we delved into the implications of CCPs' increased infrastructural authority for financial stability, specifically regarding the concentration of systemic risk in a limited group of CCPs and the potential impact of CCPs' margin calls on market liquidity.

The post-2009 reforms of OTC derivatives markets were a double-edged sword. On one hand, they placated political pressure to reform global finance after the 2008 great crash by increasing the infrastructural authority of CCPs in global derivatives markets. On the other hand, such

reforms concentrated risk in CCPs and did not consider the negative impact that CCPs' margins may have on market liquidity. Policymakers and regulators have tried to address the structural problem of CCPs' risk concentration – for example, through the recovery and resolution of failing CCPs (Regulation (EU) 2021/23, 2020). However, these regulatory actions 'stand in for a solution which de facto cannot be found' (Thiemann, 2023, p. 141). In case of a low-probability/high-impact market event, CCPs would require state intervention in the form of liquidity injection by central banks (Thiemann, 2023, p. 141). Furthermore, while the systemic risk of a failing CCP has been at least considered, policymakers and regulators have not significantly explored the negative impact that CCPs' margins can have on market liquidity (Genito, 2019, p. 955; Genito and Lagna, 2024).

The debate on CCPs' growing centrality in global finance and their impact on financial stability continues. We can only hope that viable solutions will be found before we are confronted with another tail event in global financial markets. Finding viable solutions requires thinking carefully about the 'infrastructural properties' (Campbell-Verduyn, Goguen, and Porter, 2019, p. 928) of CCPs to avoid ending up in a game of Whac-A-Mole, in which regulatory actions unintentionally create new systemic risks.

Notes

1. There are four standard 'plain vanilla' types of derivatives: forwards, futures, options (including warrants), and swaps. Both forwards and futures are agreements between two parties to buy or sell an asset at a predetermined price on a future date. However, futures are standardized and traded on exchanges, while forwards are not. An option gives the investor the right, but not the obligation, to buy (call option) or sell (put option) an underlying asset at a predetermined 'strike price' on or before a certain expiry date. The investor pays a premium when buying an option. A swap is an agreement between two parties to exchange cash flows based on an agreed-upon formula.

Derivatives have different underlying variables and assets such as interest rates, foreign exchange rates, credit events, corporate shares, commodities, and other less conventional variables (e.g., CO₂ emissions). Besides standard derivatives, there are customized contracts that alter the features of basic derivatives to create more complex instruments. Such ‘exotic’ contracts were traditionally sold bilaterally on OTC markets. See Hull (2021) for a comprehensive analysis of derivatives markets, instruments, actors, and strategies. About the importance of derivatives in global capitalism, see Bryan and Rafferty (2006), Wigan (2009), and LiPuma (2017).

2. To clarify why a professional investor uses derivatives, let us examine the hypothetical example of an investor buying a put option to hedge against the possibility of a large loss on XYZ stock. The investor buys a put option on XYZ stock with a strike price of US\$50. The investor has the right, but not the obligation, to sell 1,000 shares of XYZ to the option seller at US\$50 per share, even if the stock price falls below US\$50. The investor pays a premium of US\$3 per share to buy the option (so, US\$3,000 in total). If the price of XYZ hovers above US\$50, the investor will not exercise the put option and will lose the US\$3,000 premium. If the share price falls below US\$50 (say US\$40), the investor can exercise the put option and sell XYZ shares for US\$50 per share. The put option functions as a hedge against the risk of a decline in the stock price of XYZ below a certain threshold. Derivatives can be valuable tools of risk management on financial markets. However, their use also entails great levels of risk related to leverage, counterparty default, complexity, and lack of transparency (Steinherr, 2000; Das, 2006; Hull, 2021). This was particularly the case especially in OTC markets prior to the reforms recommended at the 2009 G20 Pittsburgh Summit.
3. Recent annual data show a notional value of outstanding OTC derivatives of US\$618 trillion and a gross market value of US\$20.7 trillion (BIS, 2023). This means that the notional value of OTC derivatives contracts is about six times the world’s current gross domestic product (GDP), while the gross market value is about the same as the US present-day GDP. OTC derivatives are mainly contracts on interest rates (interest rate swaps, interest rate options, forward rate agreements),

exchange rates (currency swaps, currency options, currency forwards), equity (equity forwards, equity swaps, equity options), and credit (credit default swaps). Despite most OTC derivatives being now standardized and cleared through CCPs, the Bank for International Settlements (BIS) continues to use the term OTC derivatives and to collect statistics on such instruments. It is important to note that a small percentage of OTC derivatives remain ineligible for central clearing (see BIS, 2024).

4. The concept of infrastructural authority draws on two streams of literature in international political economy: ‘private authority’ (Hall and Biersteker, 2004) and financial infrastructures (Bernards and Campbell-Verduyn, 2019). The former explores the power and legitimacy of private actors (e.g., CCPs) in the global economy. The latter is inspired by work on infrastructure in science and technology studies and investigates the background technology underpinning financial markets.
5. Bernanke used the term ‘systematic risk’ to refer to the risk that the failure of a single financial organization or a group of financial organizations can spread to the broader financial system and economy. He did not refer to Markowitz’s (1952) understanding of systematic risk in the context of modern portfolio theory.

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CHAPTER 22

ESG

“Sustainable” Investing and the Risk of Infrastructural Lock-In

Jan Fichtner, Robin Jaspert, and Johannes Petry

1 Introduction

During the 2021 United Nations (UN) Climate Change Conference (COP26) in Glasgow, US Treasury Secretary Janet Yellen (2021, para. 2) in her keynote speech remarked that addressing climate change will require nothing less than “the wholesale transformation of our carbon-intensive economies,” estimating the costs for this transition “between \$100 and \$150 *trillion* over the next three decades.” Mitigating climate change will thus require “making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development,” as stated in the Paris Agreement (UN, 2015). As a result, various kinds of sustainable finance have grown rapidly after 2015. But whether this allegedly “sustainable” way of investing can actually fulfill this monumental task depends very much on the concrete business schemes and investment practices that are adopted. As this chapter illustrates, this is ultimately determined by the specific infrastructural arrangements – notably environmental, social, and governance (ESG)

data, ratings, and indices – that underpin sustainable finance.

According to the European Union (EU) (2023, para. 1), sustainable finance, in its very broad sense, “refers to the process of taking environmental, social and governance (ESG) considerations into account when making investment decisions in the financial sector, leading to more long-term investments in sustainable economic activities and projects.”¹ From its beginnings as a niche phenomenon at the beginning of the 2000s, ESG has turned into a much-debated trend in recent years (Pollman, 2022). However, ESG is both highly contested and its true size is unclear, with estimates ranging from about \$700 billion to \$30,000 billion (Fichtner, Jaspert, and Petry, 2023b). This astounding disorientation regarding the actual structure of the business field creates a sphere of confusion that makes ESG prone to greenwashing.²

In this chapter, we conceptualize ESG as the infrastructure that underpins “sustainable” investing.³ We argue that ESG constitutes a particular set of market devices – data,

ratings, and indices – that define the logic, structure, and outcomes of sustainable investing. Having historically emerged as market-driven private standards for governing how to invest “sustainably,” we demonstrate how a small set of private actors defines the infrastructural arrangements that guide ESG investing. As a consequence, a preference for a market-friendly and one-sided conception of sustainability exclusively focused on risks to investors’ portfolios (“single materiality”) was implemented by the actors that defined standards. This setup of ESG creates what we call an “infrastructural lock-in,” whereby this particular conception of “sustainable” investing – which is not utilizing all available transmission mechanisms to actively advance sustainability (Fichtner, Jaspert, and Petry, 2023a) – becomes the baseline and the common standard for “sustainable” finance. Market-driven standards of private governance, we argue, ultimately shaped supposedly sustainable investment practices into a form that is inherently not significantly advancing sustainability. By investigating the infrastructure of ESG, we shed light on the crucial question to what extent ESG can play a meaningful role in the much-needed green transition (see also Seabrooke and Stenström, this volume) – and how regulation could remedy some of the crucial shortcomings of ESG investing.

This chapter is structured as follows. Section 2 discusses ESG in terms of a sociotechnical infrastructure for sustainable investing as well as its potential (non)impacts for sustainability. Section 3 then provides a brief historical overview how ESG investing developed, illustrating its emergence as market-driven private standards for defining sustainable investing. Section 4 discusses the resulting structure of the market for ESG which is highly concentrated among a few firms. Drawing on the distinction between single- and double-materiality conceptions of ESG, Section 5 then illustrates how this setup creates an “infrastructural lock-in” as ESG in its contemporary form does not seek to create positive sustainable impact. Section 6 concludes and highlights further avenues of research.

2 ESG as the Sociotechnical Infrastructure of Sustainable Investing

For every market, certain sociotechnical infrastructures need to be in place to enable transactions in the first place (Bowker and Star, 1999). In other words, particular “social, cultural, and technical conditions” make markets possible (MacKenzie, 2006, p. 13). But while infrastructures are an enabling factor, they also determine constraints and mark the boundaries of what is possible. As Caliskan (2020, p. 542) has stressed, “the study of socio-technical infrastructures plays a crucial role in making sense of economic action and agency, because they *structure possible fields of action* in identifiable ways.” Infrastructures are not necessarily deterministic but generally shape the room for what is possible – and what is not. Infrastructures therefore potentially lock-in certain practices and courses of action while making the pursuit of alternatives less likely.⁴ In the case of sustainable finance, the infrastructure that underlies ESG investing defines how “sustainable” investing is being conducted and what counts as such. ESG data, ratings, and indices – in this very sense – function both as important market devices that enable sustainable investing while simultaneously determining the limits of what sustainability impact ESG can achieve.

Importantly, these financial infrastructures are inherently political as they modify the distribution of power and capabilities within marketplaces (Pardo-Guerra, 2019). Bernards and Campbell-Verduyn (2019, p. 783), for instance, argue that financial infrastructures “can confer, extend and enable new forms of governance” and that “contemporary forms of hybrid public/private governance and corporate power often depend on control over key financial infrastructures.” Similarly, Pinzur (this volume) notes that financial infrastructures are always embedded in asymmetric relations of dependency and discretion which exist between the operators of infrastructures and their users. Whoever controls financial infrastructures therefore has significant power to shape markets and their socioeconomic outcomes.

It is thus important to analyze “the hard-wiring of technical operations into financial practices and regulations” (Dimmelmeier, 2020, p. 2). As a result, by setting the rules of the game for sustainable investing the operators of financial infrastructures have a large degree of power to shape financial markets, their dynamics, and outcomes (Genito, 2019; Petry, 2021). Who defines ESG – the data, ratings, and indices that set the parameters for sustainable investing – hence matters for what the material impact of these investments actually is.

Thus, in order to better understand the impact that ESG has as the sociotechnical infrastructure for sustainable finance, we need to analyze how its particular characteristics have emerged. As we illustrate in the following sections, ESG has developed as market-driven standards for the private governance of investment practices. This genesis of ESG has given rise to the implementation of a very *narrow understanding of sustainability* into financial market practices shaped by the notion of *single materiality* (see Section 5). Importantly, by setting the de facto standards for sustainable investing, ESG data, ratings, and indices thus created an *infrastructural lock-in* that has established a persistent benchmark for practitioners, investors, and regulators about how “sustainable” investing should be conducted. Crucially, this market-driven approach to ESG does not effectively utilize potential transmission mechanisms to create sustainable impact in the “real” economy.

3 A Short History of ESG

While ESG has become mostly synonymous with “sustainable” investing, its importance as a financial infrastructural device for facilitating sustainable investing is a relatively recent phenomenon. The historical development from a niche phenomenon to the de facto standard for sustainable investing can be divided into three stages (see Busch et al., 2021).

The earliest precursors of ESG investing are found in attempts by religious groups,

including Quakers and Methodists, to avoid investing in “sin stocks” such as gambling and tobacco (Liu, 2020). Similarly, in the 1970s and 1980s, investors from Europe and North America sought to avoid investment in companies active in South Africa to support the anti-apartheid movement – marking the first sequence of modern ESG investment approaches. In the United States, that is, proponents of “socially responsible investing” excluded producers of chemical weapons used in the Vietnam War from their portfolios (Liu, 2020). The full or partial exclusion of specific firms or whole industries (e.g., coal or tar sands) is one key origin of ESG. Referred to as “negative screening,” this practice is still an integral part of ESG (Deutsche Bundesbank, 2019; Kölbel et al., 2020). This phase of “sustainable” investing, which relies exclusively on avoiding exposure to unethical firms, has been labeled “Sustainable Finance 1.0” (Busch et al., 2021).

In 2004, the term ESG itself was introduced in a report by the UN Global Compact (Pollman, 2022). This first notion was followed by the development of the UN Principles for Responsible Investment (PRI) in 2006. Arguably, these roots mark the beginning of the “Sustainable Finance 2.0” era which was characterized by the development of ESG investing from a niche phenomenon into a mainstream investment approach (Busch et al., 2021). The first creation of ESG exchange traded funds (ETFs) in the early 2000s signaled the start of this new phase.⁵ The UNPRI established a framework defining some basic requirements, particularly regarding transparency. They did not, however, provide specific standards. As a result, a number of private firms developed a plethora of ESG ratings, data, and indices as tools for asset owners and asset managers seeking to pursue “sustainable” investment approaches. As has been repeatedly observed in market-driven processes, the ESG industry began to consolidate into a small group of big firms with high market power (Escrig-Olmedo et al., 2019; Dimmelmeier, 2020). The so-called Sustainable Finance 2.0 period was characterized by the primary aim to manage the financial risks of investors’ portfolios.

These risks were understood as stemming from ESG factors. The ultimate goal was to avoid these risks, protecting investor portfolios in order to maximize financial gains. Retail investors and institutional asset owners alike increasingly invested in “mass market” ESG funds reallocating ever-larger amounts of capital. Between 2006 and 2015, the PRI-linked investments of asset owners grew from \$2 trillion to \$13.2 trillion.⁶

According to Busch et al. (2021), the 2015 Paris Agreement marks the transition toward “Sustainable Finance 3.0.” The advent of the UN Sustainable Development Goals and the increasingly discussed urgency to keep global warming below +2.0°C induced a stronger focus on the real-world impact of sustainable finance.⁷ “Impact” can be defined as positive effects on the ESG practices of firms in the portfolios of ESG funds. Since the Paris Agreement, PRI-linked investments surged even further to \$29.2 trillion (2021) – “sustainable” investing driven by the ESG infrastructure became an important force within the global financial system.

However, as the following sections demonstrate, the emergence of ESG as private standards for financial governance has resulted in a configuration through which a particularly narrow understanding of sustainability was locked into the infrastructural devices that inform “sustainable” investment.

4 Resulting Market Structures and ESG’s Impact Potential

If we want to assess the impact of ESG we need to look at the potential channels of impact the funds may exercise and understand which actors actually decide which channels are being used. In essence, there are two mechanisms ESG funds can use in order to exert influence on corporations and create impact: capital allocation (i.e., which companies to include in or exclude, also known as divestment or “exit”), created through the steering capacities of their portfolio (Rohleder, Wilkens, and Zink, 2022), and shareholder engagement (also referred to as “voice”), which consists of direct

engagements with the top management of investee firms as well as the shareholder voting behavior of funds at the annual general meetings of the portfolio companies. So far, the vast majority of ESG funds have not systemically adopted these potential mechanisms to create an impact regarding sustainability issues (see Griffin, 2021; de Groot, Koning, and van Winkel, 2021; Golland et al., 2022).

We argue that this is the case because, since the early 2000s, ESG investing was shaped by a burgeoning private industry for ESG market tools which consolidated into a handful of globally dominant firms (European Commission, 2020; Harty and Tor, 2020; ESMA, 2022). They provide quintessential information (data) on the ESG performance of individual firms (ratings) and define groups or “baskets” of firms that are considered “sustainable” (indices). These assessments and categorizations have become authoritative to every market participant navigating the world of ESG investing. They have become a taken for granted baseline that informs how actors calculate, act, and trade (see Pinzur, this volume).

The ESG index industry is characterized by a particularly concentrated market structure, where one firm – MSCI – has emerged as the dominant provider of ESG indices. Partially, this is because MSCI is one of the very few fully integrated firms providing ESG ratings and data as well as indices. As Simpson, Rathi, and Kishan (2021, para. 4) noted, “no single company is more critical to Wall Street’s new profit engine [i.e., ESG investments] than MSCI, which dominates a foundational yet unregulated piece of the business.” This business model creates strong synergistic network effects through its provision of complementary infrastructural devices necessary for ESG investing to function (Petry, 2021). First-mover advantage via acquisitions, combined with large economies of scale and scope and a market-compatible approach paved the way for MSCI’s success. By deciding which stocks and bonds are included in ESG funds via its indices, MSCI effectively defines what counts as ESG investing and

thus emerged as a new kind of “focal institution” in this issue area (Büthe and Mattli, 2011). According to JP Morgan, “MSCI has earned its position because they have become a proven compounder with leading offerings in indexing and unmatched scale and longevity in ESG data.” Commenting on MSCI’s role in ESG, the investment bank further argued: “we are not aware of any businesses with data assets that can match MSCI’s combination of history and scale in research, data, and analytics or in indices” (Gordon, 2023). More than merely leading the market, MSCI is de facto setting global ESG investing standards.

This standard, however, does not endorse “additionality” (see Serafeim, 2023) – which means that no (or only very little) capital actually flows to “green” or “sustainable” projects that would not otherwise have been financed. This is the case because the vast majority of ESG funds are not active on the primary markets – where new capital is raised via the issuance of shares or bonds. Like conventional investment funds, ESG funds are predominantly active on the secondary market, where only already issued securities are traded. In essence, the majority of ESG funds today invest in a very similar way to conventional funds.

ESG investing as currently practiced by most asset managers is almost exclusively focused on managing ESG risks to investor portfolios and to achieve financial gains – but does not seriously engage with the corporations owned by the funds in order to enhance the sustainability of their business practices (Crona, Folke, and Galaz, 2021). ESG funds are situated at a prominent market position which could – in theory – be used to influence fossil fuel firms to change their business model and refrain from harmful environmental practices like fracking. They mostly refrain from doing so, however, as neither the forceful use of shareholder voting nor engagement with company management to advance sustainability are considered necessary elements of ESG and neither is capital allocation properly utilized in the majority of ESG funds.

For most lay observers this is probably very counterintuitive. We argue that this is the case because ESG funds mostly follow existing market patterns guided by the sociotechnical infrastructure provided by index providers, which results in an infrastructural lock-in. The underlying understanding of sustainability (or materiality) that was baked into investment decisions based on these ESG infrastructures is discussed in the following section.

5 Materiality of ESG Devices: Data, Ratings, and Indices

One consequence of the adoption of the market-driven and product-focused approach toward sustainable investing described in Section 3, is that ESG infrastructures have endorsed “single materiality” as *the* concept guiding their premises and understanding of sustainability. Single materiality is an accounting approach that aims to measure how climate change and other “market externalities” create risks that potentially influence the financial value of a corporation. In concrete terms, a single-materiality approach could consist of quantifying the water use of soft-drink makers or chemical companies and the risk they run because of potential water shortages – but only insofar as it poses a risk to their operating profit. It does not explicitly aim to account whether a corporation’s business practices create risks for the environment. In a similar vein, the environmental footprint (waste, etc.) of fast-food vendors could be assessed quantitatively – however, again, exclusively as a potentially material financial business risk. Single materiality is thus an approach that only accounts for how sustainability factors affect the financial value of a company. As Buller (2022, p. 166) put it, the primary question for single-materiality-oriented finance is “not what your portfolio can do for the climate crisis, but what the climate crisis will do to your portfolio.”

In contrast, double materiality considers how companies affect societies and the environment. In doing so, this concept sets

the ambitious aim to move beyond a pure market orientation and internalize nature and society into economic thinking and practices. This approach poses a fundamental rupture with current market (infra)structures and interests. Using a double-materiality approach would imply measuring all greenhouse gas emissions and other harmful business practices of a company and engaging the firm to adopt a path of reducing emissions and put a halt to harmful business practices in general. In other words, double-materiality-focused ESG investing would ask what fund portfolios can do to mitigate climate change and contribute to sustainability.

Consequently, we need to distinguish between ESG investing approaches that seek to create a positive sustainability impact by adopting and following a double-materiality approach and ESG as a profit-driven investment scheme informed by a single-materiality approach. In the former, the focus is shifted to the question of how individual firms can create significant positive impact with regard to sustainability issues; the latter entrenches financial risk and profitability as the driving motives for companies’ actions. As ESG ratings and indices effectively steer sustainable investing (Fichtner, Jaspert, and Petry, 2023a), we need to scrutinize the dominant actors in the field and whether they adopt single- or double-materiality approaches.

The case of MSCI’s ESG methodology approach is very instructive in this regard. Eccles, Lee, and Strohle (2020) have conducted a historical case study of KLD and Innovest, two major ESG firms bought by MSCI in 2010. KLD pursued a values-driven approach to “sustainable” investing that scored companies on a five-point scale from “major strength” to “major weakness” in the categories of community relations, employee relations, the environment, the product, and treatment of women and marginalized groups. In the words of Eccles, Lee, and Strohle (2020, p. 580), “KLD focused its ESG assessment specifically on the benefit or harm to the wider society and not on the financial benefit for investors.” In other words, ESG data by KLD sought to capture what is referred to as double

materiality. Crucially, KLD did not provide an aggregate quantitative score for rated corporations, which meant that users of its ESG data had to do their own final assessment and could not simply use the KLD data to “automatically” construct investment products. Innovest, in contrast, tried to develop a methodology “as quantitative as possible” by assessing over fifty individual performance indicators in five areas: strategic governance, emerging markets, products and services, human capital, and stakeholder capital (Eccles, Lee, and Strohle, 2020, p. 581). Innovest’s ESG assessments were relative and meant to be directly comparable with other firms (to produce “best-in-class” comparisons), the assessments by KLD were absolute (and thus arguably better at creating sustainability impact in the outside world). MSCI chose to continue with the financial value-oriented methodology of Innovest, while discontinuing the KLD approach that captured double materiality to a much greater extent.

The rationale was that the approach by Innovest was better suited to build products that could be sold to financial actors and, crucially, was also much easier to scale (Eccles, Lee, and Strohle, 2020). Scaling is pivotal for financial firms as it allows them to spend money on creating an ESG rating, an ETF, or a stock index only once, and subsequently sell it to a potentially unlimited number of clients without incurring substantial additional costs. These considerations and processes within MSCI shape the current market structure for ESG ratings and effectively erase qualitative approaches seeking to adopt double-materiality conceptions. ESG ratings in their current form primarily capture single-materiality risk and largely fail to account for double materiality.

This leads to confusing, even misleading, results. In MSCI’s ESG rating methodology, for instance, “water stress” is an important metric to calculate the environmental dimension of a company’s ESG rating. In this category, Nestlé, the world’s largest food and beverage company, is categorized as an ESG leader⁸ – notwithstanding the fact that the company has been involved in

countless scandals where it extracted, bottled, and sold drinking water for a huge profit while depriving local communities from Canada to Pakistan. In the apt words of Simpson, Rath, and Krishan:

There's virtually no connection between MSCI's "better world" marketing and its methodology. That's because the ratings don't measure a company's impact on the Earth and society. In fact, they gauge the opposite: the potential impact of the world on the company and its shareholders. (Simpson, Rath, and Krishan, 2021, para. 5)

Next to ESG ratings, ESG indices play an important role as infrastructural devices in ESG investing (Fichtner, Jaspert, and Petry, 2023b). Since the 2008 financial crisis, stock indices (e.g., the S&P 500) have become much more important in global finance as they are effectively “steering capital” (Petry, Fichtner, and Heemskerk, 2021). Indices occupy a dominant position in the investment chain (see Arjaliès et al., 2017) of ESG, too: a small group of firms is crucial for the provision of relevant ESG indices. These include S&P Dow Jones Indices (part of S&P Global), FTSE Russell (part of the LSE Group), and Bloomberg. But one firm in particular dominates the market for ESG indices as well as for ESG ratings:⁹ MSCI. Recent research found that MSCI has an astounding market share of 56% in ESG-relevant indices (Fichtner, Jaspert, and Petry, 2023a).

Thereby, ESG investing has been facilitated and “standardized” by this group of key ESG index providers. While ESG firms have not formally agreed to any market standards, as Fichtner, Jaspert, and Petry (2023a) have shown the majority of large ESG funds today nevertheless do not substantially deviate from conventional investment funds in regard of their capital allocation. A comparison of the holdings of the largest ESG ETF and the largest conventional ETF by BlackRock (the largest asset manager in ESG) provides an example of the striking similarities. Table 22.1 shows the ten largest firms in the portfolio of the (conventional) iShares Core S&P 500

Table 22.1 Capital allocation of big conventional versus big ESG fund

<i>iShares Core S&P 500 ETF</i>		<i>iShares ESG Aware MSCI USA ETF</i>	
<i>Firm name</i>	<i>Portfolio weight(%)</i>	<i>Firm name</i>	<i>Portfolio weight(%)</i>
Apple	7.4	Apple	7.3
Microsoft	6.8	Microsoft	6.5
Amazon	2.9	Amazon	2.8
Nvidia	2.2	Nvidia	2.2
Alphabet	2.1	Alphabet	1.9
Class A		Class C	
Alphabet	1.9	Alphabet	1.8
Class C		Class A	
Berkshire Hathaway	1.7	Tesla	1.4
Meta	1.6	United	1.3
Platforms		Health	
Tesla	1.4	Meta	1.3
		Platforms	
UnitedHealth	1.3	Coca-Cola	1.1

Source: The authors based on www.ishares.com.

ETF and the iShares ESG Aware MSCI USA ETF. In both funds, Apple, Microsoft, Amazon, Nvidia, and Alphabet (Google) constitute the largest constituents in the portfolio (with together well over 20%). The only top-ten firm from the conventional fund that is not also a top-ten holding in the ESG fund is Berkshire Hathaway. There is almost no difference between how conventional and ESG funds allocate capital.

From a climate-change mitigation perspective, large fossil fuel firms are particularly relevant to consider. If we examine the iShares Core S&P 500 ETF, from the example in Table 22.1 more closely, we see that 4.17% of its portfolio is invested in oil and gas companies. In the allegedly “sustainable” ESG Aware MSCI USA ETF fund, the share of investment into fossil fuel companies is only marginally reduced to 4.14%. It hardly deviates. ExxonMobil has a portfolio weight of 1.23% in the conventional iShares fund and 1.01% in the ESG fund; for Chevron, the respective weightings are 0.77% and 0.70%, respectively.

This is because the iShares ESG Aware MSCI USA ETF applies the so-called Broad ESG approach. Funds adopting this approach, generally speaking, hardly deviate from conventional, non-ESG funds in how they construct their portfolio and consequently are particularly prone to greenwashing. In contrast, so-called Light Green and Dark Green ESG funds, which tend more toward impact-generating approaches (“double materiality”), diverge from conventional funds to some degree. These, however, only account for a tiny share of the overall market. In 2021, 88% out of the 500 ESG largest funds marked can be classified as Broad ESG funds, whereas Light Green and Dark Green funds only accounted for 7% and 5% of the overall market (Fichtner, Jaspert, and Petry, 2023a). Thus, most ESG funds do not substantially deviate from conventional investment funds in their capital allocation. Moreover, the vast majority of ESG funds do not utilize the potential mechanisms of private engagements and shareholder voting to push for sustainability in the corporations in which they hold shares.

This is because – like ESG ratings – ESG index methodologies are based on a “single-materiality” conception of sustainability. Having emerged as market-driven, financial value-oriented standards for financial governance, ESG as the sociotechnical infrastructure that enables but simultaneously constrains what is considered “sustainable” investment has locked in a particular narrow conception of sustainability that informs the majority of current investment practices.

6 Conclusion

In this chapter we have argued that ESG is a privately developed sociotechnical financial infrastructure that underpins the functioning of “sustainable” investing. While primarily created for private investors, policymakers and regulators often attribute a central steering role and capacity to ESG investing in efforts to mitigate climate change. ESG funds manage large amounts of capital, thus

having the potential to trigger far-reaching changes in the economy and push toward decarbonization. However, this potential is currently not utilized, because very few ESG funds are systematically utilizing potential transmission mechanisms to facilitate sustainable impacts. Neither do they use private engagements with management or shareholder voting to push for sustainable business practices; nor do most ESG funds substantially differ from conventional funds in their capital allocation. What we observe instead is an infrastructural lock-in of a particular understanding of sustainability that is based on a single-materiality approach. ESG investing in its current form, based on single materiality, is specifically not designed to manage broader societal and environmental risks, and definitely not to mitigate the climate crisis. Arguably, ESG has gained increasing acceptance among financial analysts and other financial practitioners because it offers them a powerful tool capable of integrating social and environmental developments into their calculations merely as market signals, while refraining from any normative attempt to influence ESG issues (Leins, 2020). In other words, the current form of ESG investing is convenient for investors and asset managers because it takes conventional investing as its baseline and only “tweaks” the capital allocation.

Only a small number of financial firms have shaped the historical development of ESG investing. Arguably the most important firm has been MSCI, whose dominant market position in ESG data, ratings, and indices has enabled it to shape the underlying infrastructure of ESG. This has resulted in de facto market standards that define what is considered as sustainable investing based exclusively on single-materiality risk assessments. These ESG standards are an example of “market-based” private regulation, in which firms “establish their preferred technologies or practices as the de facto standard through market dominance or other strategies” (Büthe and Mattli, 2011, p. 14; see also Green, 2010, 2014). The outcome of this constellation is, as we have shown, an *infrastructural*

lock-in of single-materiality sustainability conceptions into investment practices.

Analyzing sustainable finance through the lens of a sociotechnical infrastructure bears the advantage of making the possible long-term consequences of the current lock-in visible. If an approach to “sustainable” investment which hardly has any effect of steering capital into decarbonization is getting locked in, it significantly reduces the role of private financial markets to advance the green transition. While others have focused on the lock-in through carbon-emitting infrastructures (Seto et al., 2016), our focus on carbon-financing infrastructures adds a novel perspective for analyzing potential pathways toward a sustainable future.

Based on our analysis in this chapter, we argue that if ESG is supposed to play any meaningful role in the “the whole-sale transformation of our carbon-intensive economies,” as demanded by US Treasury Secretary Janet Yellen, regulators have to make sure that ESG funds follow a double-materiality logic that actually creates a positive sustainable impact. Defining the use of capital allocation, private engagements, and shareholder voting to advance sustainability as essential elements of all ESG funds could potentially overcome the lock-in of the current form of ESG investing, which has very little impact and thus is not making finance flows consistent with a pathway toward a decarbonized economy.

Notes

1. While sustainable finance also includes green bonds and sustainability-linked loans, ESG is the largest segment and the focus of this chapter.
2. We understand greenwashing as projecting a public image of environmental responsibility that is not met by actual business practices.
3. We define financial infrastructures as the sociotechnical “systems through which basic but crucial enabling functions are carried out, but that tend to be taken for granted and assumed” (Bernard and Campbell-Verduyn, 2019, p. 776).
4. Seto et al. (2016) discuss infrastructures as one potential source for the lock-in of

carbon-intensive emissions pathways; while they focus on how physical infrastructures such as internal combustion engines, pipelines, or power plants engage in and support carbon emission, our focus is on the financial infrastructures that fund carbon emissions (see also Petry, 2023).

5. ETFs are investment funds that are continuously traded and that often track a whole stock market index instead of only a limited number of firms (see Braun 2016, 2021; Fichtner, Heemskerk, and Garcia-Bernardo, 2017; Fichtner and Heemskerk, 2020).
6. As noted, quantifying sustainable investing is very difficult; therefore, this data should not be taken at face value but is rather displayed to indicate the increase of sustainable investments; source: www.unpri.org/about-us/about-the-pri.
7. For the emerging literature on the potential impact of sustainable finance, see Busch et al., 2021; Caldecott et al., 2022; Fichtner, Jaspert, and Petry, 2023a, 2023b; Kölbel et al., 2020; Wilkens, Rohleder, and Zink, 2022.
8. MSCI ESG Ratings & Climate Search Tool: Nestle S.A., category: “how well is the company managing the ESG issues that could affect it financially”; www.msci.com/our-solutions/esg-investing/esg-ratings-climate-search-tool/issuer/nestle-sa/IID000000002144386.
9. Two other important ESG rating providers are Sustainalytics (part of Morningstar) and ISS ESG (part of Deutsche Börse).

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Issue Control in Green Infrastructures

Leonard Seabrooke and Annika Stenström

Our claim in this chapter is that green financial infrastructures are spaces for professional coordination and competition to exert claims at “issue control” over how green finance is treated. What professionals want, above all else, is to determine the content of green finance to reflect their varying interests. While they may seek environmental progress or financial profits – or some combination thereof – they are primarily interested in determining how green finance works and who is permitted to work on it.

One more general strategy to achieve control is to align professional “jurisdictional” control (Abbott, 1988) with the establishment of technical infrastructures. Establishing who is allowed to diagnose and treat an issue, who is permitted to be present in the room, and who judges what is appropriate is of utmost importance. Both professional jurisdictional control – ensuring that only certain actors are permitted to work in an area and contribute to its knowledge development – and infrastructures seek a common aim: to streamline and depoliticize behavior. The study of infrastructures is often equated with the study

of “boring things” (Star, 1999, p. 377). Professionals can affirm their jurisdictional prowess, which we refer to as “issue control” (Henriksen and Seabrooke, 2019; Seabrooke and Stenström, 2023), by crafting infrastructures that become unquestioned and boring.

Piecing together these infrastructures involves a few different steps, and invokes different politics, which we depict in Figure 23.1. These steps have been amply demonstrated in the extensive work on how finance is undergirded by technical infrastructure (Knorr Cetina and Bruegger, 2002; MacKenzie, 2006; Tischer, Maurer, and Leaver, 2019).

First, there is professional contestation over who is permitted to work on an issue, with rival groups, strongly or weakly tied to professional associations, seeking influence (Abbott, 1988). Second, a boundary object must be formed, including who and what is included or excluded and the creation of shared language. Once the casting has been whittled down, a boundary object can be created, which permits cooperation even in the absence of consensus (Star, 2010). Third is the forging of a governance object. This



Figure 23.1 Linking issue control to new infrastructures.
Source: Authors' elaboration.

involves a forward step from cooperation into contestation over what can be measured and valued, a phenomenon sometimes referred to as “trials of strength” (Callon, 1980). These trials can result in a governance object with more permanence than a boundary object and which is put to task in regulating behavior (Latour, 2011; Allan, 2017). Should all of this proceed without ongoing contestation, the governance objects and the professionals controlling how to govern issues can enable technical automaticity. At that stage, the socio-technical relations will be automated and only really visible when they malfunction or fail (Anand, Gupta, and Appel, 2018). While unpacking and unsettling infrastructures is difficult, these stages are reversible.

In this chapter, we walk through the elements linking professionals’ attempts at issue control over how green finance is treated, to the establishment of boundary objects, governance objects, and fully articulated infrastructures with technical automaticity. Our examples draw on the world of green finance, where there are multiple trials of strength and contests to create and inscribe governance objects. As political economists, we hasten to add that these processes reflect power asymmetries and distribute assets and resources unevenly (Colgan, Green, and Hale, 2021; Paterson, 2021). We stress that the lens of issue control is important in revealing conflicts among those making claims to knowledge and influence. Those controlling issues have a vested interest in automating the infrastructure in their favor. In short, remaking a “black box” on how to make finance green empowers particular groups and not others (Bernards and Campbell-Verduyn, 2019),

often compounding “microgeographies” of information inequality (Zook and Grote, 2016). Our empirical illustrations draw on the European Union (EU) taxonomy for green finance (Seabrooke and Stenström, 2023), as well as the “materiality” – what should be explicitly reported as material to shareholder and stakeholder interests – debate in green accounting linked to assurance services.

1 Green Transition as Professional Jurisdictional Battles

Research on professional jurisdiction battles typically focuses on how established groups, with strong professional associations, contest each other to determine who has the upper hand in deciding not only how an issue should be treated, but who is allowed to treat it. A classic example here is conflict between accountants and engineers in the early twentieth century over what should predominate for US industrial firms: knowledge over production processes or knowledge on cost allocation? Accountants won the fight over labeling with the emergence of “factory accounting,” which then became known as cost accounting. They were also successful in reproducing themselves by spreading accounting training as part of general management education, in contrast to the engineers who remained as creative specialists (Abbott, 1988, pp. 230–232). The point being that whoever can best label tasks, provide staff, and educate future professionals has a strong claim over jurisdiction. Cementing a relationship with a formal authority to license only particular professionals to work in an area is a way to secure

a professional hierarchy of who is allowed to work on what, allowing those selected to focus on how they choose to control their tasks. Prominent examples include economists (Fourcade, Ollion, and Algan, 2015), lawyers (Liu, 2013), and doctors (Freidson, 1988). Recent research has also pointed to how professionals engage in alliance formation with professionals from other groups, as well as embedding “avatars” to infiltrate their own practices (Abbott, 2005), to form “linked ecologies” that have a greater capacity to assert control over issues (Fourcade and Khurana, 2013; Seabrooke, 2014; Seabrooke and Tsingou, 2015).

Professional contestation and jostling for hierarchy can also be found in the establishment of green financial infrastructures. The establishment of carbon emissions trading systems, between 1990 and 2007, relied on multiprofessional cooperation among economists and lawyers, as well as policy analysts, directors, and consultants (Paterson et al., 2014). It is these professionals who articulated emissions trading through early policy venues from the US and United Nations (UN)-based working groups prior to the Kyoto Protocol in 1997, and then in regional operational venues (Paterson et al., 2017). Economists led this “pseudo-epistemic community dedicated to ET [emissions trading] for climate change ... [and] provided intellectual foundations for a global ET system” (Paterson et al., 2017, p. 186). Differences between the US and European/intergovernmental approaches to the design of emissions trading centered around the relative presence of economists. In the USA, they dominated with a focus on pro-market efficiency, while the European/intergovernmental approach, where policy analysts dominated more than economists, favored political compromises to get more organizations involved. The professionalization of emissions trading from 2007 onwards led to the development of a carbon market profession through the formation of trading associations, expos, and expansion of graduate training programs specialized in “carbon management” and carbon finance (Paterson et al., 2017, pp. 198–200). The point here

being that jurisdictional claims from the economics professions underpin the formation of the market. Thereafter the market developed its own institutional project that includes new conceptions of professionalism. This process relied on the establishment of boundary objects, what is included in carbon trading and what is excluded, which were then cemented into governance objects. At that point “carbon market professionals” could dominate the system, with the infrastructure largely unquestioned.

2 Green Transition as Boundary Object

An important aspect of issue control in green infrastructure is determining what is to be included for discussion and what is not. Within the sociology of professions, the demarcation of boundaries is an important element of maintaining a jurisdiction. The development of diagnosis, inference, and treatment – the classic conceptual triptych (Abbott, 1988) – involves boundary work from professionals as they seek to create internal and external networks to affirm their position and power (Liu, 2018). Such dynamics are essentially turf battles over who is allowed to treat an issue. Once these basic scuffles have been sorted, the boundary object is then up for debate. Boundary objects afford “interpretive flexibility” from different viewers (Star, 2010), which can lead to claims over how the same object can have multiple uses, as well as “trials of strength” over what the object should really become and how it should be measured (Callon, 1980).

An example can be found in how to determine what companies should include in environmental and social governance (ESG) disclosures within the EU regulatory space. Here the boundary object is the standard for disclosures, which reflect a financial instrument, a legal contract, and part of a chain of investments that are linked to scope 1, scope 2, and scope 3 conditions of environmental harm (from the immediate responsible entity, from input/output sources, and

from total chain environmental costs). As a “networked product” created by actors and infrastructures (Beaverstock, Leaver, and Tischer, 2023), disclosures are a boundary object that allow multiple interpretations.

Our own research on European sustainable finance provides an example of how ESG disclosures reveal differing treatments of boundary objects and can lead to contestation between professionals (Seabrooke and Stenström, 2023). Within the European Commission’s High-Level Expert Group (HLEG) and Technical Expert Group (TEG) the issue of what ESG disclosures should reflect was a point of contention. Professionals within the HLEG, which ran from 2016 to 2018 and provided content to the EU Action Plan on Sustainable Finance, and TEG, which ran until late 2020 to work on technical considerations, strongly differed.

A key difference in the treatment of the boundary object here was over whether company disclosures should favor an established “impact” policy established by an official authority, or whether a trial-and-error “process” approach that empowered companies was better. The issue here was both one of control – who is empowered, the regulator (EU) or the companies – and one of interpretation, as in what should count within ESG disclosures. From our interviews we know that the European Commission’s view is that the “impact” framing for responsible finance is important and that “reporting on processes is a thing of the past” (Seabrooke and Stenström, 2023, p. 1285). Finance professionals involved in the expert groups had a different opinion; that without a reasonable boundary infrastructure that could allow flexibility in ESG

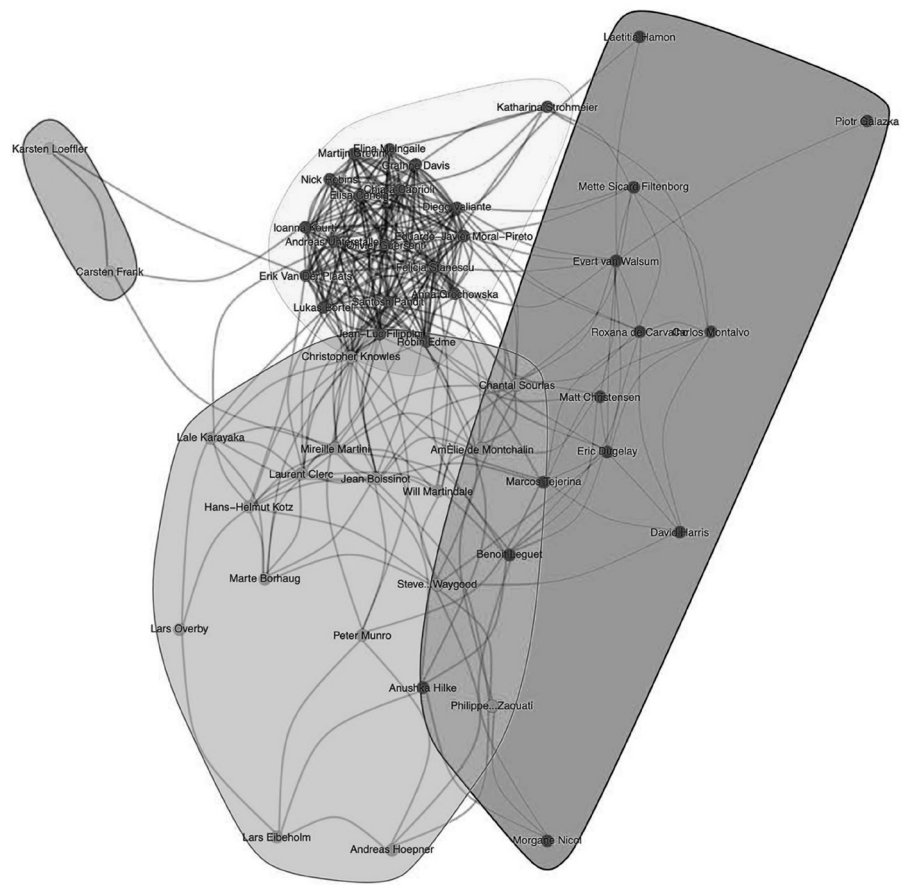


Figure 23.2 Top fifty professionals with community detection.
Source: Seabrooke and Stenström, 2023, p. 1281.

disclosures supported by a robust accounting framework (see Section 3 on materiality as a governance object), an “impact” approach to disclosures was impractical. Rather, ESG disclosures should evolve as companies understand the system better. Rather than companies bending to an imposed external standard they should develop “best practices” (Seabrooke and Stenström, 2023, p. 1285). In the end, the HLEG recommended the approach favored by finance professionals, endorsing “trial and error by companies” and “promoting of best practices” (EU HLEG on Sustainable Finance, 2018).

ESG disclosures within the HLEG and TEG reflected a “trial of strength” between different professional interests and credible interpretations (Callon, 1980). To assess how such trials are linked to professional networks, we mapped the composition of expert networks and their professional affiliations. Figure 23.2 shows this network and applies a community detection algorithm to detect who belongs to what groups. In the figure we can see a tightly knit cluster of policymakers (the small cluster in the center), a cluster of finance professionals (the large oblong-shaped cluster to the right), and a cluster of consultants and activists (the oval cluster to the bottom-left). Importantly, we can also see some brokers who span two groups, like Christopher Knowles spanning policy and finance and Steve Waygood, who bridges finance and consultancy/activism. In our analysis such actors were especially important in defining how boundary objects like ESG disclosures should be considered by the experts, which then fed into the defining of governance objects in European sustainable finance and their relationship to infrastructure.

3 Green Transition as Governance Object

In green finance, professionals battle it out over governance objects. Governance objects are “created, designated, translated and problematized” entities or practices,

which unlike fully automated technical infrastructures have not yet achieved taken-for-grantedness (Allan, 2017, p. 133). The forging of governance objects is a process of multiple trials of strengths over what can be measured and valued in green finance. Once formed, governance objects are crucial to regulating behavior and making green finance governable. Professionals have an interest in achieving issue control over what is yoked together to form the governance object. This can be illustrated by the debate in international accounting standard-setting on what should be seen as material information to include in sustainability reports. Although international accounting standard-setting often is framed as technical, prior research has pointed out that the process rather is characterized by contestation (Botzem and Quack, 2006).

Setting standards on sustainability reporting emerged as a strategy in the late 1990s to make corporate impacts visible and to connect sustainability issues to financial decision-making through accounting techniques (Thistlethwaite and Paterson, 2016). Often bringing together coalitions of non-governmental organizations (NGOs), investors, and professional accountants, a multitude of private governance initiatives setting sustainability reporting standards now exists at the transnational level. This includes the Global Reporting Initiative (GRI), Climate Disclosure Standards Board (CDSB), Sustainability Accounting Standards Board (SASB) and the International Integrated Reporting Council (IIRC). Other initiatives, such as the Carbon Disclosure Project (CDP), Accounting for Sustainability, and the Task Force on Climate-Related financial Disclosures (TCFD), have also put forward guidance, frameworks, and platforms connected to sustainability reporting, contributing to the creation of technical automaticity.

In sustainability reporting, materiality is a key concept. It guides accountants in deciding which information is to be included in the reports – and auditors in their assessment of whether or not the information included is sufficient. There is, however, no clear consensus on which

definition of materiality should guide sustainability reporting (Eccles et al., 2012; Adams and Abhayawansa, 2022; Jørgensen, Mjøs, and Pedersen, 2022). The ambiguity has left the concept of “materiality” open for both cooperation and contestation (Cooper and Michelon, 2022) between not only standard-setters, but also accounting professionals, financial regulators, and market participants.

What is measured and valued in green finance depends on which approach to materiality is inscribed as a governance object. In sustainability reporting, a distinction can be made between financial materiality and impact materiality approaches. Financial materiality is judged based on investors being the main stakeholder in need of information. Information on sustainability issues should in this sense be included if it is deemed as financial material, that is, has an impact on corporate value. Does it hurt profit? It is sometimes described as “outside-in” materiality, in the sense that it focuses on how sustainability issues impact the organization – and not the other way around. As a contrast, impact materiality stipulates an inside-out perspective, how organizations impact people and planet in which it operates. Here, reporting should reflect the impact an organization has on the economy, the environment, and society. This builds on the idea that sustainability disclosures are of interest to a wider audience than investors only.

Among the principal standard-setters on sustainability reporting, GRI, which pioneered sustainability reporting in the late 1990s, is the only one taking an impact materiality approach. The financial materiality approach is favored by standard-setters that came later, such as CDSB, SASB, and IIRC. This has been a part of the strategy to align sustainability reporting with the logic of financial disclosures. In doing so, the initiatives have been able to decouple from the distinct civil society and market logics, which created a tension in sustainability reporting initially (Thistlethwaite and Paterson, 2016). This has primarily been driven by professional accountants,

key brokers in the network, who have been able to bridge the worlds of accounting and NGOs through the strategic use of accounting expertise (Thistlethwaite, 2017).

The tension to settle the governance object of materiality in sustainability accounting has been even more pronounced as pressure on the standard-setters to harmonize the infrastructure of sustainability reporting has grown. As green finance has increased in salience, with initiatives such as the EU Sustainable Finance Action Plan, the TCFD, and the Network for Greening the Financial System, the lack of a coherent corporate reporting structure on sustainability has been pointed out. While the GRI standards have been widely used among corporations, and contributed to an institutionalization of sustainability reporting among multinational corporations (Brown, de Jong, and Lessidrenska, 2009), initiatives taking a financial materiality approach like SASB have received backing from powerful financial market actors like BlackRock (Tett, 2020). The standard-setters have sought to bring convergence to the fragmented space, arguing how their different approaches to sustainability reporting in general and materiality in particular caters to the shifting needs of stakeholders (CDP et al., 2020; see also Rowbottom, 2023).

Coalescing around materiality as a governance object is also something that new actors seeking control over the infrastructure of sustainability reporting are doing. The IFRS (International Financial Reporting Standards) Foundation, which controls the financial reporting infrastructure through its International Accounting Standards Board, announced its entry to sustainability reporting at the COP26 in 2021 with the creation of the International Sustainability Standards Board (ISSB). At the same time, it was announced that SASB, IIRC, and CDSB were to be consolidated into the ISSB. ISSB takes a financial materiality approach to sustainability reporting and models its standards on its voluntary predecessors – including the TCFD recommendations on climate-related disclosures. Also in 2021, the European Commission announced that the EU would

develop its own mandatory sustainability reporting standards. The development of the standard was delegated to the European Financial Reporting Advisory Group, whose prior task mainly has been to advise the Commission on how to implement IFRS standards in the EU. The EU standards take a “double materiality” approach, which sees materiality from both an impact and financial perspective. This means that reporting should include information both on what sustainability impacts an organization has on its environment and disclosures on how sustainability issues impact corporate value. In 2023, both the ISSB and EU’s European Sustainability Reporting Standards adopted their first couple of standards on general sustainability reporting and climate reporting. Additional standards on other sustainability issues, such as biodiversity and social reporting, are also expected to be developed. With this, the two different approaches to materiality are made operable through standardization. While it might be due to fundamentally different visions of green finance and sustainability reporting rather than jurisdictional turf wars (Maechler, 2023), these developments underscore the tension to settle the governance object of materiality in sustainability reporting to exert control over the green finance infrastructure. Thus, while materiality has been forged into a governance object, it has not yet achieved full technical automaticity. Rather, the object is still contested – leaving space for professionals to battle it out in trials of strengths over what is measured and valued in green finance.

4 Green Transition as Technical Automaticity

For professionals competing to exert greater control over green finance, making climate-related issues susceptible to audit and assurance could be a strategy to automate the sociotechnical infrastructures of the green transition in their favor. Examples of this include professional associations’ efforts to position accountants as key experts in governing climate change

(Lovell and Mackenzie, 2011), for example through the issuing of standards on assurance on sustainability reporting (see, e.g., International Federation of Accountants’ (IFAC’s) ISAE (International Standard on Assurance Engagements) 3,000 Assurance Engagements other than Audits or Reviews of Historical Financial Information and ISAE 3,410 Assurance Engagements on Greenhouse Gas Statements). In doing so, they seek to determine who is allowed to work on the issue of the green transition, while at the same time expanding the demand for their professional expertise.

Gaining greater control over green finance can be achieved by controlling the sociotechnical infrastructure that underpins it. Examples include how concepts and processes of financial audit and assurance have been extended to new areas, such as environmental audit and sustainability assurance (Power, 1997; O’Dwyer, Owen, and Unerman, 2011; Canning, O’Dwyer, and Georgakopoulos, 2019). For the Big Four accounting and professional service firms (EY, KPMG, Deloitte, and PwC), translating core expertise in financial audit to new areas such as sustainability assurance has been a strategy to expand their professional service to new markets (O’Dwyer, Owen, and Unerman, 2011). This is not unlike the role of global professional service firms – like the Big Four – in controlling the transnational infrastructure of expertise on transfer pricing (Christensen, 2022), and points to the power of private actors over sociotechnical infrastructures (Bernards and Campbell Verduyn, 2019).

However, transferring sociotechnical processes from one area to another is not free from tension. This is pertinent in the case of sustainability assurance. As a practice, assurance seeks to provide assessments on the reliability and completeness of reporting (O’Dwyer, 2011, p. 1231). Early attempts to construct the practice of sustainability assurance and make sustainability reports auditable showed that the financial assurance logic did not necessarily transfer smoothly to sustainability issues (O’Dwyer, 2011; Canning, O’Dwyer, and Georgakopoulos,

2019). This led to professional struggles between accountants and nonaccountant assurers on how to assess the completeness and reliability of sustainability reporting. Entrenched in their own professional logic, accountants struggled with how to assure sustainability information using traditional financial audit techniques and methodologies. Nonaccountant assurers, on the other hand, had a more flexible approach to the assurance engagement (O'Dwyer, 2011). Over time, this tension between accountant and nonaccountant professional expertise on sustainability assurance has decreased (Canning, O'Dwyer, and Georgakopoulos, 2019), leading to the establishment of a sustainability assurance market underpinned by the blended professional expertise of accountants and nonaccountants. So while assurance has been translated to a new area of sustainability assurance, it has also transformed to accommodate new forms of expertise. This changes the framework of who is allowed to work on the issue and what is included in the process of sustainability assurance.

This can be illustrated by the assurance engagement undertaken by the third-party independent assurance provider Bureau Veritas on Nestlé's sustainability report "Creating Shared Value and Sustainability Report 2021." Bureau Veritas is a global professional service provider, and one of the largest assurance providers of ESG data among US S&P 500 companies. In the independent assurance statement from Bureau Veritas to the stakeholders of Nestlé, the process of the assurance engagement is outlined (Bureau Veritas, 2022). Assurance is assessed with the guidance of AccountAbility's AA1000 assurance standard on the accuracy, reliability, and objectivity of the information contained within Nestlé's report. This is done based on four principles set out by the AA1000: inclusivity, materiality, responsiveness, and impact. Depending on which assurance standard that is used, different principles would guide the assurance provider's assessment. Assurance is also provided on different levels, which determine the scope of the assurance engagement. For Nestlé's sustainability

report, assurance is provided on a moderate level of assurance. As such, the assurance engagement included conducting remote interviews with Nestlé's employees at the head office, reviewing internal systems and samples of selected information, and confirming the accuracy of information with third parties and partners where relevant (Bureau Veritas, 2022). Assurance provided at a higher level of assurance would include a more extensive engagement from Bureau Veritas, meaning a more thorough review and additional steps to assess the information included in the report.

The sustainability market today is open to both accountant and nonaccountant expertise. However, while the expanding sustainability assurance market in Europe has been largely dominated by audit firms, their influence varies widely between jurisdictions. In the USA, China, and the UK for example, nonaudit firms have been successful in establishing their presence as sustainability assurance providers. Here, audit firms only account for around 15% of the sustainability assurance in the USA, 40% in China, and around 35% in the UK (IFAC, 2023). Currently, new standards on sustainability assurance are being developed at the global level by the International Auditing and Assurance Standards Board (IAASB). The IAASB has the support from the International Organization of Securities Commissions (IOSCO) in developing the International Standards on Sustainability Assurance 5000, which is planned to be in place by the end of 2024 (IAASB, 2023). At the same time, the new European directive on Corporate Sustainability Reporting (CSRD) might put audit firms under pressure from other assurance service providers. The new directive will require assurance of sustainability reports, but it also aims to open up the market to new service providers by allowing member states to authorize independent assurance service providers other than statutory auditors and audit firms to carry out the assurance of sustainability reporting. While this could open up the sustainability assurance market for new types of professional expertise, it could also lead to a

shift of who has power over the infrastructure of sustainability assurance. This example illustrates how infrastructures, while often taken for granted, are never fully fixed. Rather, they are always in flux.

5 Conclusion

Our aim in this chapter is to illustrate the three key stages through which actors and objects interact on the creation, maintenance, and defense of green financial infrastructures. We have suggested that issue control in green infrastructures is determined by professional battles over who is allowed to work on particular issues, from varying interpretations of what something is – a boundary object, to scuffles over what should be included within governance objects, and, in some cases, systems that normalize activity through technical automaticity. Here we have a scale from expert brawling between humans with clear interests to the concretizing of those interests and asymmetries through “machines.” There are various ways of interpreting issue control along this scale, including work from the sociology of professional on jurisdictional squabbles (Abbott, 1988), to trials over how to value and measure (Callon, 1980), to the creation of infrastructures that make what was once contentious “boring” (Bowker and Star, 1999). All of these stages are political and we should put in the analytical work to make struggles within them explicit. This is especially important given that they all have strong redistributive effects on who gets to define what a financial product is, what counts as environmental harm, and who benefits.

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Part IV

DIGITAL TECHNOLOGIES AND THE FUTURE OF FINANCIAL INFRASTRUCTURE



Social Media and the Changing Infrastructures of Money

Lana Swartz

1 Introduction

Over a decade ago, cultural anthropologist and sociolegal scholar Bill Maurer called for attention to “the act and infrastructure of value transfer” – that is, to payment, a domain long neglected in social studies of finance (2012a, p. 19). Payment, he argued, was important to understand both because it was a key cultural, economic, and technological form and because its cultures, economies, and technologies were rapidly changing. In other words, it served the infrastructural functions of money.

In the first decades of the 2000s in the United States, payment infrastructures are rapidly becoming more powerful. As scholars such as O'Dwyer (2023) and Westermeier (2020) demonstrate, finances are increasingly becoming platformized, with large, data-driven companies working to embed payments within their platforms and seeking to profit from access to users' transactional data.

Understanding payment as an act and infrastructure underscores that money is a communication medium, a way of transmitting

information that produces shared meaning (Swartz, 2020). Payment technologies – cash, cards, checks, or apps – do not simply transmit value. They communicate the nature of the relationship between two parties and reveal information about how we see ourselves and how we are viewed by powerful institutions (Zelizer, 1997). As a communication infrastructure, payment binds us together in a *transactional community*, a shared economic world, and this shores up new and existing inequalities.

Payment infrastructures are increasingly being understood as a form of “social media.” In the broader communication context, there is a sense that the era of mass media (characterized by unidirectional broadcast and print technologies) has given way to one of social media (digital media that is niche, participatory, peer-to-peer, globalized, and surveilled). So too, *mass money media* have shifted to *social money media*. If, as geographer Emily Gilbert suggests, state currency was designed to enact “mass” transactional communities at the scope of the nation-state, what kinds of transactional communities do new “social” payment systems entail?

Of course, there is no way to neatly segment the two; most critical scholars are uncomfortable even using the terms “mass media” and “social media” (see, e.g., Papacharissi, 2015) as though they describe discrete phases. Similarly, the shift from mass money media to social money media is more complicated than it sounds. The mass medium of cash has always been accompanied by other money tokens, including foreign currency, coupons, and checks (Carruthers and Babb, 1996; Henkin, 1998).

Yet social media money is helpful shorthand for an industry, a way of describing a certain set of technologies and a series of norms and engagements. To be sure, money has always been social and money has always been media. As a media technology, payment infrastructure is currently being redesigned to look more like social media, largely by Silicon Valley.

But this redesign brings up new questions: Who gets to control payment? Communication technologies come with constraints that can exclude potential users from the transactional communities produced by those forms of payment. Despite being a state technology, cash is difficult to control or surveil and has a low barrier to entry. New money media, created in the image and footsteps of social media, will not be equally accessible. As we move from mass transactional communities to social transactional communities, what are the implications of this shift? Who will monitor, control, and restrict these new payment rails?

2 Transactional Memories: Social Payments and Data Economies

The media studies scholar Josh Lauer (2017) demonstrates that the concept of “financial identities” is centuries old: credit bureaus of the nineteenth and early twentieth centuries collected information and stories to determine borrowers’ ability to repay. These reports, Lauer says, made modern people into “legible economic actors” (p. 35).

But in recent years, there has been a shift from these aggregations of financial data

to what I call *transactional identities*, shaped by how, where, when, and with whom we transact. If the former constituted identity via credit, the latter constitutes identity via payment infrastructure. We perform these transactional identities through payment, and they shape how others view us, whether as Amex Black card holders or electronic benefits welfare card users.

These transactional identities are being shaped in real time by social money media, as exemplified by Venmo, a peer-to-peer mobile payment app that is especially popular in the United States, where bank transfers are expensive and cumbersome. Venmo includes a social “feed” of transactions, visible to friends, similar to a Facebook news feed or Instagram post. The app requires users to annotate their transactions with notes and encourages them to use emojis: pizza, taxi, clinking wine glasses.

In this way, Venmo illustrates what sociologists Alya Guseva and Akos Rona-Tas (2017) call the “new sociability of money”: The ability of digital money technologies to “preserve the details of economic transactions, to capture our geographic movements, to infer our tastes and routines” (p. 204). The app also gives rise to new forms of social communication, including playful interactions and coded messages (Acker and Murthy, 2018). Its social streams reinforce, memorialize, and even potentially strain social relationships (Drenten, 2022).

Venmo reveals that money has always been social, but it also encloses that sociability within its platform and records it for perpetuity (O’Dwyer, 2019). Scholars across fields have argued that money is a technology of memory (see, e.g., Kocherlakota, 1998). Social media is also a technology of memory; it is part of what the media scholar Jordan Frith has called “a new memory ecology” assembled on mobile phones (2015, pp. 90–91).

These transactional memories can also be used for surveillance and control. Nigel Dodd writes that “a device for *remembering* cannot be divorced from the criticism that it is also a vehicle for political and commercial *surveillance*, above all, as long as the

technology involved is controlled by corporations and states” (2014, p. 296, original emphasis). Kelsi Barkway (2023) documents how even seemingly benign technologies (in this case, benefits cards for distributing welfare payments) can be perceived as tools of surveillance and social control, inciting fears in users that their spending is being monitored and they will be judged as undeserving.

Digital transactions are, in fact, being used for control and punishment. Police in Atlanta have used access to an activist’s PayPal account to bring criminal charges against a bail fund that has supported protests against the construction of a large police training facility (Lennard, 2023). Consumers may not be aware that their transactional memories can be used to cause them trouble, as in the case of mobile-phone borrowers in Kenya, whose phones offer them access to credit while simultaneously generating a stream of financial and personal data that can harm their credit scores. Social scientists Kevin P. Donovan and Emma Park (2022a, 2022b) note that many of these borrowers end up seeking expensive short-term credit to prevent damage to their credit scores, ensnaring them in a cycle of debt that is difficult to exit, a form of “predatory inclusion.”

In fact, many of our experiments with digital payment technologies are being enacted on the world’s most vulnerable people. Aaron Martin (2019) documents how mobile money platforms facilitate both familiar and novel forms of surveillance of users by government entities and service providers. Similarly, anthropologist Margie Cheesman notes that companies and aid organizations providing support in refugee camps are testing out web3 technologies such as blockchain wallets to distribute various kinds of payments. In this environment, where users have limited choices, rights, and protection, forced use of these technologies requires them to generate financial data over which they have little control (Cheesman, 2022a). Thus, she recommends that web3 technologies not be used experimentally among vulnerable populations (Cheesman, 2022b).

3 Chokepoint Power: How Controlling Payment Infrastructure Controls Users’ Lives

The systems that allow us to get paid, like many other critical infrastructures, are largely invisible until they stop working (Star, 1999; Edwards, 2003). And when those systems stop working, it often comes as an account that is frozen without warning, perhaps for opaque reasons. Users may have little recourse, and the consequences of an account freeze can be severe.

In response to the 2008 financial crisis, the US Department of Justice and the Financial Fraud Enforcement Task Force launched Operation Choke Point. The name of the project is notable: The task force had the power to constrain merchants’ ability to get paid, targeting fraudulent institutions by “choking them off from the very air they need to survive” (Zibell and Kendall, 2013). To fully participate in a transactional community – to be a “citizen” of that community – you need unobstructed access to a system of payment, because a system that can suddenly cut you off is more dangerous than not having access at all.

In recent decades, the business of getting paid has been changing in critical ways. In the United States, for example, payment acquisition systems are shifting from traditional independent sales organizations or ISOs (middlemen organizations that serve as payment service wholesalers), to tech startups looking to disrupt the payments system (see Figures 24.1 and 24.2). Payment cards were originally designed for an economy in which the line between buyers and sellers was clear; modern payments companies facilitate peer-to-peer payments in a geographically dispersed communication system.

In the 1990s, an emerging set of payment service providers (PSPs) overlaid new systems on existing infrastructure, bridging old and new technologies and policies (some more successfully than others). The first of these providers, and likely still the most successful, was PayPal, which created parity between users. Its primary innovation was to bypass the old payment acquisition

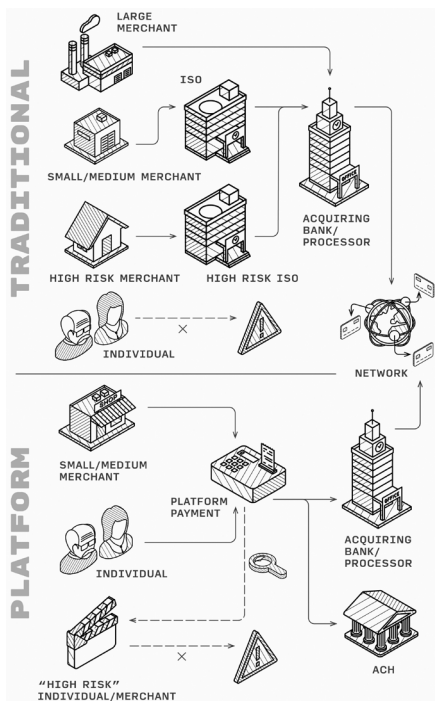


Figure 24.1 Traditional and platform models of how payments are acquired.
Source: Created by Meghan Macera.

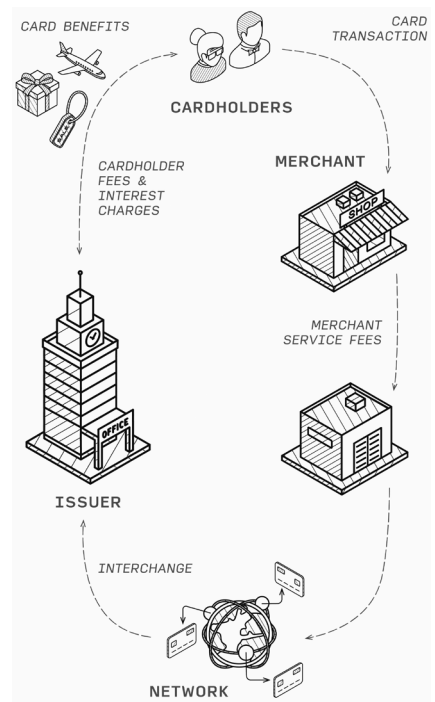


Figure 24.2 The communication of a card payment.
Source: Created by Meghan Macera.

system by keeping money in a closed loop on its platform for as long as possible. This has become the predominant model for PSPs coming out of the tech sector, such as WePay, Square, Venmo (now owned by PayPal), and most of the embedded social media payment systems, such as Facebook Messenger Payments.

However, in the midst of this shift, the way that payment providers manage risk has also changed, in ways that do not benefit – and indeed, can imperil – consumers. This is a shift in what sociologists call “riskwork” – how risk is imagined and managed – that can lead to payment shut-offs for vulnerable users. Managing payments means managing risk, and managing risk is inherently political.

In the traditional ISO model, issuers represent the interests of cardholders, while acquirers represent the interest of merchants and there is a marketplace for payments in high-risk industries. In contrast, within the new payments model, the PSP’s client is the platform, not the parties who are transacting. Risk is managed, not through a marketplace model, but a standard tech-industry mechanism: the terms of service (TOS) agreement, which users must agree to (but don’t usually read) when they sign up for an account, TOS agreements can change at any time. and there is no compelling interest for tech companies to find a way to manage risk when they can simply ban any transactions they deem “too risky.”

As is common in the realm of social media, these peer-to-peer payment systems use surveillance and automation to enforce TOS agreements and mitigate risk. Surveillance scholars have noted that the power of surveillance extends beyond watching to identifying, classifying, and assessing (Gandy, 1993; Lyon, 2002), making surveillance a form of “social sorting.” As Fourcade and Healy point out, the “classification situations” produced by the wrangling of “big data” are “presented, and experienced, as moral-ized systems of opportunities and just deserts.” They “have learned to ‘see’ in a new way and are teaching us to see ourselves that way, too” (2017, p. 10).

Although the tech industry could, theoretically, develop systems that profit from varied appetites for risk, like traditional ISOs, there has instead been a shift toward probabilistic modeling and monitoring, using machine learning to monitor users' social media presence to flag "high-risk" transactions and ban them.

But this gives rise to a variety of mistakes, like bans on users who tag a Venmo purchase "Cuban" for a sandwich, or playfully use a bomb emoji. Predictive analytics systems are always experimental and designed to live in "perpetual beta," in which products are "developed in the open, with new features slipstreamed in on a monthly, weekly, or even daily basis" (O'Reilly, 2005). This makes it even harder for users to predict what might earn them an account freeze.

To make things more confusing for users – and more perilous for users with fewer resources – TOS agreements tend to be unevenly enforced. As the internet researcher Tarleton Gillespie (2018) points out, platforms of all kinds routinely make seemingly arbitrary calls about what does and does not violate TOS. For banned users, often their only form of recourse is a byzantine and ineffective process, while, in the meantime, they have lost access to their stored funds, as well as to the transactional community of the platform.

This has been notably true for sex workers. As of 2018, the sex-worker activist Liara Roux has collected dozens of examples of discrimination against sex workers by financial services companies (Lake and Roux, 2018; see also Blue, 2015). Legislation and policies intended to reduce human trafficking also constrain sex workers, denying them access to the websites they use to work and make a living (Blunt and Wolf, 2020).

We still haven't created payment infrastructures that move at the pace of our modern world but maintain all of the key affordances of cash. Cash is anti-surveillant, self-clearing, immediate, and reliable (O'Brien, 2017; Scott, 2022). But the most vulnerable are often forced to choose between payment channels that are unreliable or totally inappropriate for the digital

nature of their work. We are still not getting payments right – not for everyone, and not all of the time.

4 Money (and Everything Else): Increasingly Private, Segregated, Siloed

In recent decades, the card-issuing business in the United States has become increasingly competitive and stratified, producing niche transactional identities. Although payment card products are mandated to look similar and use the same infrastructure, they are imbricated in different infrastructural, economic, and discursive assemblages (see Deville, 2013; Gießmann, 2018). Some cards pay users back; others charge usage fees. Some are more expensive than others for merchants to accept. The architecture of the modern card network is marked by hierarchy, difference, and communication.

Merchants agree to pay slightly more in interchange fees to receive payment from rewards cards and other luxury credit cards designed for the most "desirable" consumers than they do from standard cards. But because merchants then increase their costs to account for interchange, some consumer advocates argue that customers wind up paying for their own – or other people's – rewards (see, e.g., Schuh, Shy, and Stavins, 2010). As Maurer (2012b) has pointed out, this system doesn't exactly fit the picture of the capitalist economy; it is a rare situation where competition among issuers for the "best customers" drives prices up for everyone.

Universally accepted payment cards are relatively new (see Swartz and Stearns, 2019; Swartz, 2020). The earliest precursor to credit cards, Charge-Plates, emerged in the 1930s. Resembling dog tags, these metal rectangles could be used by department stores to quickly imprint a customer's account information on a payment slip.

By the 1950s, the Diners Club charge card had emerged as the first universal third-party payment card in the US, although it did not give customers access to credit, and in fact preceded the first credit card by at

least fifteen years. The club functioned like a membership organization, offering a range of services beyond credit. Merchants paid a fee to be able to accept Diners Club card payments (a closed-loop system), but were assured by the organization that these members would likely spend. Indeed, having a Diners Club card was seen as a ticket to an elite group who had access to “country club style billing” or receiving a folio bill (Sutton, 1958). By the end of the 1960s, these elite customers were flocking to American Express, another closed-loop charge card. An AmEx card was initially difficult to get, and the company made a name for itself over the next several decades as a product for the elite, conferring privileges and status (Grossman, 1987).

In the late 1960s, beginning with Bank of America’s BankAmericard, banks began to issue payment cards linked to consumer credit accounts (Evans and Schmalensee, 2001). These credit cards, unlike Diners Club and American Express, were easy for bank customers to access; even with poor credit, most Americans could be approved for some kind of credit card (Nocera, 1994), which meant that paying by card was no longer reserved for elite customers. The BankAmericard network was eventually licensed to other banks and became the Visa Network, an open-loop system that acted as an intermediary among a variety of banks, merchants, and cardholders. As the historian of technology David L. Stearns (2011) explains, opening the loop – making it possible to pay across banks, card types, and indeed transactional identity classes – was the key innovation of the bank card system.

When regulations against interstate banking loosened, beginning in 1978, banks in open-loop networks started to issue credit cards on a national level, competing for customers on a much wider geographical scale. By the early 2000s, the payment card market had become differentiated enough to create a wide range of stratified transactional identities – from “ultrapremium” cards for wealthy (or at least choosy) consumers, to small-business credit cards, debit cards, secured credit cards for those with poor

credit, and prepaid cards for consumers who were unbanked or underbanked.

Just as payment methods have become increasingly stratified, so too have our visions of the future of money. A variety of scholars, activists, and entrepreneurs have described futures in which money is digital and issued by nongovernment entities (Maurer, 2005; Brunton, 2019). In the wake of the 2008 financial crisis, many people were eager to try anything other than money as usual (Maurer, 2011).

One of these imagined futures is cryptocurrency. Beginning with Bitcoin, first theorized in 2008, these digital currencies intentionally create new transactional communities, rethinking the value, identity, space, time, and politics of money. Designed to be a kind of “digital gold,” Bitcoin took hold of the public imagination as a kind of “Magic Internet Money,” backed not by the government but by cryptographic scarcity, able to move at the speed of the Internet without the drawbacks of traditional payment systems like fees and surveillance (Maurer, Nelms, and Swartz, 2013; Swartz, 2017). Bitcoin has been joined by thousands of other cryptocurrencies, few of which have ever been accepted by vendors, but all of which are ways to reimagine nongovernment-issued money, which might outcompete and outlast state-issued currency (Swartz, 2018; Brunton, 2019).

The future of money might also look something like corporate currency, a reality that is already playing out in the forms of rewards programs and social media payments. Starbucks, for example, now issues something that hews very close to a private digital currency: Starbucks Rewards, a loyalty program in which members can earn “stars” for purchases and can load and reload funds on Starbucks gift cards for perks. As of 2023, the program had 30.4 million members and funds loaded on cards had reached US\$3.3 billion (Starbucks, 2023).

Facebook has also dabbled in creating a corporate currency, first with the announcement in 2019 of Libra, envisioned as a universal, global digital currency: a one-world money. Rather than being niche and

segmented, Libra was described as connecting users across currencies and payment systems. Unlike cryptocurrencies, Libra's design involved large corporations managing its monetary policy and infrastructure. Although the project was eventually shut down, in 2019 Facebook also announced the launch of Facebook Pay (now Meta Pay), which integrated payments with the company's suite of social media products.

Some new forms of currency seek to be more universally accessible, but whether they will be able to achieve this is uncertain. Central bank digital currencies (CBDC) are currently being "explored" by many of the world's central banks. While designs for these currencies vary widely, they are by definition a liability of the central bank, accessible to the public. However, since central banks do not have the digital infrastructure to provide financial services directly to consumers, these currencies must be intermediated, and the questions of *by whom* and *how* are crucial. If CBDC are to be truly accessible, rather than replicating existing systems that lock some consumers out, they must be very carefully designed (Narula, Swartz, and Frizzo-Barker, 2023; see also Swartz and Westermeier, 2023).

The future of payment infrastructures seems increasingly stratified. Customers who are members of loyalty programs or who carry "ultrapremium" cards often have access to a differentiated experience, with a separate customer service portal, lavish treatment, and even different physical spaces within a hotel or sports arena. The flipside is true for shoppers using state benefits cards, who can only buy certain foods at the grocery store. Technology and culture scholar Nathaniel Tkacz (2019) argues that payment apps compete on the basis of offering not just payment but, perhaps more importantly, "experience" of the world. He explains that such "experience money" takes up ordinary transactions and "deliberately infuse[s]" them "with a coherent value proposition" (p. 277).

As our money becomes more plural, so too do our transactional identities. We may find ourselves using multiple monies, bouncing between different payment infrastructures,

and thus oscillating in and out of a variety of transactional identities (Maurer, 2005, p. 13). We don't know the shape of tomorrow's transaction media: What is emerging is social media money: private, surveilled, and data-driven. Some new money forms are hierarchical and segmented; others are universal. It is likely that we will be asked to trust corporations with our money and our data and our ability to get paid. The segmentation of these money forms means that you could be living in a separate transactional community than the person sitting next to you, while their plurality means that we will be constantly shifting between different communities and different forms of money.

And it is worth noting that some marginalized communities are experimenting with cryptocurrency to express resistance to the imposition of colonial economics, even though most cryptocurrency projects ultimately fail (Cordes, 2022).

5 The "Social" Future of Payments

Venmo users with public feeds broadcast a lot of personal information without realizing it. Friends can watch each other meet cute, fall in love, and break up in the course of a few months' transactions. See, for example, the 2017 art project by Han Thi Duc, *Public By Default*, which finds poignant stories in the Venmo lives of others.

But Venmo can also be used to conduct social experiments, like the one that unfolded in June 2020, as the USA convulsed with anger over the killing of George Floyd, a Black man, at the hands of White police officers. As tensions simmered, a handful of people, separately, in diverse geographic locations, began to experiment with a kind of informal reparations: peer-to-peer payments to Black people, either friends or strangers.

In Vermont, activists Moirha Smith and Jas Wheeler crowdsourced a list of Black people's Cash App and Venmo accounts, titled "Wealth Redistribution for Black People in Vermont," and posted it on Facebook. The accompanying "Letter to White People"

noted that “one of the easiest ... ways to support Black life, Black joy, Black safety, Black community is to give your money to Black people.” The list ultimately grew to over 300 names, and its organizers estimate that \$65,000 was transferred in varying amounts.

Recipients reported that they felt weird about getting money from strangers, but did appreciate the funds (NPR, 2021). Meanwhile, a few Black people in other parts of the USA began to receive notifications that White friends and acquaintances had sent them small amounts of money, presumably as a form of reparation – but without any kind of organized campaign. These transfers tended to be small amounts of money, and recipients said they found them baffling and insulting (Gimlet, 2020).

Just as people are always finding new ways to communicate, we are also finding new ways to pay. Money is inherently social and new forms of sociality will necessarily be reflected in our payment systems. New money technologies, then, will offer an opportunity to make new kinds of transactional communities and also to make mistakes, forging a messy path toward an unknowable payments future.

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Trading on Social Trading Platforms

Xiaochuan Tong and Alex Preda

1 Sociability in the Market

Individual participation in financial transactions has been a market feature since at least the days of the tulip mania. While in North America and Western Europe individuals have lost ground to institutional investors since the 1960s (Useem, 1996), it is worth noting that in other major financial markets, especially Asian ones, they continue playing a significant role in terms of share of market transactions and volume. Since the late 2000s, though, we observe an increased participation of retail investors in market operations in North America and Western Europe too: Episodes such as the GameStop saga in 2021 – when groups of retail investors managed for a while to cause significant losses to some hedge funds – have brought some of this participation to public attention. Equally, periodic waves of popular enthusiasm for Bitcoin, tokens, or nonfungible tokens have contributed to this public attention, especially since of late crypto assets have gained regulatory legitimacy.

A common ground for these apparently disparate phenomena – GameStop was

about the stock of a fading game retailing chain, while crypto manias are about a new and ill-defined class of assets – is the infrastructures that made them both possible. Chat forums such as Reddit, where retail traders coordinated their actions and summoned each other in real time, trading apps such as Robinhood, or crypto trading apps belong to the infrastructures that made possible this broader individual participation to financial transactions. Of course, as David Pinzur argues (this volume), we need to distinguish between ready-to-hand devices and infrastructures: Trading apps on smartphones and chatrooms belong to the former, while data centers, cloud computing, or transmission lines, as well as the algorithms calculating spreads on the GameStop stock (among many other things) would belong to the invisible background that solicits awareness only in moments of crisis. Yet, we have to notice here a few interrelated aspects: First, while communication infrastructures play a crucial role in finance (see also Coombs in this volume), social media have been seldom counted by academics as pertaining to financial infrastructures (though

professional investors have recognized their significance). Second, we need to ask the question, how does social media, as part of this infrastructure, impact investor behavior? How do they (mis)align participants? What kind of social dynamics do they foster?

While financial markets are social by definition and communication has played a key role since their inception, this has been less recognized in benchmark models of financial decision-making, which have focused on individual behavior seen as striving toward utility maximization, grounded in an efficient processing of information, and risk aversion (e.g., Fama, 1970). Forms of sociability and their consequences have been largely seen as imitative behavior and investigated as such (herding phenomena). Finance scholars have more recently recognized that social behavior in markets extends beyond imitation phenomena – hence the shift in focus toward “social finance” (Hirshleifer, 2015) meant to emphasize a reorientation of investigations away from the presumption of individual decision-making to the effects of mediated social dynamics upon markets. While there is a decades-long body of financial research on individual investors, social media-influenced decisions are much less well understood. This opens a potentially fertile ground for dialogues between sociologists of finance and financial economists interested in social behavior.

Over the last fifteen years, social media have become more and more integrated with trading platforms, giving rise to what are called social trading platforms (STPs) (see also Tong and Preda (2023) for more detail). From the perspective of social research, STPs, as we have argued, add another dimension to the study of how evolving infrastructures reshape not only market institutions but also the behavior of participants.

The rise of general social media (such as Facebook) has been quickly followed by the rise of social media exclusively dedicated to traders and integrated with online trading, often built in a smartphone app (“Facebook” for traders). In the institutional realm, data providers such as Bloomberg have also integrated social messaging in their data

provision. By offering much lower fees compared with traditional brokerages, coupled with a global outreach, STPs have managed to attract millions of individuals into financial transactions. Some of the largest STPs have millions of subscribers and revenues of over one billion US dollars (The Insight Partners, 2022). STPs offer platform-wide communication forums, as well as the possibility of building communication groups. Traders can exchange messages in real time – meaning as they trade and observe the market – either within distinct groups or with everyone who has an account on the platforms. At least as important, STPs use metrics for ranking the most successful traders and embed copying algorithms that allow participants to automatically copy the transactions of those traders deemed to be more skilled. Should the latter be successful, they receive a share of the profits made by those who have copied them. In this sense, STPs can be seen as integrating within broader societal trends of generating status differentials by means of commensuration and public rankings (Mennicken and Espeland, 2019).

For sociologists of finance and financial economists alike, there is very rich data to be studied from STPs, such as trading data, network data, and communication data (e.g., Tong and Preda, 2023). These different types of data have become increasingly valuable with the rapid growth in technological innovations, such as AI and machine learning. Institutions or individuals may utilize these tools to construct trading strategies or even perform algorithmic trading. Trading data includes traders’ everyday trading records, such as daily balances, profits and losses, number of trades, trade sizes, and so on. Network data includes the structures of how traders are connected to each other as well as whether/how often they participate in the social communication features, such as online discussion forum (ODF) and one-on-one messaging. Communication data includes the discussion content on the ODF, revealing how traders perceive and frame market events, how they justify their trading decisions, and how they account for market

events. As some STPs (and other trading platforms) have made this data available for social science research, it becomes possible to investigate how new communication infrastructures shape the social dynamics of markets. This chapter aims to shed light on this issue.

2 Sociability and Financial Performance

At least three streams of literature are directly relevant to the notion of “sociability” in relation to the financial performance of investors. We present three streams of literature to reflect the profound impacts of social interactions on financial decisions as well as the inherent skills and abilities of both professional and retail investors in financial markets. We aim to highlight the dynamic nature of human behavior, particularly in financial markets, in the presence of infrastructures that facilitate interactions among investors (e.g., social media). We argue that it is important to further understand the relationship between social interactions and investors’ financial performance, as well as the underlying mechanisms through which investors’ financial decisions are influenced.

The first stream of literature investigates the relationship between social interactions and investment biases, such as disposition effects (Heimer, 2016) and herding effects (Gemayel and Preda, 2018b). We should make clear that the notion of bias, widely used in behavioral finance, does not mean “irrationality” or “prejudice” or attachment to stereotypes on the part of investors. It simply means that observed behavior does not fit the predictions of the benchmark model of individual decision-making – as such, “bias” should be understood as deviation from such predictions (it is used interchangeably with “effect” in the sense of empirically observed effects). This being said, most studies are silent on how social interactions through media impact the financial performance of individual investors (Heimer, 2014, 2016; Gemayel and Preda, 2018a). Online communication represents a distinct form of social

interaction. Research indicates that online chats can offer valuable information for individual investors, aiding their decision-making (Antweiler and Frank, 2004; Das and Chen, 2007). A recurring theme in this body of literature is the emphasis on the significance of STPs (Gemayel and Preda, 2018a, 2018b) and information systems (Abuelfadl, Choi, and Abbey, 2016) through which individual investors make their financial decisions. Online trading platforms, including social interaction features, provide a unique avenue for researchers to explore the impact of social interactions on investor behavior and financial performance. It is important to note, however, that a majority of individual investors tend to experience financial losses on such platforms (Preda, 2017). For instance, studies using data from investment-specific online social networks, involving 5,693 foreign exchange retail traders with around 2.2 million trades from early 2009 to December 2010, have examined the influence of social interactions on the disposition effect (investment bias). These studies have shown that after gaining access to social networks, traders tend to exhibit nearly twice the magnitude of the disposition effect. This effect refers to a trader’s tendency to sell winning stocks while holding onto losing stocks (Heimer, 2016). By utilizing data from the Consumer Expenditure Quarterly Interview Survey spanning from 2000Q2 to 2010Q1, Heimer (2014) has demonstrated a strong association between social interactions and active portfolio management. This is more prevalent among active investors compared to passive investors. It is important to note that this study cannot establish the direction of causality in the relationship between sociability and active portfolio management, as acknowledged by the author. Furthermore, there is an implication that social interactions may increase risk-taking, which could potentially have a negative impact on the financial welfare of traders.

However, a fundamental question remains unaddressed in existing literature: whether being sociable in the market, involving more social interactions, is advantageous or disadvantageous for the financial performance

of individual investors. Notably, the existing literature does not distinguish between individual investors in terms of their social characteristics. Future research should bridge this gap by examining the financial performance of individual investors in relation to their varying levels of sociability in the market.

The second strand of literature is in alignment with broader social sciences and natural sciences. It seeks to uncover the impact of social interactions on the financial performance of individual investors, from the perspective of complex human systems and social networks (Saavedra, Duch, and Uzzi, 2011; Saavedra, Hagerty, and Uzzi, 2011; Liu, Govindan, and Uzzi, 2016). This strand's focus lies in understanding the complexity of human systems and the collective wisdom of human interactions rather than merely examining the outcomes of financial decisions (Pan, Altshuler, and Pentland, 2012; Altshuler, Pentland, and Gordon, 2015). Research in this area highlights that the patterns and content of instant messages (IMs) sent and received by professional stock day traders in typical trading firms can be interpreted as indicators of collective wisdom among individual investors across various platforms and can potentially influence investors' financial performance (Saavedra, Duch, and Uzzi, 2011; Saavedra, Hagerty, and Uzzi, 2011; Liu, Govindan, and Uzzi, 2016). For example, Saavedra, Hagerty, and Uzzi (2011) used a dataset consisting of 66 individual stock day traders in a typical trading firm from September 2007 to February 2009, including over 1 million trades, with 55% being profitable. Their findings indicate a positive association between synchronous trading and the probability of making a profit, and the levels of synchronous trading are closely related to the patterns of IMs. Similarly, Liu, Govindan, and Uzzi (2016) examined a dataset from 30 professional day traders, covering around 886,000 trading records and over 1.2 million IMs from January 2007 to December 2008. Their research reveals a connection between the expressed emotions in online communications and the profitability of

actual trades. Traders who exhibit minimal or excessive emotional expression tend to make relatively unprofitable trades, while those with moderate emotional expression tend to make relatively profitable trades. Pan, Altshuler, and Pentland (2012) utilized data from the online STP eToro and provided evidence that social trades, often associated with crowd wisdom, are more likely to outperform individual trades. However, it's important to note that social traders are not consistently optimal performers (Pan, Altshuler, and Pentland, 2012). These studies operate with a notion of collective or crowd wisdom that in part sends back to the established concept of herding, and in part attempts to identify emerging phenomena in communication processes, based on large datasets: Communication is synchronized with trading actions, while interpretive frames (for market events) emerge within communication and become objectified (more specifically, are iterated across communication sequences and cannot be attributed to a single source anymore). The results point to at least two effects of communicational infrastructures: action synchronicity and objectification of interpretive frames.

These studies suggest that social communication and interactions play a significant role in the decision-making process of individual investors, highlighting the need for a more precise behavioral model (Pan, Altshuler, and Pentland, 2012). Furthermore, Altshuler, Pentland, and Gordon (2015), using data from the same online STP (eToro), which involved over 3 million individual investors and more than 40 million trades spanning from 2011 to 2014, revealed an inverted U-shaped relationship between the average financial gains and the number of information sources used for decision-making. This suggests that having too little information is insufficient, while an excess of information can be harmful in terms of financial performance. As mentioned earlier, while some studies indicate an association between social interactions and financial performance, the literature does not investigate different degrees of

communication in relationship to investors' financial performance. Future research needs to address this question by taking into account different levels and degrees of communication and to develop an analytical model to explore the relationship between communicative interactions and the financial performance of individual investors.

The third strand of literature investigates the skills and abilities of investors (including both professional and retail) in relationship to the (positive) returns on investments. We distinguish here between professional and retail investors. This is because individual investors tend to exhibit different patterns of decision-making compared with professional investors (Preda, 2017). In terms of professional investors, previous research indicates that approximately 24% of professional currency managers (drawn from a sample of thirty-four individual currency fund managers) have the potential to achieve significantly positive abnormal returns within a four-factor model in the currency market (Pojarliev and Levich, 2008). However, there is no evidence demonstrating that currency fund managers can consistently generate abnormal returns (Pojarliev and Levich, 2010). In contrast, when we consider retail investors, conventional wisdom suggests that, in the stock market, active trading individual investors tend to underperform passive trading individual investors. This underperformance is often attributed to the costs associated with a high level of trading (turnover) (Barber and Odean, 2000). However, other studies present evidence that within the highly active individual investors there exist small subsets of individual investors that earn abnormal returns (Goetzmann and Kumar, 2008; Dahlquist, Martinez, and Söderlind, 2016). For instance, in Sweden's Premium Pension System approximately 5.8% of active and 0.6% of highly active individual investors earn significantly higher returns, achieving average returns of 6.86% and 12.57% per year, respectively. This is in comparison to the remaining 93.5% of inactive individual investors who achieve average returns of 3.82% per year.

These active investors manage their investments by reallocating money from different funds in their pension accounts (Dahlquist, Martinez, and Söderlind, 2016). Moreover, there is evidence suggesting that around 2% of high-turnover and under-diversified individual investors' portfolios perform better than their high-turnover and better-diversified counterparts in the stock market (Goetzmann and Kumar, 2008). This demonstrates that active trading is not always hazardous to wealth, at least for some investors, although their proportion is quite small. In the context of individual currency investors, which is the focus of this chapter, certain studies employing a four-factor model (Pojarliev and Levich, 2008) indicate that individual currency investors can achieve abnormal returns even after accounting for transaction costs (Abbey and Doukas, 2015).

Building upon these strands in existing literature, it becomes evident that they all place significant emphasis on communication and instant messaging within the context of STPs. Sociability, as implicitly depicted in these studies, revolves around engaging in communication with other traders through instant messaging and participating in community discussions. However, existing studies do not furnish clear-cut evidence regarding whether this sociability, understood as engaging in communication, has a positive or negative impact on financial performance. The underlying assumption is that the "wisdom of crowds" is superior to making decisions independently. But is this indeed the case? Does online communication with other traders enhance financial performance? On the one hand, one can argue that engaging in online communication enables traders to swiftly exchange information and acquire knowledge. On the other hand, however, an opposing argument can be made – that online communication distracts traders and exerts a detrimental influence on their performance. The question of whether sociability in the form of communication is ultimately advantageous or detrimental to financial performance remains a pivotal one.

3 Communication and Survivorship: A Case Study of STP

Communication alters investors' trading behavior and decision-making process (Heimer, 2016; Han, Hirshleifer, and Walden, 2022; Tong and Preda, 2023). Traders can be influenced by communication with friends and neighbors in terms of stock market participation (Hong, Kubik, and Stein, 2004; Guiso and Jappelli, 2005) and investing strategies (Han and Hirshleifer, 2012; Heimer, 2014). Empirical studies have documented that communication plays a role in retail traders' decision to start trading in equity and foreign exchange (FX) markets (Brown et al., 2008; Kaustia and Knüpfer, 2012; Changwony, Campbell, and Tabner, 2015; Chen and Roscoe, 2017). Against this background, it is intuitive that traders can also be influenced by the conversations they have with other traders while trading, especially when they are discussing their ongoing trading activities and decisions. The consequences of social communication on traders can not only include the decision to participate and to adapt their trading strategies, but also the decision to continue (survive) or to cease (quit) their trading activities.

However, the relationship between survivorship in trading and social communication is unexplored in the literature. The investigation of the survival of traders has a distinct value for understanding the dynamics of a trader's lifetime decision-making processes, which is different from the decision to participate (at the beginning of a trading life) and to choose their trading strategies (in the middle of a trading life). It is the decision to quit trading (at the end of a trading life) which finally concludes the story of a trader's trading life. This decision constitutes an important aspect of the characteristics of a trader's trading life.

It is not fully clear to the academic community what traders talk about and how the various aspects of their trading activities are influenced by the content of the conversations they have while making their trading decisions (let alone examining the impact of social communication on traders' behavior).

However, in the setting we explore in this chapter (data from a STP) we can observe what traders talk about while trading and how their behavior is subsequently altered by such social communication. We observe that traders are keen to talk about the future in the ODF. For example, "Today is looking very sketchy, I'm going to hold a long aud/jpy averaged about 77.90 and call it a week," "What do you [sic] think the EURUSD pair is going to do in the next 5 hours?," and "Maybe MyFXtrade will have a real-time graph of these numbers in the future we can use."

Intuitively, these discussions anchor traders' expectations regarding the future. Traders should therefore be more curious to check out their expectations in the future and more likely to stick around to see what happens, compared to instances where they do not have any expectations at all. Consequently, traders should have the incentives to continue to stay (survive) in the market (as opposed to exiting the market) after having such conversations regarding the future of the market. Therefore, we examine whether social communication impacts the survival of traders.

Such an investigation is especially relevant since, as we have argued, technological evolutions have led to integrating communication with real-time trading. This integration changes the way transactions are organized, in the sense that it becomes possible to obtain real-time information about how fellow traders make decisions, swap opinions, and interpret market information jointly. Evidence shows that communication on social media can predict prices in equity markets and FX market movements (Ozturk and Ciftci, 2014; Reed, 2016; Lachanski and Pav, 2017). FX markets are of particular interest because entry barriers are usually lower compared with the stock market, attracting a broader spectrum of investors of different financial means. Crypto asset markets are another domain of interest here, but studies of crypto traders are still in an incipient stage. Recently, studies have developed theoretical models in order to describe information transmission in the market through network communication,

capturing the implications for asset prices (Ozsoylev, 2004; Han and Yang, 2013; Han, Hirshleifer, and Walden, 2022).

4 Communication and Survivorship: Possible Explanations

We encounter several converging explanatory approaches. One, coming from the sociology of finance, is that market participants (i.e., professional traders) use face-to-face communication or online messaging to coordinate with each other, build joint expectations based on what they observe while trading, and reciprocal obligations (e.g., Knorr Cetina and Bruegger, 2002; MacKenzie, 2009; Laube, 2016). This explanation is grounded in studies of institutional trading floors and trading rooms, studies that do not examine massive online communication.

Another explanatory approach is that capitalist organizations generate fictional projections of the future as a means of coping with uncertainty (Beckert, 2016). However, such projections are generated at an organizational level, including various tools (e.g., business plans). It is unclear how they impact survival at organizational or individual level (if at all).

A third approach is provided by the anticipatory discourse theory which has been advanced in applied linguistics and psychology studies (Kinsbourne and Jordan, 2009; Streeck and Jordan, 2009; Saint-Georges, 2012; Poli, 2019). Specifically, the anticipatory discourse theory suggests that “futurity is an inevitable component of text, talk, and more largely of social life, because human action has an intrinsically forward-looking nature” (Saint-Georges, 2012). The “forward-looking nature” embedded in human communication takes two forms in the discourse processes, namely projection and anticipation (Kinsbourne and Jordan, 2009). Streeck and Jordan (2009) suggest that the forward-looking nature “consistently emerges in any discussion of interaction” (p. 93).

These insights reveal an important theoretical implication on the dynamics of human behavior subsequent to communication.

That is “the very fabric of interaction and communication seems to be imbued with forward-looking anticipatory structures that facilitate ongoing, fluid interactions in a dynamic social environment” (Streeck and Jordan, 2009, p. 95). Applied to the case discussed here, it would mean that communicational infrastructures present in markets embed such anticipatory affordances – they provide participants with opportunities to project the future repeatedly – and such anticipations ground actions in the market.

This theoretical implication is not exclusive to finance. We find that, in the context of STPs, these insights are evidenced by the discussion contents of the ODF. When reading through the content of the ODF, one significant feature is that traders are keen to talk about events in the future, share their predictions about the future, and discuss trading strategies based upon their perception of different states of the market in the future.

Given the discussed forward-looking nature of online discussions, we would expect that social communication increases the survival of traders. This is because traders, based upon the online discussions, may change their future expectations about the market or the platform, alter their perception of their own trading skills, and try out new trading strategies. These influences can be eventually translated into an increased survival probability of traders in the short term or a prolonged trading period in the long term. Therefore, we would expect that social communication increases the survivability of traders on a STP.

5 Sociability and the Wisdom of Crowds

This section aims to shed light on the effect of social media on the wisdom of crowds, and among different types of crowds, most of which are affected by communication. At least two strands of literature are directly relevant to the issue. The first one is the influence of social media on human behavior and the second one is the wisdom of crowds.

As the literature shows that social media has broad influences on human behavior, we have sufficient grounds to expect that social media plays a (positive or negative) role in the decision-making process of individual investors. However, the wisdom-of-crowds literature focuses more on when and why crowds make better decisions. It remains unclear whether this wisdom can be influenced by social media and whether it is influenced differently according to different types of crowds. For instance, we can expect that social media accelerates crowd formation and/or polarization of opinions, and that there are differences in this respect between media and other communicational infrastructures.

5.1 *The Impact of Social Media on Individual Behavior*

There is ample evidence coming from nonfinancial domains showing that social media alters the behavior of individuals, affects life satisfaction, and even causes addiction-like symptoms and mental health issues (i.e., mental depression, see Shensa et al., 2017) in a variety of settings (Kuss et al., 2013; Leung, 2014; Colucci, 2016; Alkhalaf, Tekian, and Park, 2018; O'Reilly et al., 2018; Turel and Gil-Or, 2018). For instance, the use of WhatsApp is not directly linked to the academic performance of students, but the time spent using WhatsApp is proportionally related to symptoms of addiction (Alkhalaf, Tekian, and Park, 2018). Moreover, besides the evidence suggesting that the negative relationship between social media addiction and well-being varies between women and men to some extent (Turel and Gil-Or, 2018), adolescents themselves often perceive social media as a threat to their well-being (O'Reilly et al., 2018). Furthermore, symptoms resembling addiction and problematic behaviors associated with excessive or even compulsory social media usage are prevalent among the general population. These phenomena can be explained from the perspective of the morphology of the posterior subdivision of the insular cortex in human

brain systems and processes (Turel et al., 2018). It is estimated that more than 210 million people worldwide suffer from internet and social media addiction (Longstreet and Brooks, 2017).

Similarly, in the financial markets, social media is also found to have a significant impact on the behavior of individual investors, in terms of both financial performance and decision-making (e.g., the decision to quit or stay in the market). More recently it has been argued that social media significantly impacts the behavioral biases of individual investors, such as herding effect and disposition effect (Heimer, 2016; Gemayel and Preda, 2018a, 2018b). For example, it is estimated that after the inclusion of social media on trading platforms, trading behavior is significantly influenced and, as a result, investors exhibit around twice as much disposition effect as before the inclusion (Heimer, 2016). In addition, on different types of trading platforms, investors tend to exhibit different magnitudes of disposition effect. For example, individual investors on an online STP, one that incorporates social media features such as the ability to observe the financial performance of other investors, exhibit a lower disposition effect when compared to individual investors using a traditional trading platform (Gemayel and Preda, 2018a). However, individual investors on a STP tend to exhibit higher levels of herding when compared with those within traditional trading environments (Gemayel and Preda, 2018b).

5.2 *The Wisdom of Crowds*

Another strand of literature documents the collective effect of the wisdom of crowds, which is similar to a self-fulfilling prophecy. Once collective anticipations of the future are adopted by a crowd and objectified, the crowd starts acting according to the anticipations and thus realizes them. A case in point is provided by the predictability of price movements based on analyzing the anticipative information produced by a group of people (Chalmers, Kaul, and Phillips, 2013; Nofer and Hinz, 2014; Azar and Lo, 2016; Karagozoglu and Fabozzi, 2017; Polzin,

Toxopeus, and Stam, 2018). For instance, through text analysis, research demonstrates that both articles and investor comments posted on a popular US social media platform for investors have the predictive power for stock returns and earnings surprises (Chen et al., 2014). Moreover, social media, serving as a tool to reflect investor sentiment, contains valuable information regarding future asset prices. For example, using Twitter data that includes tweets related to the Federal Reserve, a tweet-based asset allocation strategy outperforms several benchmarks. This includes outperforming a buy-and-hold strategy on the market index (Azar and Lo, 2016). Furthermore, in the domains other than finance, such as in computer science (as well as in other social sciences), research shows that a complex human system, including social interactions between participants, has a significant impact on the decision-making processes of individuals. This decision-making in turn influences the financial performance of participating investors (Saavedra, Duch, and Uzzi, 2011; Saavedra, Hagerty, and Uzzi, 2011; Pan, Altshuler, and Pentland, 2012; Altshuler, Pentland, and Gordon, 2015; Liu, Govindan, and Uzzi, 2016). For instance, there is an inverted-U shaped relationship between information and the financial performance of investors who engage in sending and receiving IMs while making financial decisions. In this relationship, financial performance tends to improve as the information level increases, but it eventually reverses when information becomes excessive (Altshuler, Pentland, and Gordon, 2015). The accuracy or efficiency of the wisdom of crowds relates to the diversity of the agents in the crowd (in terms of their skills and abilities) and to the structure of the crowd, such as population size and social structure (e.g., Hong and Page, 2001, 2004; Page, 2007; Economo, Hong, and Page, 2016). For example, a group with diverse agents sampled from a competent population outperforms a group with high-ability agents in terms of problem-solving, which indicates the tradeoff between ability and diversity on the wisdom of crowds (Hong and Page, 2004).

5.3 *The Impact of Social Media on the Wisdom of Crowds*

We can see from this that social media significantly impacts the behavior of individual investors in both financial markets and other domains of everyday life. As individuals are impacted under a variety of settings, it is worth considering how exactly this social feature influences the behavior of a group of participants and the associated outcomes. However, based on the literature on the wisdom of crowds in financial markets, there is not enough evidence on its temporal dynamics or under different circumstances, and on the reactions of the wisdom to external shocks (e.g., inclusion of social media). Furthermore, there is insufficient evidence to indicate which specific groups within the crowd are most affected by external shocks, particularly the inclusion of social media. There is also a gap in understanding how the wisdom evolves in the presence of social interactions compared to when there are no social interactions among individuals.

So far, this impact seems not to be very clear and there is a need to examine additional empirical evidence. One can argue that the inclusion of social media improves the wisdom of crowds. This is because individual investors get access to more sources of information which helps with their investing activities online. However, one can argue that the wisdom of crowds is negatively impacted by the inclusion of social media: The additional information disseminated through social media can be ambiguous or manipulated, while individual investors can also be distracted by information-exchanging activities. Similarly, it is also not clear who will be impacted more by social media. We could say that more intensive users will be impacted more. However, we could also say that less involved investors are impacted more, since they do not fully understand what is going on in these chats, given their lesser exposure to these activities and, eventually, they will get distracted by these activities. Consequently, intuition cannot help us much here. We need more evidence on these issues.

In summary, the puzzle here is how exactly the inclusion of social media impacts the decision-making of individual investors and, more importantly, which categories/groups of investors are most affected in terms of different levels of sociability. Trading platforms can be structured in various ways: some incorporate social media features, while others do not. Furthermore, among investors on STPs, there are those who actively utilize these social media features, and conversely, there are those who do not, even if these features are available. The crucial question is whether this disparity in the use of social media features has an impact on the wisdom of crowds of individual investors. This inquiry can be focused on identifying which groups of investors are more profoundly affected by the inclusion of social media, particularly with regard to their level of engagement in these online social activities (e.g., the wisdom of more sociable vs. less sociable individual traders as distinct groups).

6 Conclusion

We have examined here two interrelated issues: the integration of communication infrastructures into trading platforms and the impact of social media on trading behavior. This chapter has primarily focused on three aspects: the potential impact of communication on trading decisions and associated outcomes (i.e., financial performance); decisions to quit trading (i.e., survivorship); and the wisdom of crowds (i.e., group decisions). We discuss existing literature on each of these aspects and highlight potential areas for future research.

We have formulated two arguments: The first, theoretical, is that communication infrastructures, long seen as essential in finance, need to include social media. These play a key role not only in the realm of individual traders – which we have discussed here – but also in that of institutional traders. As we have mentioned in the opening, institutional data providers have integrated social messaging into their offerings, while, to the best of our knowledge, we have limited evidence

on the impact of social media on the behavior of institutional traders. We know that social media data is intensely used in devising trading strategies, including algorithmic ones. Especially as communicational infrastructures evolve rapidly under the impact of AI and machine learning, it is imperative to examine closer both their evolution and their impact in finance and beyond.

The second argument we have made here concerns the impact of social media on trading behavior. Evidence points to the fact that social media usage increases imitative behavior and conformism (perhaps not surprisingly), but also that financial performance, at least in the realm of individual traders, is not positively impacted by social media usage (except for a tiny minority). This raises, among others, regulatory issues with regard to the integration of social media with trading platforms, even more so as these media incessantly evolve and as market infrastructures are regulated.

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Digital Financial Infrastructures in the African Agricultural Sector

Practices, Networks, and Philanthrocapitalism

Marie Langevin and Valérie L'Heureux

1 Introduction

Through digitalization the reach of formal finance can be expanded to previously underserved territories and populations, thereby enhancing the capacity of financial infrastructures to increase monetary flows. This transformation is observable in developing countries, where various actors collaborate to integrate informal economic activities into financial circuits, trying to connect them to the financialized capitalist system and adapt financial infrastructures. This chapter focuses on the role of philanthrocapitalist actors in this process, specifically examining the efforts of the Mastercard Foundation to advance the digitalization of financial infrastructures around the African agribusiness sector.

Our approach uses both critical development studies and science and technology studies (STS) to investigate infrastructuring processes. Grounded in the insights of Star and Ruhleder (1996), we perceive networking as a pivotal element of infrastructural change, encompassing interconnected social, organizational, and technical dimensions.

We study the infrastructural transformation process by analysing the Foundation's practices in agriculture and digital finance through discourse and programme analysis, as well as by examining its network of partnerships and fundings using social network analysis (SNA).

In keeping with Carse's historical observation that infrastructure originally pertained to the organizational groundwork that preceded the construction of physical artefacts (Carse, 2016), we posit that the Foundation contributes to financial infrastructural changes by assembling organizations, technologies, and capital through its networks, thereby creating platforms capable of (re) directing African resource flows into formal finance circuits. Previous research has shown that the Foundation helps to connect digital financial infrastructures to the financialized capitalist economy and that the firm Mastercard is frequently involved in those circuits (Langevin, Brunet-Bélanger, and Lefèvre, 2023). This is not to suggest that these efforts to alter financial infrastructures are guaranteed to succeed; in fact, they encounter various challenges, gaps

within existing infrastructures, and complexities in connecting them to peripheral economic elements such as rural finance. Nevertheless, we observe continued digitalization of agricultural finance in which the Foundation is actively involved. Our goal is to understand the project and shed light on the consequences of this process in terms of wealth circulation. We ask: How might the evolution of relationships reshape the credit landscape, impacting accessibility, costs, and organizational channels? We thus aim to contribute to social and policy debates about the power of (digital) financial infrastructures and their agency (Bernards and Campbell-Verduyn, 2019; de Goede, 2021; Pinzur, 2021; Campbell-Verduyn and Hütten, 2023).

We begin in Section 2 with our conceptual framework, followed by our methodology. Section 3 delves into the Foundation's approach and analyses its project related to the emerging digital financial infrastructure in the African agribusiness sector. We then explore the various networks, organizations, and actors involved, and finally, we conclude by reflecting on the connections between this evolving infrastructure and global power structures in the financialized capitalist economy.

2 Philanthrocapitalism and Digital Financial Infrastructures

In a conception akin to an *agencement*, as described by Callon (2021), Pinzur (this volume) emphasizes, like Bernards and Campbell-Verduyn (2019), that infrastructures do not inherently exist but instead take shape or materialize through labor that often remains unseen. We specifically argue that the contributions of organizations associated with philanthrocapitalism (or strategic philanthropy) to the emergence and transformation of market infrastructures are overlooked and remain largely imperceptible to analysts in critical development studies and STS. Nevertheless, entities like the Mastercard Foundation are significant actors in the realm of development

and the capitalist economy. It is crucial to explore how the practices of these mega-foundations can potentially alter the circulation of wealth as they contribute to transformations such as the creation of new platforms, the digitalization of financial infrastructures, their recombination with other elements, and even the construction of new infrastructures.

Created by Mastercard International, a global payment technology firm that plays a major role in financialized capitalism, the Mastercard Foundation is one of the largest philanthropic institutions in the world in terms of capitalization. It is driven by its mission to advance education and financial inclusion as a catalyst for inclusive growth in developing countries. This *raison d'être* inherently places the Foundation within the process of financial infrastructures transformation and its digitalization. The critical literature on financial inclusion highlights the pivotal role of digital financial technologies in extending financialization at the margins (e.g., Langevin, 2019; Natile, 2020; Bernards, 2022). These mechanisms are vital in establishing financial circuits that link peripheral agricultural markets to the dominant circuits of financialized capitalism. To make payment and credit transactions viable and profitable, operational digital financial infrastructures are essential.

By looking at the prevailing constellation of actors involved in the Foundation's financial inclusion project and targeting marginal spaces in the global political economy through a neo-colonial analytical lens, we seek to identify the power relations being played out. To do so, we draw upon a broad concept of infrastructures conceived as a background operation and define the financial 'infrastructuring process' as an agency process of emerging new capabilities born at the confluence of innovative practical configurations to link, in this case, segments on the periphery of formal economic and financial circuits. This perspective is essential for incorporating infrastructural agency because, as de Goede (2021, p. 353) contends regarding global payment infrastructures, their inherently political

nature holds the potential to 'reinscribe power relations and reroute money flows'.

The Mastercard Foundation's existence is intricately linked to global power structures. As part of its 2006 IPO (initial public offering), the firm Mastercard International provided the Foundation with its capital from the firm's own shares. With a substantial endowment of over \$39 billion (Canada Revenue Agency, 2022), the operational capacities of the Foundation are thus partly built on the profitability of the firm Mastercard, a dominant financial capitalism corporation. What Mastercard International does in global capitalism is provide technological financial services to states, consumers, and enterprises to make their financial transactions fluid and secure. Simply put, the business case for the firm is that the higher the volume of transactions through their financial infrastructures, the more user fees are collected. Our previous work revealed that the Foundation's practices reinforce Mastercard's global organizational power by helping establish new market infrastructures, particularly in sub-Saharan Africa (Langevin, Brunet-Bélanger, and Lefèvre, 2023). In this chapter, we narrow our focus to agribusiness, a strategically vital area for development institutions, for-profit entities, public entities, and philanthrocapitalist organizations. Globally, the Foundation ranks among the top ten private foundations that invest in agriculture (OECD, 2018, p. 61), with a significant portion of its investment portfolio directed to this sector (OECD, 2023).

The infrastructures discussed in this chapter go beyond being mere physical conduits; they involve farmers who are integrated into the global political economy, albeit through various pathways and sociotechnical relations. On a relational level, we aim to differentiate what impacts the potential for inclusion and wealth capture in this infrastructuring process. We explore how new infrastructures emerge and interconnect with existing ones and consider the adaptable nature of the 'installed base' (Star, 1999, p. 382). Socio-technical relations may in fact evolve 'often subtly – as alternative bundles of sociotechnical relations

arise and interact with sociotechnical relations that already exist' (Campbell-Verduyn and Hütten, 2023, p. 461). We put forward the following question: What new relationships between actors and technologies alter the landscape and influence who can access credit, at what cost, and through which organizational channels?

3 Method, Empirical Materials, and Analytical Grid

In Chapter 1 of this volume, the editors Westermeier, Campbell-Verduyn, and Brandl ask contributing authors to adopt an 'infrastructural gaze' for their analyses. Although our primary focus is a major player in development finance, we employ a form of 'infrastructural gazing on finance' that delves into micro-level empirical data to explore how and where infrastructures undergo change. Our particular interest lies in understanding the actors involved in the Mastercard Foundation's network and the impact of digitalization on core infrastructure functions like payment and credit in the African rural economy. We examine the Foundation's role in Africa's agricultural sector in a relational manner, encompassing relationships with technologies, public and private entities, institutions, investment flows, and other resources within the Foundation's networks of fundings and partnerships.

Using a database of the Foundation's discourse on its website from its inception until 2019, we extracted and analysed references related to agricultural finance and the Foundation's programmes in the African agricultural sector. In addition to examining brief statements such as news items and blog posts, we conducted an in-depth analysis of key documents, particularly those involving the Foundation and its partners in agricultural finance, such as the Fund for Rural Prosperity (FRP) and the Rural and Agricultural Finance Learning Lab (RAFL). These documents include action plans and assessments regarding agricultural finance and digitalization of the sector. Our objective

was to understand the project undertaken by the Foundation in this domain, with a focus on the role of technology in constructing new digital infrastructures or transforming existing ones, along with the (re)integration of certain components.

We combined this method with SNA to examine how actors who play particular roles and mobilize capital are organized and brought into circulation by the Foundation. Our network dataset covers 2,206 fundings granted to 575 organizations from 2007 to 2021. We have also identified 68 partnerships spanning from 2008 to 2022 involving 166 partner organizations. SNA helps us understand the composition and functioning of networks associated with the Mastercard Foundation. It focuses on the structural patterns in relational data, where units (e.g., individuals and organizations) are interconnected within these networks, which is significant for both the unit and the network. This method aligns well with the concept of infrastructure as a relational entity and enables observation of how the Foundation's practices stimulate network development in various sectors, like agriculture. It sheds light on the process of infrastructural transformation, including its (re)connection to the 'installed base'. This approach helps us understand the Foundation's relational capacity in digitalizing and formalizing informal sectors and reshaping markets, without assuming hierarchical control over the entire network or its components.

Our analytical framework, inspired by the 'infrastructural gaze', focuses on infrastructure as transformative socio-technical relations. In the discursive aspect, we scrutinize how the Mastercard Foundation defines and characterizes the infrastructuring project by observing their framing of current issues in the African financial sector for agriculture, their action plan, recommendations, the organizational constellation they aim to engage, the mobilizing and transformative roles digital technologies should play in the process, and implications for development circuits and flows. We also examine the diverse networks involved in this infrastructuring project, detailing the organizations

participating in the Rural and Agricultural Finance (RAF) initiative and RAFL, as well as those funded by the Mastercard Foundation, probing their functions and agency in this infrastructural process and potential relationships with power structures and macro-circuits of capital.

4 Agribusiness, Capital, and Technology: A Narrative of Necessity and Innovation

This section examines the Mastercard Foundation's discourse on its website and in selected reports related to the RAF initiative and RAFL. The goal is to capture the overall narrative regarding the transformation of financial infrastructure for agribusiness and understand the project promoted by the Foundation and selected partners. This process has been ongoing for about a decade, and the discursive materials, including programme details and sector diagnostics, provide insights into the Foundation's intentions, practices, and, in some cases, results.

4.1 *The Necessary Change*

The Foundation's intent to transform the financial infrastructure for agriculture is based on a diagnosis that positions the African agricultural sector at the heart of the meta-objective 'inclusive growth'. Reeta Roy, President and CEO of the Mastercard Foundation, explains in this vein that 'agriculture and agri-business hold tremendous potential to help [people] living in poverty in Africa improve their quality of life and build better futures for their families' (Mastercard Foundation and One Acre Fund, 2013).

Agriculture is associated with the theme that comes up most often in the Foundation's discourse, namely employability,¹ as the intended effect of its actions: 'Agriculture, the largest sector of employment in Africa, promises opportunities for job growth and economic prosperity' (Mastercard Foundation, 2018).

The supply of formal jobs is fundamental to the narrative: poverty exists because

there is no job creation. To counter poverty, unemployment must be addressed and, to do so, employment must be created in the formal sectors, mainly in agriculture; otherwise, unemployment and unpaid or poorly paid work persists on family farms and in informal labour. To solve these problems, it is necessary to transform the agricultural sector by intervening in the financial infrastructure to increase access, efficiency, and profitability, among other factors. The quote that follows by an associate programme manager at the Mastercard Foundation summarizes the rationale for infrastructural transformation in agriculture and digital finance in particular:

economic growth in agriculture can be twice as effective in reducing poverty than growth in any other sector. This sounds promising, but the formal sector economy in Africa is not growing fast enough to absorb the 11 million young people entering Africa's labour market every year. The reality is that agriculture and the informal sector will be the only pathways for the majority of these young people in the next two decades. Transforming agriculture so it is more profitable for young people will be vital. It's not only a matter of necessity, it's also a matter of opportunity.

Agriculture in Africa is not yet transformative [...] Today's young people don't want to be farmers, they want to be 'digital agripreneurs'. This makes sense if you consider that Africa is increasingly going digital. (Randrianasolo, 2016)

4.2 The Programmatic Strategies of Change

The Foundation's strategy for transforming the agricultural sector and its financial infrastructure involves two key elements. First, it emphasizes empowering youth who play a pivotal role in championing innovative, technology-driven, gender-aware, and climate-smart approaches to modernizing agriculture (Mastercard Foundation, 2018). Secondly, the focus is placed on digital finance to boost financial inclusion among farmers, with the promise of reaching more individuals and fostering inclusive growth

in Africa by generating additional economic opportunities. It is generally implied in the Foundation's discourse that jobs created in agriculture will be formal, yet detailed explanations of the process are lacking. While solutions mainly target mobilizing youth and leveraging digital finance, concrete strategies for transforming the agricultural job market are not clearly outlined. The underlying assumption is that more profitable and efficient agriculture, facilitated by digital finance infrastructure, will lead to the creation of formal jobs. The simplicity of this reasoning is typical of the Foundation's discourse on socio-economic issues, whether about poverty or job creation (Langevin, Lefèvre, and Brunet-Bélanger, 2024).

Since its creation in 2006, the Foundation has implemented programmes to equip youth with skills in finance and technology, promote entrepreneurship, especially in agriculture, and provide market-oriented training. In 2015, the RAF initiative emerged, encompassing the multi-year (2015–2018) FRP competition and RAFL. The \$50 million FRP has aided 38 companies in creating 171 financial products and services in 15 sub-Saharan African countries (FRP, 2022a). These companies, united by their activity in the financial sector, serve 'poor, rural, and financially excluded customers' through various channels (direct banking, input-based finance, asset finance, and tech for access to finance) (FRP, 2022b). In subsequent years, the focus on finance, agriculture, and digital technology among youth persisted, as shown in initiatives like the Young Africa Works summits in 2016 and 2017, which celebrated efforts targeting farmers and supporting various activities in eleven African countries (AgDevCo et al., 2017).

An analysis of the Foundation's national programmes, constituting its programmatic architecture as of 2022, confirms this orientation. In that year, six out of the seven programmes targeted agriculture as one of their fields of activity: Ethiopia, Ghana, Kenya, Nigeria, Senegal, and Uganda. For instance, Kenya's Young Africa Works programme targets agriculture and the digital economy

to catalyse growth. The initiative aims to develop small businesses, enhance productivity in the agricultural value chain, and improve education through digital soft-skills programmes. The narrative strongly emphasizes the digitalization of finance, highlighting the need to expand digital payments for further financial inclusion of rural households. 'Pathways to Prosperity: 2019 Rural and Agricultural Finance State of the Sector Report' succinctly summarizes the mechanism: 'Digitization of payments increases convenience and security of monetary transactions. In addition, it can enable access to other financial products, such as savings and credit, by providing vital customer data to financial service providers' (ISF and RAFL, 2019, p. 15).

4.3 The Challenges Encountered

But the success of this mechanism is not a given. Distinct challenges facing the process of digitalizing the agricultural sector are noted in the reports published by the Foundation and ISF Advisors. First, fragmented demand makes participants hard to reach and expensive to serve; a lack of knowledge about market actors fosters distrust. The nature of agricultural interactions, marked by volatility, low transaction values, and localized, seasonal production, discourages financial service provider interest (ISF and RAFL, 2021, p. 39). Viability and scalability issues arise, given small profit margins and the need for rapid user acquisition with significant capital-intensive investments (ISF and RAFL, 2021, p. 41). Inefficiencies persist with multiple intermediaries, and limited digital connectivity and physical infrastructures in rural areas pose challenges. Scaling-up digital finance services in agribusiness requires transitioning from early experimentation to reaching a critical mass, necessitating a different stage and type of investment by both service and capital providers to avoid innovation stagnation (ISF and RAFL, 2019, pp. 7 and 43).

To address these challenges, recommendations include advancing towards a

cashless society, urging rural and agricultural economies to embrace digital financial transactions (ISF and RAFL, 2019, p. 15). The proposed model emphasizes technology-based platformization of agricultural finance, mobile money penetration, and the use of social media for data. Platforms would facilitate direct connections between various value chain actors, enhancing market efficiency and transparency through digitized transaction data (ISF and RAFL, 2021, p. 15). Special attention to women is advised, considering their higher mobile phone usage and underserved market segment status (ISF and RAFL, 2019, p. 15). This emphasis is strategic. In a 2021 report on agricultural platforms, ISF and RAFL cite DigiFarm as a noteworthy example of 'targeting women'. The case highlights women's potential as lucrative customer segments 'with high lifetime customer value. Particularly since Platforms tend to be able to capture more value from offtake-related transactions (services that women may be more likely to use than men) than from other lower margin services such as advisory, or inputs' (ISF and RAFL, 2021, pp. 46–47). Finally, reports suggest that another key is an enabling regulatory ecosystem in which to operate. This includes trade policies, foreign exchange management, pricing, and data regulation (ISF and RAFL, 2021, p. 19).

4.4 Contributing Institutions and Actors

A distinctive feature of the Foundation's practices is that it works in partnership and involves different types of actors around its initiatives (Lefèvre and Langevin, 2020). The Foundation does not act independently in the field but instead connects actors to whom it grants financial and sometimes technical resources (see Section 5 for details on this network). The Foundation always calls upon networks of actors. The *Digital Financial Services for Agriculture* handbook, co-published with the International Finance Corporation (Mastercard Foundation and IFC, 2018), details the roles every type of actor should play to expand the digitalization process

from mobile network operators, financial institutions, non-governmental organizations (NGOs), or development organizations and agribusinesses to third-party technology providers. In most of the documents analysed, the crucial argument made to justify this relational mode of practice is that partnerships are essential to develop commercial and sustainable digital agricultural financial products and services.

To understand the standard relational modalities in infrastructure transformation, we note that the structuring into networks and platforms between different types of actors is also a hallmark of the model adopted by several of the Foundation's key partners (especially those who have won FRP challenge grants over the years and make up the RAF initiative portfolio) such as Apollo Agriculture, APA Insurance, Finserve, and M-KOPA. We can thus conceptualize that those platforms and networks are connected to infrastructures and thereby participate in their transformation.

4.5 *The Role of Digital Technologies*

The Foundation emphasizes expanding digital technology to reach unbanked, rural, and poor populations, recognizing its role in enhancing financial infrastructure efficiency. Mobile financial technologies, particularly digital payments and mobile money accounts, are crucial for inclusive growth in agriculture to absorb the youth entering the labour market. The concept of the 'digital farmer' is evident in the Mastercard Foundation's statements, reflecting a techno-utopian vision (see, e.g., Mastercard Foundation and KCB Group, 2016). Digital wallets and other technological solutions, such as weather stations and soil sensors, extend beyond finance into the agricultural sector. These transformations converge into digital platforms that organize interactions, streamline communication across the value chain, and generate substantial data that is shared with financial institutions for assessing farmers' credit-worthiness (Mastercard Foundation, 2020; ISF and RAFL, 2021).

4.6 *Implications for Circuit/Flux Development*

Our examination of the Foundation's narrative and programmatic materials reveals practices that aim to direct resource flows into the formal economic and finance sector. A key action plan outlines technical recommendations for agribusiness finance growth and defines digitalization, identifying the actors involved and shedding light on flow circulation. Digitalization, as defined by RAFL, encompasses various aspects, including customer relationship management, registration, loan analysis, disbursement, repayment cash flows, and delivery of support services (Dalberg and RAFL, 2016, p. 1). We can envision the monetary flows (credit and savings) and who and what will capture a part of the value of this circulation: value created by rural households and the agricultural sector will, in part, be captured by traditional microfinance institutions, agribusiness, and commercial banks, as well as high-tech banks and niche non-banking financial institutions (Dalberg and RAFL, 2016, p. 2). The promotion of digital platforms by the Foundation and its affiliates encourages both disintermediation and reintermediation, leading to a transformation of the existing financial circuit (ISF and RAFL, 2021, p. 49).

Overall, we deduce from this analysis that financial inclusion, digitalization, and the formal economy are at the core of the Foundation's programmatic strategy. For farmers, the focus is on microfinance, digital finance, and large-scale data collection to understand their behaviour and adapt microfinance and digital finance to this promising market. This strategy contributes to the process of infrastructuring agribusiness by rejigging some infrastructures already in place, sometimes connecting to new ones in a global and digital manner. Like the process highlighted by Plantin et al. (2018) these programmatic orientations point towards processes of 'platformization' of infrastructures and an 'infrastructuralization' of platforms.

5 Network of Partnerships

The Foundation's practices induce the development of new networks around the agricultural sector in Africa, overlapping public and private components. We now turn our attention to the relational changes at the infrastructural level by unpacking the components and connections in these networks. Thus, networking conceived as the core infrastructural change 'becomes a primary analytic phenomenon' (Star and Ruhleder, 1996, p. 113). Figure 26.1² maps the partnership network surrounding the Foundation since its launch. The mapping exposes partnership clusters in specific sectors with different kinds of actors and organizations, such as in education, the public domain, private consultancy firms, think tanks, NGOs, and private corporations. We noticed a myriad of key actors in the field of financial inclusion, including the Bill & Melinda Gates Foundation, USAID (United States Agency for International Development), Women World Banking, Grameen, CGAP (Consultative Group to Assist the Poorest), GSMA (Global System for Mobile Communications Association) Foundation, SEEP (Small Enterprise Evaluation Project) Network, UNCDF (United Nations Capital Development Fund), and Accion. Notably, the Foundation's initiatives connect influential players on the African continent, tied to colonial power structures, to foster the digital financial services market for the poor, evident in partnerships with Equity Bank, Equity Group Foundation, and the Kenya Commercial Bank (KCB) (details in Langevin et al., in press).

Within this constellation of actors, we focus now more specifically on the RAF initiative (Figure 26.3³), which, as noted earlier, involved the Foundation supporting a portfolio of private organizations funded through the FRP. The project was carried out from 2015 to 2019 in collaboration with the RAFL, an organization created by the Foundation dedicated to learning, best practices, dissemination and mobilization. This trio (RAF, FRP, and RAFL) collaborates

synergistically to disseminate practices across the financial and agricultural sectors, uniting private sector businesses and NGOs (Table 26.1). The budget for this partnership is approximately \$148 million.

KPMG East Africa is the organization which receives the most funding from the Foundation within this partnership, receiving \$74 million. The professional services firm manages the FRP. The FRP's office and phone numbers are the same as KPMG's offices in Kenya, thus we deduce that the funding is intended for the management of this programme. The Fund's original aims included improving access to finance for over one million farmers, supporting the commercialization of innovative products and services, and fostering agricultural finance markets. In our analysis of the Foundation's employment relationships network since its inception, which includes board members and senior and middle management, we identified five connections linking both entities, including current and former COOs of the Foundation.⁴ These connections are significant, as the Big 4 global professional service firms like KPMG 'exercise power in the global economy by commanding transnational infrastructures of expertise that provide stability and order to globalization, and which form a critical resource that other actors – namely corporations and regulators – depend on to act' (Christensen, 2022, p. 1). AgDevCo, a British not-for-profit investment firm specializing in African agribusiness, partnered with the Foundation to enhance productivity and market access for nearly 500,000 smallholder farmers. The KCB collaborated with the Foundation to improve financial service access for up to two million farmers, providing financial and non-financial services through the mobile solution, KCB MobiGrow, with a commitment to make \$200 million in credit available (Mastercard Foundation and KCB Group, 2016).

It is worth noting that the private sector partners in this network hold influential positions in the financialized capitalist political economy. KPMG, a major accounting and consulting firm, is part of the elite Big 4,

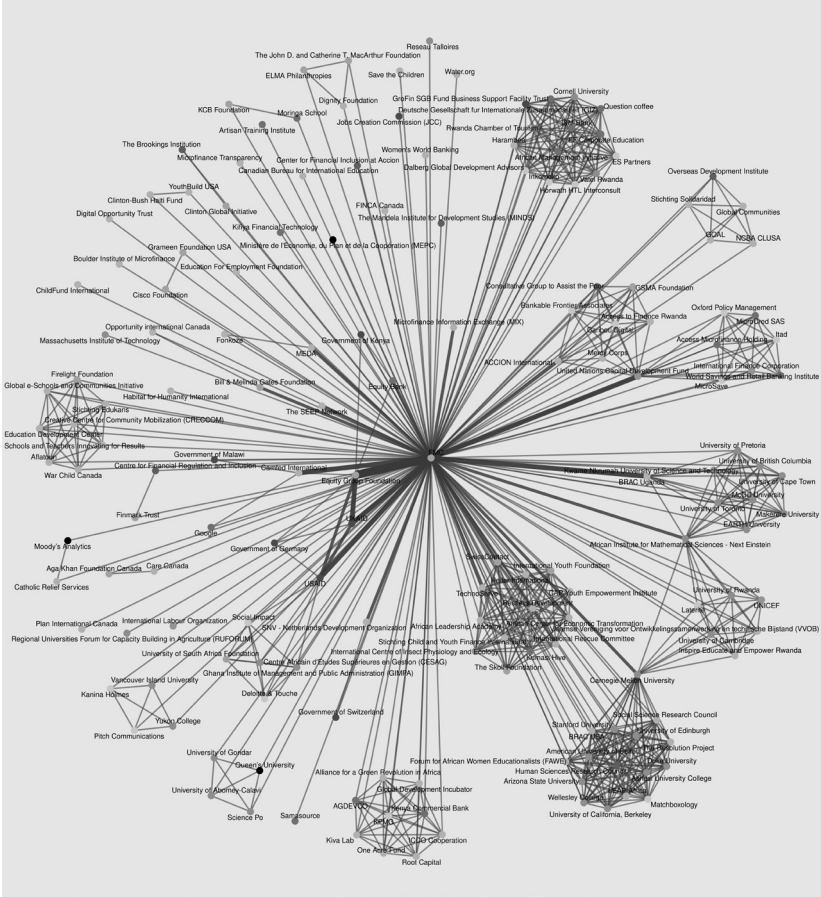


Figure 26.1 Mastercard Foundation’s Partnership Network, 2007–2021. For a higher-resolution, color version visit: www.cambridge.org/Westermeier
Source: Authors’ elaboration.

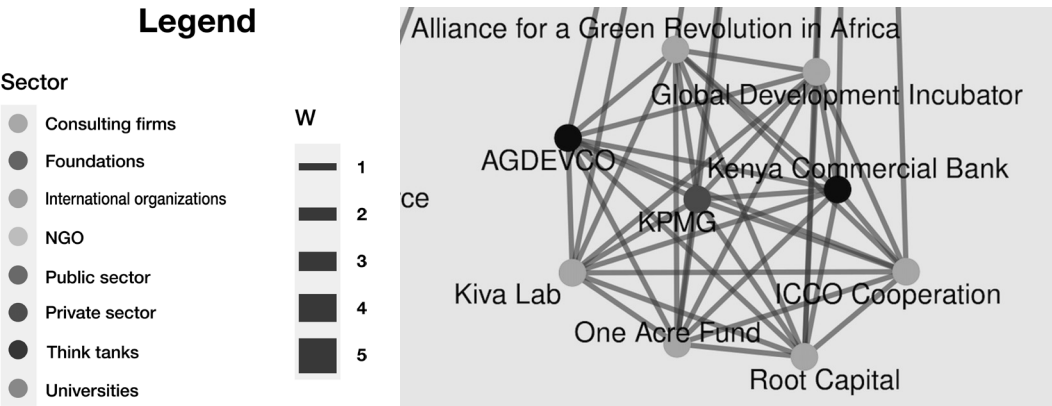


Figure 26.2 Legend. For a higher-resolution, color version visit: www.cambridge.org/Westermeier
Source: Authors’ elaboration.

Figure 26.3 Partnership. For a higher-resolution, color version visit: www.cambridge.org/Westermeier
Source: Authors’ elaboration.

AgDevCo focuses on the African agricultural sector from the United Kingdom, and KCB, known for its connections to neo-colonialism,

extends its influence beyond Kenya across the African continent (Bernards, 2022; Langevin et al., in press).

Table 26.1 The Mastercard Foundation's Rural and Agricultural Finance Partnerships

<i>Partner organization</i>	<i>Specific project</i>	<i>Sector</i>	<i>Country</i>	<i>Total funding</i>	<i>Employment ties</i>
KPMG	Mastercard Foundation FRP	Private sector	Kenya	\$74,132,092	5
ICCO Cooperation	Strengthening African Rural Smallholders	NGO	Netherlands	\$28,309,552	0
Alliance for a Green	Financial Inclusion for Smallholder Farmers in Africa Project	NGO	Kenya	\$21,211,653	0
Revolution in Africa	Support of Farmers and SMEs				
AGDEVCO	Agricultural Finance for Smallholders and Related Businesses	Private sector	United Kingdom	\$17,767,607	0
One Acre Fund	Expanding One Acre Fund's Outreach	NGO	Kenya	\$15,442,070	0
KCB	Expanding Access to Finance for Smallholder Farmers	Private sector	Kenya	\$12,054,328	0
Kiva	Expand Financial Access Among African Smallholder Farmers and Rural Populations	NGO	United States	\$8,931,909	0
Global Development	Learning Partner: RAFL	NGO	United States	\$8,879,941	0
Incubator					
Root Capital	Expanding the Frontier of Rural Agricultural Finance in West Africa	NGO	United States	\$7,264,620	1

Source: Author's compilation based on data submitted annually to the Canada Revenue Agency by the Mastercard Foundation and FRP documents.

Among NGO partners, ICCO Cooperation (International Cocoa Cooperation) in the Netherlands received over \$28 million to offer affordable agricultural financial products to 200,000+ farmers. Kenyan NGO AGRA, founded by the Bill & Melinda Gates Foundation and the Rockefeller Foundation, collaborated with the Foundation to expand financial services access to 700,000 smallholder farmers, emphasizing agribusiness as a primary financing method and supporting agricultural market information systems and payment innovations. One Acre Fund, a Kenyan NGO, provides East African farmers with asset-based financing and agricultural training. US-based NGO Kiva Microfunds, focusing on inclusive finance, established Kiva Labs to provide 700,000 clients access to new financial products.

Global Development Incubator, an American NGO, served as the learning partner for the RAF initiative, overseeing the RAFLL. It shared best practices, improved stakeholder understanding, and developed the monitoring, evaluation, and learning framework for the entire RAF portfolio. The role of this American NGO is an indicator of the significance of the organizational capacity-building and the continuous learning process within infrastructuring seen as a process. Organizational work is a vital aspect of an infrastructural perspective. Carse's genealogy of the concept notes that, in the early twentieth century, infrastructure 'referred primarily to the organizational work required before railroad tracks could be laid: either establishing a roadbed of substrate material (literally beneath the tracks) or other work functionally prior to laying tracks like building bridges, embankments, and tunnels' (Carse, 2016, p. 28). The Mastercard Foundation's network-driven transformations empower various actors to document and make visible this learning, accessible through websites like those of the Foundation, RAFLL, and affiliated entities such as Dalberg and ISF, two development consulting firms.

Root Capital, a US-based NGO, engages in social investment in marginalized rural communities. Collaborating with the Foundation on the 'Expanding the Frontier of Rural Agricultural Finance in West

Africa' initiative, with a budget of approximately \$7 million, the partnership aimed to enhance the livelihoods of over 200,000 smallholder farmers. It sought to connect them to local markets, offering access to training and financial services. This collaboration reflects the process of integrating agricultural economies into formal marketplace structures, aligning with Brooks' (2021, p. 1) concept of inserting new market subjects 'into value chains and wider circuits of capital and data'. This aligns with Mann's (2018, p. 28) observation that digital data in Africa is designed to 'become a source of power in economic governance'.

From this analysis, we deduce that the majority of these actors are based in the Global North, where innovations are conceived before being implemented in Africa with the support of the Foundation's capital, expertise, and programmes. These innovations are frequently crafted to integrate new consumers into digital finance platforms assembled in Africa, often through neo-colonial corporate telecommunication, digital, and data infrastructures, enrolling diverse populations previously excluded from formal financial relations under colonial regimes (Langley and Leyshon, 2022, p. 401).

6 Conclusion

Our analysis, guided by the infrastructural gaze, has aimed to understand how the infrastructure-(re)building process is linked to existing power dynamics and how it integrates with established circuits, such as those of the Foundation and other key channels in financialized capitalism and the neoliberal development agenda. Discourse analysis reveals an underlying agenda to generate more wealth through inclusive growth, aspiring to establish a commercial agricultural sector fully supported by formal finance and digital technologies. Our SNA indicates that actors involved in (re)building infrastructures and integrating resource flows into channels, whether through activating digital and financial literacy or constructing platforms leveraging massive data

of African farmers, all share the characteristic of being anchored in the formal economy and finance.

This study sheds light on the ongoing involvement of philanthrocapitalist organizations in the financial sector in Africa, providing insights into the way financial infrastructures in the developing world are interconnected with global power structures (Bernards and Campbell-Verduyn, 2019). Echoing concerns expressed in critical infrastructure literature, we acknowledge how infrastructural technologies ‘inscribe specific ways of doing things [and] sediment historical power relations and core-periphery relations’ (de Goede, 2021, p. 354). This prompts us to question the implications for the future of agribusiness in Africa, considering that the transformed financial infrastructure, through the integration of the Foundation’s networks, assigns pivotal functions to neo-colonial financial institutions like KCB. The financial infrastructure underlying agribusiness in Africa today significantly mirrors the power dynamics of the past. The project that seeks to ‘bank the unbanked’ is being made possible by the transformations of financial and development infrastructures that redistribute financial access while being anchored in powerful existing systems that can capture wealth.

Notes

1. Based on our NVivo analysis, this theme has been coded eighty-three times, coming from the nodes ‘intended effects’ and ‘employability’.
2. Brandl et al. (2025). Available at www.cambridge.org/in/universitypress/subjects/economics/finance/cambridge-global-handbook-financial-infrastructure?format=HB.
3. Brandl et al. (2025). Available at www.cambridge.org/in/universitypress/subjects/economics/finance/cambridge-global-handbook-financial-infrastructure?format=HB.
4. Out of the 1,048 organizations connected to the Foundation inside our multi-level social network analysis (including fundings, partnerships, employment ties, and co-affiliations), KPMG ranks fifteenth.

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India Stack

Authority and Innovation in a New Financial Infrastructure

J. P. Singh

1 Introduction

In 2009, the Indian government began work on introducing a twelve-digit biometric identity card known as Aadhaar, which means “foundation” in Hindi. By 2024, almost all adults in India had an Aadhaar ID, which has facilitated direct identification and provision of government payments to beneficiaries. In 2016, around the time there were one billion Aadhaar IDs, a Unified Payments Interface (UPI) was overlaid on Aadhaar to facilitate payments among banks. The third layer of the financial infrastructure, “Data Empowerment and Protection Architecture,” is meant to secure and verify digital identities necessary for any transaction. The three-layered financial infrastructure has enabled almost seamless commercial transactions among consumers, vendors, and banks, from payments to a taxi driver to a utility provider. In 2023, identity verification moved increasingly toward cloud-based platforms such as the Aadhaar-backed DigiLocker, made possible through the Ministry of Electronics and Information Technology (MEITY).

The three infrastructural layers of identity, payments, and verification have made “India Stack” possible: The set of application programming interfaces (API) that, in February 2024, generated 8.6 billion transactions monthly, worth \$170 billion ([Indiastack.org](https://indiastack.org), 2024). India’s vibrant startup culture, which largely rests upon the ease of making payments, would not be possible without India Stack.

Artifacts have politics (Winner, 1980). India Stack is no exception. The term stack implies a physical layering, in this case of APIs above the identity and payment layers. Understood in an infrastructural sense, the layering results from the actions of multiple agents, including the state, business, and society. This chapter discusses the political economy facets of the relationship between the Indian state and the unlikely rollout of a mega-scale financial architecture such as India Stack. How did a state historically inadequate at providing public goods at scale roll out a postindustrial project of mega-proportions in record time? What are the distributional outcomes and the social meanings that arise from such an undertaking?

The short answer lies in the three inter-related c's of state legitimacy in India: calculation, coercion, and creativity. The interrelationships show that the current "materiality" of India Stack rests upon the historical continuations of – or (in some cases) departures from – collective understandings in society and business about the role of the state. The longer explanation focuses on the three c's in more detail: (1) The financial architecture parallels the Indian state's historical habits of authority or postcolonial *calculations* that favored large-scale projects; (2) the calculations now encompass the imagination and *creativity* of groups such as India's skilled and entrepreneurial IT talent; and (3) state legitimacy in India purportedly mobilizes market provision for social inclusion (e.g., in the name of "financial inclusion"), but like artifacts, markets also represent politics. While a supposedly inclusive financial infrastructure is made available to over a billion people, a set of *coercive* and exclusionary adjacent policies have raised surveillance and human rights concerns regarding minority religions and civil society groups, and have led to an overall decline in India's democracy.

The India Stack project, described later in this chapter, strengthens state authority through bureaucratic and technical creativity. State authority is also enabled through a set of historically contextual cultural and economic calculations – and coercions. The financial infrastructure reflects the prerogatives of state meaning-making or legitimacy through what anthropologist James Scott terms an "administrative ordering of nature and society" (Scott, 1998, p. 4). The India Stack project also belies claims about the weakening of the postcolonial state that cannot make territories and people "legible" or provide them with material comfort (p. 2). This underestimates the idea that the state is weak, as well as the state calculations about demographics and coercion enabled through digital networks that rest upon the identity of citizens. It is often argued that postcolonial states such as India turn to authoritarian populism as, in their view, neoliberal economic policies fail to encourage social inclusion and

employment (Chacko, 2018). This chapter shows state calculations about demographics and coercion are enabled alongside creative provision of goods and services through the India Stack architecture.

The administrative ordering of Indian society through the Aadhaar identity card thus sits alongside the state's historic monopoly on violence (Tilly, 1985). Arjun Appadurai notes that recognizing "calculative action as a central feature of twenty-first century economics" is important for understanding how financial markets (or capitalism in general) function (Appadurai, 2012, p. 14). This calculative tradition can be traced to the classical political economies of Adam Smith, Karl Marx, or Max Weber. Understanding the social meanings and distributional impact of India Stack entails situating its utilitarian calculations within the political and cultural anthropology of everyday life in India. As Chapter 1 of this volume notes, an "infrastructural gaze helps piece together and pierce through the complexities of finance" but "big-picture concerns of power, authority, legitimacy" in this chapter are revealed through the three interrelated aspects of calculation, creativity, and coercion.

From the introduction of railroads and telegraph in colonial India to fintech in the postcolonial twenty-first century, the constitution of authority and governance in India has been based on technology.

2 Calculations

Infrastructures are material artifacts with social and political meaning (Bieker, Hughes, and Pinch, 2012; Bernards and Campbell-Verduyn, 2019). The techno-imaginary found in policy is indicative of political and social possibilities for the present and the future (Jasanoff and Kim, 2013). Rodima-Taylor and Campbell-Verduyn (2023, p. 17) note "how collectively held visions (imaginaries) materialize into existing sociotechnical relations (infrastructures)." Imaginaries and infrastructures, therefore, reveal calculations from states and providers

about the intended beneficiaries and the collectively held meanings by the providers and the users of the infrastructure. In India's case, the calculations of the Indian state and bureaucracy have been crucial to the techno-imaginary informing infrastructures, the latest iteration being India Stack.

A historic example in India is that of railways. More was spent on railways than on any other forms of infrastructure in India during the colonial era. The railways safeguarded British governance and investments. In postcolonial India, railways became a key means of transport and an indispensable part of India's indigenously focused import-substitution industrialization strategy. From 1924, during the colonial era, until 2016 the Indian railways budget was presented to parliament as separate from the union (or federal) budget because of railways' importance to the country. It was not a coincidence that the railways' and union budget were combined in 2017, just as India turned its attention to postindustrial infrastructures.

While railways and telegraphs were considered important to the British Empire's governance of India, the telephone, which is now at the core of India Stack, was viewed as a luxury in postcolonial India and deemed unimportant for development (Singh, 1999; see also Handel, this volume, for an analogous understanding of the telegraph). Instead, postcolonial imaginary emphasized the radio, and later television, for developmental communication. Programming was colored by secular and inclusive constitutional norms (regardless of the reality of Indian society). The field of development communication coevolved with such communication infrastructures in India and other parts of the developing world (Gudykunst and Mody, 2002). Radio and TV broadcasting companies, along with a limited number of telecommunication providers, were either entirely state-owned or were public goods.

Three types of calculations from the Indian state, starting in the 1980s, pushed India toward thinking about new types of information-driven infrastructures that would later form the basis for Aadhaar and

India Stack. First, India had a bureaucratic and engineering skillset that would assist with these efforts. The calculations from the Indian state rely on "sarkar" or a vast bureaucracy and elected officials with huge influence over people's daily lives. At the top of the hierarchy is a set of officials from the Indian Administrative Service (IAS) who constitute an elite meritocracy within the state. In 2023, there were about 5,000 IAS bureaucrats in the country, with around 180 IAS selected yearly from over a half a million people who take the competitive civil service exams every year. Nothing in postcolonial or current India moves forward without the consent or vision of IAS officials. Therefore, the rollout of India Stack involved several IAS officials who either aided (or thwarted) the Aadhaar and other efforts.¹ India has also developed important science and technology education institutions in the postcolonial era – the foremost being the Indian Institutes of Technology – that provide graduates with the skillsets to make an IT-led infrastructure feasible. Interestingly, nearly two-thirds of those selected from the highly competitive Indian Civil Services exams are from engineering backgrounds (*Economic Times*, 2023). Natural science and engineering fields historically made it easier for examinees to score high on the civil service exam and get selected.

Second, India began prioritizing telecommunication in its development strategies in the 1980s and information technologies starting in the 1990s, and moved away from the state provision of telecommunications. While the rollout of telecommunications until 2000 was slow, that of mobile telephony after 1999 through private firms grew exponentially. By the end of the first decade of cell phone provision there were over 600 million cell phone subscribers, and, by 2020, over a billion. Beginning in 1991, India also veered away from its Import Substitution Industrialization (ISI) strategy to allow private actors to provide goods and services that had traditionally been seen as public goods. The state had provided landline telephones, but the private sector was allowed into the mobile telephony

market. One of the main failures of the ISI strategy was an overly regulative state known as the license-quota-permit-Raj. As India liberalized, there were corruption scandals, some of the biggest being around spectrum allocation for mobile provision. Nevertheless, parallel developments provided some regulatory oversight through the Telecommunication Regulatory Authority of India and Telecom Disputes Settlement and Appellate Tribunal, which together sought to create impartial rules and ensure interoperability among providers.

Third, the colonial and postcolonial Indian state, in contrast to most in the developing world, had and has a high capacity for collecting statistics and calculating demographics. In doing so, the state has employed “a cadastral lens” that simplifies and makes visible some characteristics of populations over others (Scott, 1998). The ten-year census survey was a prime example. In 2002, the central government proposed a National Population Registry (NPR) that would serve as a precedent for and, later, a competitor to the Aadhaar program. There was a security dimension in maintaining a population register, as proposed by Prime Minister L. K. Advani, leader of the Hindu-aligned Bharatiya Janata Party (BJP) that currently governs India under Narendra Modi. A controversial Citizenship Amendment Act (CAA) in 2019 extended Indian citizenship to persecuted religious minority refugees from neighboring countries, except if they were Muslim. CAA set off fears and protests that even Indian Muslims would face discrimination in proving their citizenship.

The historical precedent in the three calculations presented is apparent in the dirigisme and the skillsets within the state, and was fostered through public institutions and the state’s imagination about its demographics. There were other connections, such as those reflecting the ISI strategy. The shift to information technologies featured Indigenous solutions. Narayana Murthy, CEO and founder of Infosys, one of India’s biggest IT firms and one of the four firms in the country with a market capitalization above \$100 billion,

mentioned the 500-line switch from government’s Center for Development of Telematics in the 1980s as a foundational vision that would assist India’s adoption of IT and spread rural telephony (Murthy and Murthy, 2009, p. 114). The market liberalization strategy did not immediately dismantle state ownership. In fact, initially it endowed state officials with tremendous power to decide between corporate winners and losers, and it resulted in many well-known corruption scandals.

The introduction of Aadhaar in 2009 followed the three aforementioned calculations, and linked them with finance and biometrics. The Unique Identification Authority of India (UIDAI) was created as a government body to assist with Aadhaar efforts. Nandan Nilekani, one of the Infosys founders, was brought in from the private sector to lead UIDAI. Nilekani’s appointment is representative of collaboration with the private sector and reflects the growing economic and political importance of information technologies. The first Aadhaar card was issued in September 2010 and, by 2024, there were 1.31 billion Aadhaar cards in the country. Nilekani relied on a team of industry and highly competent bureaucrats, including several IAS officers, to plan the Aadhaar strategy (Ramnath and Assisi, 2018). Aadhaar was initially conceived as a voluntary ID card to facilitate the provision of public goods, especially income transfers and government subsidies, which were enjoyed by nearly half of the Indian population. By one estimate, before Aadhaar was launched only 15% of government subsidies reached the intended beneficiaries because intermediaries would siphon off some of the funds (Raghavan, Jain, and Varma, 2019). An Aadhaar registry would facilitate payments directly to the beneficiaries.

3 Creativity

Aadhaar was initially planned as a voluntary scheme, but it increasingly took on compulsory dimensions for Indian citizens and became a central and inescapable

component of proof of identity in India. Aadhaar identity is now a prerequisite for verification for almost all private and public services. Aadhaar is also the foundation of the financial infrastructure in India that links banks with public and private providers of goods and services. Although conceived by the Congress-led central government in India, the current BJP-led government embraced it in 2014 when it came to power. Therefore, the India Stack project also reveals continuities rather than breaks in the Indian state's historical steering of its financial infrastructure.

The term creativity is employed in this section for the financial affordances or possibilities enabled through the India Stack platform described later in the chapter (Earl and Kimport, 2011). The creativity of India Stack lies in affordances that were unavailable earlier. This includes payments and receipts, access to public records, registrations, and – most importantly – the foundational layer for the startup culture in India that has benefited from the API architecture that rests upon Aadhaar and the UPI payments system.

Aadhaar from its inception was conceived as an infrastructure that would enable other platform or layers to be stacked upon it. Bernards and Campbell-Verduyn (2019) point out five characteristics of infrastructures, which include their facilitation, openness, and centrality to a variety of activities, their durability over time, and their relative obscurity operating in the background. The uniqueness lies in tracing the scale and the interconnections that allowed the platform to grow and take on several functions. Transfer payments employing the Aadhaar platform began to be made in 2014 through a central government program called PMJDY (Prime Minister's Jan Dhan Yojana), which entailed opening bank accounts through the biometric identification inherent in Aadhaar. By 2018, there were 310 million bank accounts associated with this program (Ramnath and Assisi, 2018, p. 128) and in 2022 there were 460 million (*Financial Times*, 2022).

The next step came in 2016 with the launch of the UPI enabled through the

National Payments Corporation of India, a nonprofit jointly owned by major banks, which made all banking transactions interoperable. The unique feature of UPI was that it enabled transactions across various payment systems such as Paytm (launched in 2010), Google Pay, and Amazon Pay. After its entry in 2017, Google Pay both boosted and accounted for over half the transactions through UPI. The government launched its own interface for interoperable transactions, called Bharat Interface for Money or BHIM, which enabled transactions among users; this was ostensibly also to deflect the critique that all major existing applications were commercial or foreign owned.

The integration of Aadhaar with UPI and BHIM fed into the creation of India Stack and associated digital security measures that have further boosted the fintech industry and associated startup culture in India. Almost all apps in India are part of India Stack and operate through the underlying UPI. Recent work showing the overlap of often-state-enabled and widely accessible *infrastructures* with ICT-driven *platforms* is useful here (Plantin et al., 2018; Westermeier, 2020): The infrastructural layer comprising Aadhaar and UPI overlaps with the set of open interfaces or the platform known as India Stack. India Stack fits the conceptualization of platform capitalism (Sell, 2022).

India's experience has attracted global attention. The digital ID and fintech interfaces being developed globally now regularly cite the Aadhaar and India Stack platforms, and Indian writers – politicians, business leaders, and journalists – point out at length that the experience has attracted attention from international organizations such as the World Bank and the International Monetary Fund, global platforms such as Microsoft and Google, and multiple national governments (Nilekani and Shah, 2016; Ramnath and Assisi, 2018; Kant, 2019). While the creativity of India Stack is often praised in the West and India, the underlying coercions are largely overlooked.

Section 4 describes India's struggles with data laws but, in the meantime, the

technical solutions being developed have led to the MEITY developing the electronic eKYC (Know Your Customer) and DigiLocker as cloud-based services for consent-based digital identity verification. Aadhaar founder Nandan Nilekani has described the platform as follows: “the Aadhaar program has now conclusively proven that we need not look only to the Silicon Valley of the world for cutting-edge innovation in technology” (Nilekani and Shah, 2016, p. 46).

4 Coercion

The legitimacy of any infrastructure rests upon the way that state, commerce, and society are co-constituted. Sections 2 and 3 have described the calculations and creativity of state and commerce. This section turns to society and its collective understandings and participation in India Stack. Economic sociology rejects the view that states and markets are in opposition to each other or that the increasing role of one decreases that of the other (Block and Evans, 2005). They are, in fact, co-constituted, and market rules are often embedded in social understandings of the roles economic actors perform (Granovetter, 1985). A social understanding that accepts the authority of state and business would be one where the state, through its “cadastral lens,” (p. 47) produces a “prostrate civil society” (Scott, 1998, p. 5). In a hierarchical postcolonial society such as India, the temptation to produce a prostrate civil society with authority and coercion, the basis of state legitimacy, is always present. Meritocratic bureaucrats used to enforcing top-down rules or technocrats designing engineering utopias may have scant regard for involving civil society, or fail to understand how social norms and civil society function in a democratic polity. Unfortunately, state coercion has increasingly replaced active and explicit societal consent as the financial infrastructure has evolved in India.

There are two ways to examine the role of society in India Stack. One looks at the direct involvement of societal actors in deliberating

and formulating the rules that went into the formation of India Stack. However, infrastructures also reflect their political environments and societal hierarchies (Winner, 1978). A polity’s overall vision and rules informing societal engagement with the state are, therefore, equally important. Both are discussed in what follows.

The Congress Party-led government, in power until 2014, had a difficult time passing legislation that would make Aadhaar a legal instrument. At issue was its status as a voluntary instrument when introduced, to it increasingly becoming a compulsory undertaking. Eventually the legislation was passed as a “money bill” in the Indian Parliament in 2016. Money bills do not require the consent of the upper house, and so are easier to pass. A civil society challenge to the money bill did not succeed in the Indian Supreme Court. The plaintiff in both Indian Supreme Court cases was a retired judge from the Karnataka High Court and the cases are known as the Puttaswamy cases after him.

The societal contestation over Aadhaar and India Stack at first glance might point at anything other than a prostrate civil society. For example, a successful civil society challenge from the Internet Freedom Foundation in 2016 defeated moves that would have compromised net neutrality. Another challenge resulted from Aadhaar’s data collection and breaches, and fears regarding the surveillance capacity of the state or other actors with access to Aadhaar data. One of the most fundamental revisions to the legal framework came from a 2017 Supreme Court case that enshrined privacy as a fundamental right in India and enjoined the central government to come up with a data privacy framework. In August 2023, the Indian Parliament passed the Digital Personal Data Protection Act (DPDPA). It was critiqued for providing enormous powers to the central government and introducing the language of “deemed consent” or implicit consent of individuals rather than explicit consent (Sabharwal, 2023). In early 2024, the Editors Guild of India, a national journalists’ organization, filed a petition with the government, noting that “deemed

consent” could also be used against journalists reporting any story about individuals.

The preceding narrative points to legal recourse for Indian civil society and journalists, but this is in the context of legal charges being filed against journalists by the BJP-led central and state governments for reporting unfavorably about Aadhaar and of widespread attacks on civil society organizations in India. The rollouts of Aadhaar and India Stack have been top-down processes with hardly any direct consultation with Indian society. Therefore, most accounts of civil society engagement are either in the form of challenges in courts to the infrastructure or to the perceived legitimacy of these state maneuvers. An analysis from Mahrenbach and Pfeffer (2023) showed the declining legitimacy of Aadhaar in the first 10 years of its operation from an analysis of nearly 250,000 tweets.

This analysis tracks a period when the Aadhaar efforts were new and during the time when the Supreme Court cases took place. Critiques of Aadhaar are hard to find on Twitter now, especially from media and civil society leaders, and press freedom has declined in India. The restrictions on civil society groups and nongovernmental organizations continue to increase.

Most broad indicators about democracy or democratic deliberation in India present a bleak picture. India’s rank in the World Press Freedom Index at its inception was 80 in 2002, declining to 122 in 2010, and in May 2023 stood at 161 out of 180 countries. In 2000, the V-Dem scores for Indian democracy were as follows: 0.66 for deliberative democracy, 0.97 for electoral democracy, 0.58 for liberal democracy, and 0.48 for participatory democracy (see Figure 27.1). In 2022, these score had declined substantially from being at par with prosperous liberal democracies to among the lowest worldwide: Deliberative democracy was 0.29, electoral democracy 0.4, liberal democracy 0.31, and participatory democracy 0.26 (Coppedge et al., 2023).

Civil society involvement has been marginal in the evolution of Aadhaar and India Stack. The Indian government can claim electoral mandate and global attention as constitutive of societal consent. As shown, India continues to decline on almost all measures of democracy. Society is envisioned mostly as a recipient or a consumer in India Stack calculations rather than as a deliberative entity – questioning, contesting, or engaging with Aadhaar and India Stack policies. With the decline of deliberation, Scott

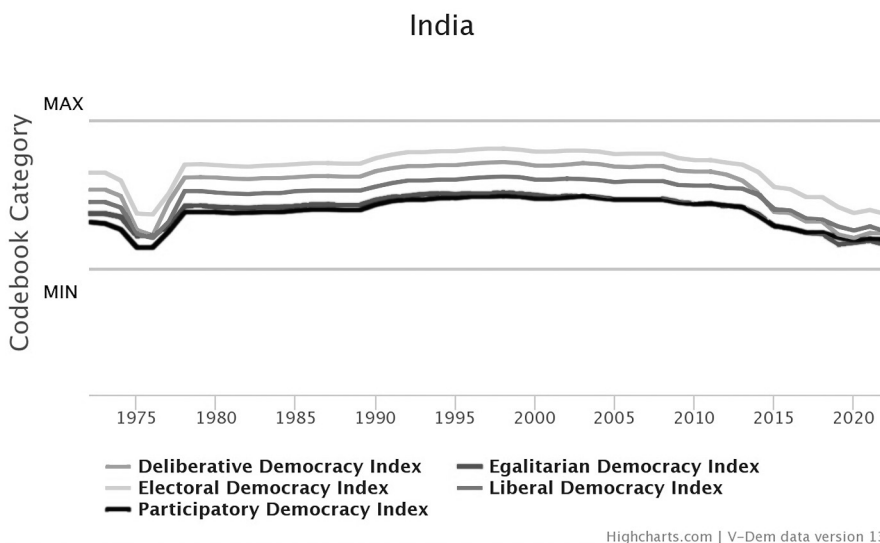


Figure 27.1 V-Dem scores for India, 1972–2022.

Source: Author’s elaboration based on data in Coppedge et al. (2023).

(1998, p. 4) is right in calling attention to a “prostrate civil society” whose primary interaction with the infrastructure is to partake of its core functions that have been internalized as collective understandings.

5 Conclusion

The three c’s discussed in this chapter each reveal alternative facets of India Stack across different realms of state authority in India. The state’s infrastructural gaze has been central to the endeavor of the fintech infrastructure that offers both continuities and departures from the way the Indian state has functioned historically. With the liberalization of Indian markets in the 1990s, the envisaged pluralistic political-economy realm in liberal thought, in which firms would check state power, has instead evolved into the coproduction of state legitimacy and coercion through an identity-based infrastructure that the state controls. Large-scale projects often consolidate state control and coercion (Acemoglu and Robinson, 2012).

From the railroads to artificial intelligence (AI), large infrastructures are part of the legacy of state techno-imaginaries in India. The state authority sector in India is understaffed: There are only 3.2 million federal government employees for a population of 1.4 billion people (Sinha, 2023). State authority is better understood as unrivaled and far-reaching, especially through the actions of its competitively selected bureaucracy – the IAS – two-thirds of which is now drawn from engineering schools. Nevertheless, these vast infrastructural calculations have included Indigenous capacity-building, whether the locomotives or engines for the railroads, or the rise of Indian startups and unicorns for the AI infrastructure.

The Indian fintech infrastructure, enabled in its everyday usage through the India Stack platform, is unique and is already looked up to as a development model by several developed and developing countries and international organizations. In the mid-2010s, India seemed to be behind in fintech

and in mobile money infrastructures (Singh and Flyverbom, 2016), and it seemed that the extant banking sector and government regulations had thwarted mobile money efforts. Instead of allowing mobile payments through SIM cards, as the pioneering Kenyan government did for M-Pesa, the Indian government demanded that bank accounts be linked to these payments. In hindsight, the rollout of Aadhaar and the UPI, and the facilitation of government payments and subsidies, have led to an exponential increase in bank accounts and, subsequently, mobile money in India. The identity and payment layers have also now led to India Stack being central to India’s vibrant startup sector with regard to information technologies and AI. Despite the continuities, the departures also demonstrate a creative state. The twenty-first-century Indian state works closely with business; the twentieth-century postcolonial state kept it at arm’s length.

There has always been a beneficial payoff for the Indian state in large infrastructures. For the British Empire, technologies of telegraph and the railroads were those of colonial extraction and of maintenance of the empire. Postcolonial India arguably needed these same forms of carriage and communication to extend governance over a vast territory and people. The railroads budget had symbolic importance and railroads were part of the popular imagination of being Indian. The fintech architecture, endorsed by all political parties in power for the last fifteen years, extends and expands the control of the Indian state. The license-quota-permit-Raj is gone. Businesses now grow in a liberalized marketplace and the classic British or postcolonial Raj or governance is history. In its place is the identity-surveillance-silencing Raj of an increasingly autocratic Indian state. The fintech architecture both represents and replicates that control.

Do AI-driven fintech architectures or all platform architectures in AI drive toward autocratic control? At the core of AI is data that identifies people (in this case Aadhaar), which is activated through algorithms for service provision – be this social media or

fintech applications. However, the indicators correlating AI infrastructures with autocracy point to a mixed picture (Singh et al., 2025).

First, there are dissimilarities across AI infrastructures themselves. Not all states with fintech and AI offer a similar architecture with inadequate data controls. The European Union, with its 2016 General Data Protection Regulation and 2023 AI Act, is a strong exception, but even countries such as Kenya and Colombia have strict regulations on data. Second, the debate on platforms and their entanglement with the state needs further research and evidence before grand claims can be warranted. For every grand claim, there is contestation. India's fintech architecture works within a controlling state, but also with continuities of history and enormous creativity. India's precipitous decline in V-Dem and press freedom scores is also not unique. The 2023 V-Dem report on the state of democracy worldwide is ominous and points to a decline in democracy in the Global North and South (Papada et al., 2023). The democracy levels in 2022 worldwide were those of 1986, with the most precipitous declines in Asia-Pacific, followed by Latin America and Central Asia. V-Dem makes special note of the decline in India. The declines in democracy seem correlated with per capita incomes more than how deeply AI fintech infrastructures have permeated a country. Our own policy research also shows that there are varieties of AI infrastructures with varying values across states, and it would be inaccurate to correlate all AI platforms with autocracy (Singh et al., 2025).

This chapter has provided evidence that large infrastructures in the past and fintech infrastructures in the present are both steered by, and contribute to, state authority and control in India. There is not enough evidence to state definitively that fintech infrastructure and platform economies always lead to democratic decline, but the negative evidence cannot be dismissed either, including the centralization and manipulation of large national or even global data sets to service a few firms or states. Similarly, the thesis that neoliberalism has created an

underclass in India that must be controlled through authoritarianism needs questioning: The India Stack architecture recently, and neoliberalism since 1991, have created affordances and a secular rise in overall incomes. This chapter locates the rising authoritarianism instead in historical social factors and political calculations.

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Note

1. The UIDAI, which administers Aadhaar, was not associated with any ministry until 2016 and, therefore, faced opposition from powerful IAS officials within ministries such as home affairs, which was developing the NPR. Interestingly, in 2016, UIDAI was integrated into MEITY, which has now overtaken several other government ministries, such as commerce, in India's central government hierarchy of importance.

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Infrastructures for Financial Inclusion in South Asia

Juvaria Jafri

1 Introduction

Are you who you say you are? The infrastructures for financial inclusion exist primarily to answer this one question. Identification is a prerequisite for inclusion into a financial system that grants credit and processes transactions that are essential for day-to-day activities. But identification is complex; financial inclusion would certainly not be a global challenge if it could be done easily. The evidence for this is that, despite the growing power of finance and the agility of digital technology, over one billion individuals, mostly from the poorest households, remain disconnected from their own national financial systems (World Bank, 2021).

Advances in digital technology have made it easier for many individuals to access the financial system to make payments, to borrow, and to lend. The scale of these transactions has meant that many large financial institutions have gained immense influence and global power since the late 1990s. Nevertheless, financial access has been elusive for the most marginalized individuals. The Global Findex Database offers

compelling statistics to highlight this point (World Bank, 2021). The four largest developing economies with unbanked individuals are: China (224 million), India (191 million), Pakistan (99 million), and Indonesia (97 million). In each of these countries, over half of the unbanked are women. And globally, about one-third of the unbanked are young people; between the ages of fifteen and twenty-four.

Financial inclusion has thus not been pervasive enough to close the gap in access to banking services between what the World Bank categorizes as high-income and low-income countries (Demirgüç-Kunt, 2018). Data from the Global Findex Database shows that, on average, in high-income countries 90% of individuals have bank accounts, relative to under 30% in low-income countries (Demirgüç-Kunt, 2018).

And even when and where financial access is available, its ostensible benefits have been challenged (see Duvendack et al., 2011). Critical scholars have repeatedly highlighted how new digital strategies and technologies, commonly known as fintech, have strengthened the role of global finance

in poor countries. These perspectives build on earlier critiques of strategies such as microcredit and microfinance, which note how these practices are counterproductive and reproduce inequalities (e.g., Roy, 2010; Soederberg, 2014; Mader, 2015).

A more recent set of studies explores the phenomenon of ‘digital financialization’, which shows how the monetization of data widens inequalities because the most marginalized groups are compelled to relinquish the most privacy to access the financial system (Jain and Gabor, 2020). These concerns have become more meaningful as fintech infrastructures in many countries have become foundational to governance – specifically, e-governance – through the provision of digital identity. As examples from India and Pakistan – of Aadhaar and NADRA (National Database and Registration Authority) respectively – illustrate, financial access has become one part of a narrative that also includes digital welfare. For these two countries, the melding of financial access and digital welfare entailed the absorption of policies from global development discourses, particularly to assemble collaborations between private and public organizations to expand into what has been described as the ‘informal economy’; an undocumented space which is regularly problematized by development practitioners for low tax contributions, weak productivity, limited access to finance, and social protections (see Alter Chen, 2005).

As I show later in this chapter, perhaps the most striking aspect about efforts to incorporate this informal economy into the financial mainstream has been an emphasis on payment systems. These have expanded as new financial infrastructures, seeking to advance financial inclusion, have driven a shift from traditional over-the-counter methods to transactions that are digital, mobile phone-based, and biometrically verified. These have resulted in a system designed not just for the poor and unbanked, but also the non-poor, who have access to the mainstream banking system. This reflects an emergent consensus driven by the specific features of the financial infrastructure, including actors, objects, and processes (see also Swartz, this volume).

My focus is on how new payments systems serve as infrastructures for financial inclusion on the condition that they are backed by digital identification technologies. I show how these infrastructures for financial inclusion are a product of global and local shifts in development strategies. I use examples from India and Pakistan to show how these infrastructures have their roots in the KYC or know-your-customer requirement that policymakers sought to address through biometric databases. Thus, a core argument of this chapter is that tools initially intended to enhance financial access eventually became foundational to the broader issue of social policy, which in developing countries is increasingly organized through the concept of a digital welfare state (see Alston, 2019). As such, I observe how the repurposing of technology has consequences that are often unplanned, highlighting a tension between chance outcomes and the purported linearity of techno-determinism.

The remainder of the chapter is organized as follows: Section 2 is a discussion on the international context of KYC requirements, showing how digital financial infrastructures see these obligations as the core challenge for financial access. Section 3 offers the specific local contexts of biometric databases in India and Pakistan respectively. Section 4 examines how initiatives to use biometric data to overcome KYC requirements have tended to rely on partnerships between multilateral agencies, governments, private financial institutions, and philanthropic foundations. Section 5 notes how the infrastructures for financial inclusion have elicited state support as exemplified by the respective instances of active support from the central banks in India and Pakistan. Section 6 concludes.

2 KYC: An International Agenda

The financial inclusion movement has repeatedly highlighted how KYC requirements are an impediment to financial access because poor people often lack identification documents (for an overview see Jafri, 2023). This problem underpins the case for such

individuals to be given a digital identity as part of various development strategies.

As such, one of the key promises of fintech has been that digital identification will enhance development interventions. Fintech firms are increasingly collaborating with financial institutions, development organizations, platform technology companies, and philanthropic foundations to enhance access to the financial system through digital identity databases. Not only has a business model of data mining and data monetizing proven immensely successful but, as Gabor and Brooks (2017) observe, development practice has been shaped by behaviouralism based on big-data analysis and accumulation.

Digital identification has thus become central to digital financial transactions. Most of these transactions are what is known as G2P or government-to-person payments. The digitization of these transactions is a key facet of e-governance and underpins what has been described as a digital welfare state, characterized by the increasing uptake of digital data and technologies in welfare design, partnerships, administrative processes, and service provision (Alston, 2019; Van Zoonen, 2020). The World Bank is a vocal supporter of this approach, which is seen as a comprehensive strategy to improve financial inclusion, women's economic empowerment, and government fiscal savings (World Bank, 2023). Aside from forming the infrastructure for governance and welfare in poor countries, digital financial transactions are a favoured strategy of the World Bank and its affiliated institutions (e.g., CGAP, 2023; ID4D, 2023) because they are cost-effective, growth friendly, business friendly, and inclusive.

There is also an important narrative around how digital transactions restrict corruption, terror finance, human and drug trafficking, and tax avoidance and evasion (see Campbell-Verduyn, Rodima-Taylor, and Hütten, 2021). This has become persuasive since the turn of the century, immediately prior to which, in the 1980s, growing concerns about money laundering and the war on drugs – and eventually also nuclear proliferation – created the impetus for what became

guidelines to address AML/CFT, that is, anti-money laundering and countering the financing of terrorism (Amicelle, 2017).

These guidelines are centred on KYC processes to establish a customer's identity and identify risk factors for fraud and other financial crimes. The origins of KYC are in the USA Patriot Act, officially known as the Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism Act 2001. This legislation was enacted by President George W. Bush on 26 October 2001, shortly after the attacks in New York on 11 September. A quick and forceful response to the terrorist events, this legislation had – and continues to have – a profound impact on financial institutions worldwide.

The main components of KYC emerge from the AML rules of the Patriot Act. These include the customer identification programme (CIP), customer due diligence (CDD), and enhanced due diligence (EDD). The Act mandated the implementation of CIPs for new customers in specific financial institutions. Additionally, it specified EDD requirements for correspondent banking and private banking customers, particularly those who were non-US individuals. These measures expanded on existing AML legislation in the United States and imposed new obligations regarding CDD procedures for private banking and correspondent bank accounts involving non-US individuals. The Patriot Act thus encompassed various special measures, promoted cooperative AML efforts, prohibited unlicensed money transmitters, and established significant extraterritorial powers. These requirements significantly impacted the landscape of AML and CFT, both domestically and internationally (see FinCen, 2023).

A related event is the October 2001 meeting of the G10 central banks and other supervisory authorities on terror financing, where it was noted that – to prevent abuse of the financial system – it was necessary to develop and implement effective KYC and CDD procedures (Bantekas, 2003). These events also underlie the transformation of the organization known as FATF or the Financial Action

Task Force on Money Laundering. Formed in 1989 by the G7 with the goal to combat money laundering from drugs crimes, until 2002 this was simply an intergovernmental body entrusted with the development and promotion of relevant domestic and international policies. However, at an extraordinary plenary held in late 2002, it broadened its mandate to encompass terrorist financing. More recently, FATF has formally acknowledged that financial exclusion is a money-laundering and terrorist-financing risk: this is detailed in its open ended mandate (FATF, 2013).

The FATF mandates that every nation implements effective CDD procedures, which involve authenticating the identity of individuals engaged in financial transactions. In its 'Recommendation 10' on CDD, the FATF provides a set of guidelines that encompass various obligations, such as 'identifying the customer and validating their identity through trustworthy, unbiased source documents, data, or information' (FATF, 2013).

Because FATF rules necessitate the use of considerable documentation and rigid procedures to verify the identity of clients, they limit financial access. World Bank data shows that tedious documentation requirements are the reason – reported by 17% of adults – for not having a formal bank account (see Allen et al., 2012). To address this, banking regulators in some countries have sought to offer simplified accounts. These 'no-frills' accounts are suited to FATF guidelines because they limit transaction frequency and quantities; they thus allow the issuing bank to take a risk-based or 'proportional' approach to KYC, which assumes that the risk from low-value transactions is inconsistent with the need for onerous documentation (FATF, 2013).

FATF guidelines thus have a tyrannical influence on financial infrastructure. Infrastructural actors, particularly banks and financial institutions in the Global South, have little choice but to comply with this international regime. The geopolitical salience of this, especially Western-centric conceptualizations of identity documentation, is explained by de Goede and Westermeier (this volume).¹

3 The Global Project for Digital Identity: Features and Critiques

The demands of the FATF constrain financial inclusion and the response from global institutions has caused the infrastructural gaze of finance to rest on identity verification. As a result, the agenda for digital financial access is now a globalized one, and a product of initiatives guided by two respective institutions: Consultative Group to Assist the Poor (CGAP) and Identification for Development (ID4D).² Both these institutions are led by the World Bank, using a partnership model that involves philanthropic and development organizations. This model is based on a consensus drawn from three assumptions about the benefits of financial inclusion: (1) financial inclusion initiatives are a part of the commercial and retail banking system; (2) financial inclusion advances social policy, specifically through digital welfare; and (3) financial inclusion counters money laundering and terror finance. An overarching theme is that the lack of digital identification impedes not only financial inclusion but development more broadly.

The CGAP and the ID4D initiative have an overlapping history. CGAP was launched in the 1990s as 'a multi-donor effort to broaden and deepen the success of the work done by pioneer institutions' in microfinance (CGAP, 1998). Eventually, as the financial access agenda expanded, the CGAP established itself as the leading think tank for knowledge, particularly 'best practice' on financial inclusion; Roy (2010) and Mader (2015) offer critical commentaries on this process.

This success of the CGAP drove the creation of another World Bank project: the ID4D initiative, which frames digital identification technologies as having transformative potential for poor countries. This initiative acknowledges that individuals who lack birth registration and official forms of identification are typically the most vulnerable people in the poorest countries (ID4D, 2023). The World Bank's access to global knowledge and expertise, financial

instruments, and private sector networks are salient features of an approach which seeks to establish digital identification systems for the delivery of basic services to the poor.

At the core of this strategy is the ID4D Multi-Donor Trust Fund, which was established in 2016 and is supported by several organizations including the Bill & Melinda Gates Foundation, Omidyar Network, and the Australian Government (ID4D, 2020). Digital identification technology has thus gained a reputation as the leading edge of technology for development and builds on earlier narratives around the transformative potential of access and connectivity. These perspectives are fuelled by copious examples of development interventions based on digital technology.

3.1 Consensus on e-Governance

Perhaps the best-known example of digital approaches to development is that of 'e-governance' to automate day-to-day government activities (see Dattani, 2020). Walsham (2017) observes how the use of ICTs in development, since the mid-2000s, is now in a 'proliferation' phase, spurred by an explosion in mobile phone usage. As Heeks (2010) notes, contemporary strategies for development and poverty reduction are engrossed with mobile phones and particularly their role in supporting collaborations with private businesses.

The SDGs or Sustainable Development Goals of 2030 capture this fixation. For instance, not only are mobile phones described as 'enablers' for all seventeen SDGs, they are also seen as central to the delivery of these goals (WEF, 2018). This has provided the rationale for a stream of financial technologies or fintech that combine profitability with social goals – a double bottom line – and are funded by both the public and the private sectors. The push for digital financial access comes from three multilateral agendas for global development: these include information and communications technology for development, financing for development, and, more recently, the ID4D initiative.

Across these agendas there is consensus on three points: (1) that information and communications technology are key tools for financial access and therefore development; (2) that development initiatives need private sector funding; and (3) that this is encapsulated in the United Nations (UN) SDGs for 2030, particularly Goal 16.9: 'to provide legal identity for all, including birth registration' (UN, 2020). Because identification is 'also a key enabler of many other SDG goals and targets' including financial and economic inclusion, this particular target has attracted the support of international organizations such as the World Bank, corporate donors, and large philanthropic foundations (see World Bank, 2020).

Essentially, the purpose of a digital identity is simply to formalize the individualization of access to computer networks (see Kiennert, Bouzeffane, and Thoniell, 2015). But as instances grow of digital financial transactions replacing those based on physical cash, the scope for the use – and misuse and abuse – of digital identity has multiplied. In critical studies of finance in the Global North, these tendencies are revealed in practices such as algorithmic credit scoring; these have been shown to drive financial exclusion but also financial subjectivity (e.g., Leyshon and Thrift, 1999; Kear, 2013). More recent work on digital transformation in the Anglosphere and in European countries draws attention to how platforms and financial infrastructures produce – and are also produced by – new collaborations and competitions between the financial and tech industries (Langley and Leyshon, 2020; Westermeier, 2020).

4 Digital Identity Projects

Scholars of the Global South have expressed heavy scepticism about the intrusive nature of digital financial inclusion and the practice of alternative data capture to expand financial markets (Aitken, 2017; Gabor and Brooks, 2017; Bernards, 2019). These concerns are amplified as these practices have become centred on digital data, including

biometrics and locational data. By relying on the hardware and software of personal mobile phones, fintech is utilized through 'platforms'. Platforms enable payments to be made electronically for various services and goods. As Roitman (this volume) shows, platforms have had great success in advancing alternative modes of banking: this is reflected in the success of mobile money in several – African and South Asian – countries, and in the profitability of many various online platforms, including for e-commerce, food delivery, taxis, and so on. As such, digital finance is now at the cutting edge of development interventions centred on technology.

For example, one of the Sustainable Development Goals is reducing hunger. Digital finance contributes to this goal by giving farmers financial tools to cope with income variations and smooth consumption between harvests. Another example is the climate change and clean energy goal. Digital payments make it possible for households to use pay-as-you-go methods for solar panels and other clean technologies. (McKinsey, 2016, p. 11)

Because of these shifts – in technology and in development strategy – digital finance has augmented the need for digital identification. But, digital finance can only be used by those who are financially included.

The notion that financial access is elusive for those who lack official identification documents is a recurrent theme in financial inclusion scholarship. For many years the fix for this was to offer alternative products to enhance financial access (see Collins et al., 2009). Financial access itself has undergone a series of conceptual shifts, as microcredit gave way to microfinance, and microfinance gave way to the more nebulous terminology of financial inclusion and inclusive finance, which includes digital finance. A detailed discussion of these transformations takes place within Natile's (2020) study of mobile money in Kenya.

These shifts have drawn attention to strong overlaps between those who are financially excluded or unbanked and those who lack identification documents. The World Bank reports that 1.7 billion people

are without financial access (World Bank, 2021). Furthermore, an estimated 1.5 billion persons globally have no form of identification; mostly in the Global South, and often migrants and refugees (ID4D, 2016). Identification projects, which have sought to issue documents to prove citizenship and entitlements to public goods and services, precede digital identity databases. But digital finance requires that identification data should be digital. As such, in contemporary development practice, identification documents are seen as complementary to digital finance, and projects to increase access to identification documents are attached to initiatives for financial access.

As a development tool, digital finance has two primary utilities: (1) as mobile money and (2) for G2P payments. Mobile money does not, in theory, require digital identification to operate, but there is increasing regulatory pressure to link mobile money with digital identification, as FATF recommendations have become embedded in domestic banking regulations.

The other use of digital finance in development strategies is for G2P payments. These include social transfers – including conditional cash transfers – as well as wage and pension payments. The advantages of digitizing G2P payments are covered in CGAP (2009): they include improvement in financial inclusion by connecting recipients to branchless banking channels, but also reductions in government costs by streamlining transactions, and decreases in leakages through theft, fraud, and corruption. Recent analyses by organizations such as the World Bank (2018) and the UN (2020) find that 'the identity gap' (Beduschi, 2019, p. 2) sizeably impedes access to basic healthcare, education services, and social safety nets. To address this, development interventions led by international organizations have been actively assisting states in expanding digital identity. These efforts have been targeted at domestic as well as refugee populations with the support of organizations such as the World Bank, the Asian Development Bank, and the United Nations High Commissioner for Refugees (see Beduschi, 2019).

4.1 Digital Intrusions

But even beyond basic healthcare and education service, critical scholars have raised concerns about the increasing use of fintech to disburse refugee assistance. For instance, Bhagat and Roderick (2020) show that fintech designed for refugees living in camps and informal settlements in Kenya facilitates racial forms of capital accumulation and expropriation. This occurs because institutions in the Global North, including Mastercard, Safaricom, and Western Union determine who is included and excluded from various forms of monetary assistance, including credit (Bhagat and Roderick, 2020). These examples of international development through fintech connect patterns of individual mobile phone usage and the digitization of social transfers by the state with the business models of private technology companies and financial institutions (see Gabor and Brooks, 2017).

For some scholars this is evidence of a need to review how financialization operates in the Global South (e.g., Aitken, 2017; Jain and Gabor, 2020). For instance, Aitken (2017) shows how new practices attached to financial inclusion projects are data-gathering exercises to identify and extract value from those without formal credit scores in contemporary financial markets. Jain and Gabor (2020) use examples of recent events in India – particularly demonetization and the Unified Payments Interface – to show ‘digital’ financialization is distinct from ‘analogue’ financialization; whereas the latter is driven by financial deregulation, financial innovation, and financial globalization, the former is advanced through innovations in digital infrastructures and by supportive and proactive governance. To some extent, such analyses imply that fintech – particularly for poor countries – is simply the new face of financialization. Digital identities play a crucial role in this form of financialization by widening the client base for financial institutions; this is done through increasing the number of those who can use the financial system. Digital identities also deepen the client base by using

differential rates and pricing for financial services (see Mader, 2016). These perspectives see digital financialization as a form of what Zuboff (2019) calls ‘surveillance capitalism’, a system in which firms grow by collecting and monetizing data for profit. In this perspective, large financial institutions and technology companies are responsible for imposing their policies and practices in poor countries.

The shortcoming of this view is there is only limited acknowledgement of the security imperative that is imposed primarily by rich countries on poor countries through the FATF. These concerns are reflected in the growing identification literature on developing countries. The issue of digital surveillance – which operates through identification data, including biometrics and government-issued documents – is a problem from the lens of human rights, particularly the right of individuals to privacy. These challenges are covered in the work of legal scholars (e.g., Beduschi, 2019) and in the grey literature of international and national non-profit organizations such as Privacy International (2019) and the Center of Information Technology Research in the Interest of Society (CITRIS) (UCSC Institute for Social Transformation, 2024; Nonnecke, Ruhrmann, and Geroski, 2019). A common concern in these perspectives is that the increasing use and expansion of digital national identity databases – spurred by SDG focus on legal identity – can be abused in surveillance. Digital identity systems can advance but also limit civil and political rights within the areas of data protection, political participation, and the inclusion of diverse ethnic identities (Nonnecke, Ruhrmann, and Geroski, 2019; Privacy International, 2019, 2020). A related concern is about the role and implications of public–private collaborations, particularly when data privacy and protection laws have uneven effects.

4.2 Surveillance, Power, and State Capacity

The global project for digital identity is thus a product of various power relations involved in the construction of financial

infrastructures. Global organizations, particularly the CGAP and ID4D, thus frame issues of development as gaps in Global South financial infrastructures. This includes building narratives about digital identity as a prerequisite for secure and reliable payments and settlement systems which are fully dependent on mobile telephones and internet connectivity. By widening the avenues for surveillance, this infrastructural gaze advances a form of governance which is similar to what Mamdani (2012, p. 1) describes as ‘define and rule’; an approach centred on the definition and management of difference. This has tended to not only enhance the capacity of the state through e-governance, including digital welfare, but also the power of the private sector. This is explained in the following section, which draws attention to the pivotal role of public–private partnerships in the design and deployment of financial infrastructures.³

4.3 Public–Private Partnerships for Financial Infrastructures: Examples from India and Pakistan

Public–private partnerships have been at the core of financial inclusion infrastructures for both India and Pakistan. In India’s case, the most prominent success of this approach is reflected in the India Stack, or more generally in the financial infrastructure known as the stack model (see also Singh, this volume).

A stack is the foundation of any digital application and combines fintech-led development strategies with the security imperatives of governments. Bratton (2016, p. 5) describes this as an accidental megastructure that is not only a computational apparatus but also an architecture of governance.

Essentially a combination of projects, a stack is created by linking the technologies required to operate an application: this includes computer languages, architecture, libraries or lexicons, servers, user interfaces and experiences, software, and databases. These utilize applied programming interfaces (APIs), a set of algorithms and code that allow different platforms to ‘speak’ to

each other. APIs can thus be accessed by any private or public player through protocols.

4.4 India Stack and the Agency of Infrastructure

The ‘India Stack’ is described as a ‘set of APIs that allows governments, businesses, start-ups, and developers to utilize a unique digital infrastructure to solve India’s hard problems towards presence-less, paperless, and cashless service delivery’ (India Stack, 2019). In India’s case, the model allows third-party private developers to use the Aadhaar database for customer authentication and verification. This has created an infrastructure primarily geared towards fintech because it facilitates access to data based on biometrics and identification documents. It also exemplifies how the initial design of, and subsequent updates to, protocols can impact other infrastructures (see Campbell-Verduyn and Hütten, 2023).

The success of the India Stack is almost completely dependent on the Aadhaar system. This is managed by the Unique Identification Authority of India (UIDAI), which was established in 2009. The objective of this organization is to issue ‘Aadhaar’ or unique identification numbers (UIDs) to adult citizens, or residents, of India. From its inception in 2010, the Aadhaar project was framed as centred on welfare, with identity and inclusion as twin objectives. In this narrative, welfare in the form of social support programmes had been hampered by corruption from ‘middlemen’; Aadhaar would overcome this problem by removing the middlemen and facilitating a shift to cash transfers, as ‘in kind’ programmes were prone to corruption (Khera, 2019). Aadhaar has been advantageous for the financial sector, particularly for fintechs, since India’s central bank, the Reserve Bank of India, allowed banks to accept Aadhaar as proof of identity for opening bank accounts to support financial inclusion. Aadhaar has slashed KYC costs for banks: financial institutions can conduct ‘eKYC’ checks at 15% of the cost of a non-digital KYC (PwC, 2018).

The financial sector in India has also been a massive beneficiary of the digital ecosystem that has erupted from the infamous demonetization drive in India. Those holding cash were pushed to deposit this in the financial system when the Modi government removed the largest banknotes – 86% of currency by value – from circulation (Jain and Gabor, 2020). Particularly controversial is the role of ‘iSpirit’, or the Indian Software Product Industry Roundtable, which has taken to coordinating the India Stack and hence the digital ecosystem centred around Aadhaar. This is organized as a not-for-profit think tank, staffed mostly by individuals, sometimes described as volunteers from the tech world, who dedicate their time, energy, and expertise towards India’s hard problems (Dattani, 2024). An interest group formed by influential individuals and technology firms, iSpirit has been scrutinized for lobbying for data localization, for special access to central bank policies, and for hiring individuals who have left government roles to assume private ones, allegedly to profit from Aadhaar-related businesses (Quartz, 2019). Dattani (2020) has described these alleged transgressions as ‘governpreneurism’, noting that the Aadhaar database provides a digital framework for private companies to authenticate identities and deliver additional paid services including financial services. The availability of data, combined with a revolving door for individuals alternating between government and corporate employment, suggests an underlying objective shared by Aadhaar and the India Stack: promoting success for corporate entities and the financial technology industry (Dattani, 2020).

4.5 *Biometric Governance in Pakistan*

Across the border in Pakistan, biometric data also plays a pivotal role in shaping financial inclusion infrastructures. The NADRA repository has for several decades been a core part of the KYC process in Pakistan. This database contains the biometric data and other personal information of Pakistani residents and citizens. As such, in Pakistan, as in India, national identity numbers – issued

by NADRA – can be used to verify identities and thus to conduct eKYC checks.

NADRA has been recognized as a global leader in the application of identification systems and technology to a range of development issues (Malik, 2014). The main objective of this institution, since its inception in 2000, is to issue computerized national identity cards, or CNICs, with a unique thirteen-digit number, to Pakistanis aged eighteen and over. The CNIC is a requirement for conducting transactions of various types with the government as well as the private sector. For instance, voting in elections; applying for a passport or driving licence; purchasing vehicles, land, and other assets; purchasing a plane or train ticket; obtaining a mobile phone SIM card; opening and maintaining a bank account; and conducting financial transactions.

It is estimated that as much as 98% of Pakistan’s adult population is registered with NADRA (Malik, 2014), and most national identity cards are also linked to a phone number (PTA, 2024). Following an anti-terror drive in early 2015, the Pakistan Telecommunication Authority proceeded to block all mobile phone SIMs that had not been biometrically verified (Craig and Hussain, 2015). As a result, every mobile phone number in Pakistan is now associated not only with a CNIC number but also with a set of fingerprints. This has facilitated Pakistan’s commitment to FATF standards as biometric verification eases CDD requirements.

4.6 *The Phone–Fingerprint Nexus*

The affixation of biometric identity to mobile telephone SIMs has eased the roll-out of payment gateways that are alternatives to private-sector interbank networks, which have dominated e-payments since digital transactions first began. India’s JAM Trinity – Jan Dhan, Aadhaar, and Mobile – is a core part of India’s financial infrastructure for inclusion, particularly when coupled with the UPI or Universal Payments Interface, a real-time payment system developed by the National Payments Corporation of India (NPCI).⁴ This allows

for instant money transfers between banks through mobile devices with the help of the UPI app, which uses biometric verification via the Aadhaar database.

The JAM Trinity thus strengthens the foundation for UPI transactions by ensuring a broad base of individuals with bank accounts, secure and reliable digital and biometric authentication, and mobile phones as a widespread means of access. The success of this approach is also heavily due to the NPCI, a not-for-profit organization founded in 2009 to manage India's retail payment systems. NPCI owns the UPI and worked closely with iSpirit – the public-private consortium – to define and develop UPI. By operating like a utility where earnings are reinvested into operations instead of being returned to shareholders, and by not having to pay taxes, the NPCI was able to offer low rates – relative to international card schemes such as Visa and Mastercard – for its switching services. This made competitors drop their prices (Cook and Raman, 2019). A switching service is a system or platform that facilitates the routing of payment transactions between different parties in the financial ecosystem. When a cardholder makes a purchase or performs a financial transaction, the payment needs to be processed and authorized by various entities, including the cardholder's bank or the issuing bank, the merchant's bank or the acquiring bank, and payment networks. A key accomplishment of UPI is that it is being used by over 160 banks in India; these banks cover up to 95% of the country's banking customers; the small banks that have not yet joined UPI have refrained mainly because of limited technical capabilities (Cook and Raman, 2019).

In Pakistan, a similar initiative to promote a low-cost or free instant payments system is known as Raast. Launched by the central bank or SBP (State Bank of Pakistan) in 2021, this forms a fundamental part of the National Financial Inclusion Strategy. By decreasing dependence on cash, this initiative seeks to encourage the adoption of digital payments, particularly among low-income households and small-scale merchants. Though launched and operated by

the central bank, the development of Raast was supported by Karandaaz, a not-for-profit special purpose vehicle that is grant funded by the UK's Foreign, Commonwealth and Development Office and the Bill & Melinda Gates Foundation (Karandaaz, 2023).

Transaction numbers for both systems, India's UPI (Cook and Raman, 2019) and Pakistan's Raast (SBP, 2023), show that they are respectively being used widely by individuals, commercial/retail banks, and microfinance institutions. As such, these initiatives have been successful. But this success would not have been possible if the central banks pushing these infrastructures had taken a less activist approach towards promoting new technologies for financial inclusion.⁵ In both countries, there was resistance initially from the banks who were reluctant to move away from the privatized fee-earning infrastructures to which they had become accustomed. For example, the Reserve Bank of India offered incentives to bring banks to the table in the formation of NPCI, promoting apps to improve UPI uptake, and offering free access to the Aadhaar database for biometric authentication. The SBP resorted to rerouting transactions so that they would be processed through Raast instead of the privately owned, fee-based, incumbent service provider (Khan, 2023).

5 Discussion: Financial Infrastructures, Inclusion, and Access

Explicit and active support from the respective central banks in India and Pakistan has been central to the rollout of affordable payment systems. Payments, in contrast to loans and deposits, have gained prominence relative to credit and other financial products since around 2010. This is partially an outcome of the Global Financial Crisis 2007–2009, after which it became clear that microfinance is no less crisis-prone than other sources of finance (see Di Bella, 2011; Wagner and Winkler, 2013). The relatively recent importance attached to payments and payments system has been a

notable outcome of the discursive shift from microcredit to microfinance to financial inclusion (see Mader and Sabrow, 2015). Financial inclusion encompasses an extensive array of services, particularly mobile money, remittances, and even government payments; these go beyond the traditional realms of microfinance, such as credit, savings, and insurance.

In taking a proactive approach to advancing financial inclusion, both central banks – the Reserve Bank of India and the State Bank of Pakistan – have benefited from high rates of cash usage and low rates of payment card usage. As D'Silva et al. (2019) note, existing frameworks could expand from the modernization of financial infrastructures. For the payment cards – debit and credit – that were in usage, the domestic banks used systems that were not interoperable; furthermore, users could not integrate their payments across systems. For example, sending money from an account at one bank to an account at another bank could take up to two calendar days, if sent after a cut-off time, and even longer over weekends or holidays.

Perhaps the most interesting feature of these new payment infrastructures is that the turn to digital biometrically verified transactions brings financial inclusion to the mainstream, rather than constraining it to specific, purposively designed microfinance institutions. This emphasis on payment systems is a departure from approaches centred on poverty finance (Bernards, 2022), or a bifurcated system defined by mainstream commercial banks based on a traditional bank intermediation model on the one hand, and inclusive finance based on a disintermediated, or shadow banking model, on the other (Jafri, 2023). Not only are the new payment systems designed to be used by consumers through mobile phones, they are also the same whether used through a commercial/retail bank or microfinance bank. In making this possible, these central banks – and others which promote digital payment systems – acknowledge that financial access can be improved not only for the poor but for more affluent users as well, especially by linking the two. There are concerns,

however, about inequities arising from unevenness in digital literacy and also from gendered patterns of mobile phone ownership (GSMA, 2021).

6 Conclusion

In this chapter I have explored how an infrastructural gaze on financial inclusion has caused national payment and identification systems to be enlisted in a global project that foregrounds the role of data in development. This project has the support of global institutions and sets out to create financial infrastructures that respond to socio-economic and political realities.

The need for these financial infrastructures is motivated in part by an international security agenda with KYC requirements at its core. These obligations are the core challenge for financial access. In India and Pakistan, biometric databases have been incorporated into financial infrastructures to ease bank access while complying with rules to limit money laundering and terror finance. As such, initiatives to use biometric data to overcome KYC requirements have tended to rely on partnerships between multilateral agencies, governments, private financial institutions, and philanthropic foundations.

Through these partnerships the respective central banks of India and Pakistan have created new payment infrastructures to advance digital biometrically verified transactions. The success of these infrastructures is that they have pushed financial inclusion into the mainstream of banking rather than limiting it to specialized microfinance institutions. This represents a departure from poverty-finance approaches or a bifurcated system. As such, central banks recognize that improving financial access benefits not only the poor but also more affluent users, particularly when the two become infrastructurally connected. However, concerns remain regarding disparities in digital literacy and gendered patterns of mobile phone ownership, which can contribute to inequities in access and surveillance.

The macro and micro-level aspects of this infrastructural gaze illuminate wider questions of power given the way in which financial infrastructures are not only designed and deployed, but also imposed. On the macro-level, the role of the FATF and the governance of financial transactions cannot be understated. While there is a rich and growing literature on the detriments of this for many countries in the Global South, it has tended to focus on the geopolitical constraints that come from the FATF regime. An infrastructural gaze is useful for highlighting how the strategies to address these constraints – often framed in the language of development – have shaped the wider financial system. Similarly, there are micro-level implications too, particularly the tension between the public and private actors. As the examples in this chapter show, shifts in the wider financial system – whereby financial access becomes a product of public infrastructure – have been driven by the support of private and philanthropic institutions, which have endorsed a model in which user costs are either low or non-existent. How viable this is depends on how the role of financial infrastructures is perceived in the future.

Notes

1. Sial, Jafri, and Khaliq (2023) show how the repeated targeting of financial infrastructure, particularly through the weaponization of the US dollar including through sanctions, has had devastating and lasting effects in Pakistan and Afghanistan.
2. Other institutions, including the World Economic Forum and the GSMA (Groupe Spécial Mobile Association), have also been active in this agenda.
3. A related perspective on this type of liaison is Dattani's (2020) concept of 'goventreprerpreunermism', where private sector professionals play a leading role in Aadhaar and India Stack, which are promoted as public services.
4. 'Jan Dhan' refers to the Pradhan Mantri Jan Dhan Yojana (PMJDY), a financial inclusion programme launched by the Government of India in August 2014. The term 'Jan Dhan' literally translates to 'People's Wealth' or 'People's Treasury' in Hindi. The primary objective of the Jan Dhan Yojana is to ensure access to financial services for all households in India, especially those who were previously excluded from the formal banking sector (PMJDY 2023).
5. The central banks of India and Pakistan are, respectively, the Reserve Bank of India and the SBP.

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A Short Infrastructural History of Currency Digitalization in the People's Republic of China, 2000s–2020s

Tim Salzer

1 The Digital Yuan: A History of Multiple Layers and Scales

In January 2016, during an international financial conference, officials of the People's Bank of China (PBoC) publicly announced that the Bank was working on developing a digital version of the renminbi (RMB) (Diyi Caijing Ribao 第一财经日报, 2016).¹ As representatives of the Bank explained, work on the project had already begun in 2014, when the Bank set up its own digital currency task force in response to the multiplication of privately issued cryptocurrencies at the time. The task force was given the mission to examine the possible benefits accruing from the development of a digital currency backed by the Chinese state. Since this initial statement in 2016, the Chinese digital currency, even though still in its pilot phase at the end of 2023, has elicited a wealth of journalistic as well as scholarly commentary. Thus, in the specialized financial press, the digital yuan (e-CNY) has dominated discussions surrounding central bank-issued digital currencies (see Figure 29.1). Furthermore, several books have been published that are targeted

toward a nonexpert readership and devote much space to discussions of the Chinese digital currency (Turrin, 2021; Aglietta, Bai, and Macaire, 2022; Chorzempa, 2022).

Arguably, this heightened degree of attention to the seemingly dull topic of payment systems reform (cf. Swartz and Westermeier, 2023) – of which the introduction of digital currencies is a part – stems from the weaponization of international financial infrastructures since the turn of the millennium. Thus, over the 2000s and 2010s, the payment infrastructures underpinning the global economy, which in less turbulent times operated quietly in the background, have come to the center of attention in policymaking and journalistic circles, due to their repeated instrumentalization for the enforcement and perpetuation of Western and especially American sanctions policies (de Goede, 2012; de Goede and Westermeier, 2022; Mallard and Sun, 2022; Nölke, 2022). Hence, payment systems reform has suddenly come to be perceived as an issue with clear geopolitical implications and thus as a topic which is relevant to a much broader public beyond financial industry professionals.

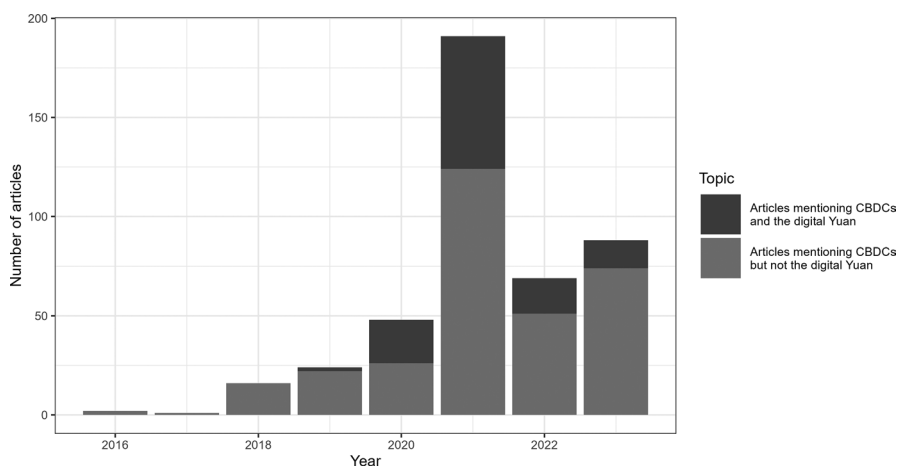


Figure 29.1 *Financial Times* articles mentioning CBDCs and the digital yuan, 2016–2023.

Source: Author's elaboration based on data obtained from Europresse on December 1, 2023; frequencies include the *Financial Times*' paper and online editions as well as blog entries. Search string: "digital yuan," "dcep," "dc/ep," "digital RMB," "digital Renminbi," "Central Bank Digital Currency," "Central Bank Digital Currencies," "CBDC," "CBDCs," "Central Bank Cryptocurrency," "Central Bank Cryptocurrencies."

To some extent, the current geopolitical context has also affected the scholarly debate surrounding the digital yuan. Indeed, research in this field has at times strong strategic and conjectural undertones. This is apparent first of all in the fact that the current social scientific debate revolves crucially around the issue of the probable *future* consequences of the digitalization of the Chinese currency (Gruin, 2021; Huang and Mayer, 2022; Deng, 2023; Peruffo, Cunha, and Haines, 2023). As a side effect, there is so far no single study about the currency's historical origins, besides the People's Bank's own official account. Second, research about the digital yuan has tended to analyze the digital currency from the point of view of Western countries, questioning in particular the currency's possible implications for the future of dollar hegemony (Zhang, Cui, and Campbell-Verduyn, 2023). By contrast, the repercussions of the digital yuan within the People's Republic of China (PRC) and its immediate geographical vicinity have received much less critical scrutiny. The present chapter aims to fill this gap in the literature by providing a somewhat longer history of currency digitalization in the PRC, of which the work on the digital yuan represents only the current endpoint. In this endeavor, this chapter draws on

a variety of public statements by the People's Bank as well as a selection of newspaper articles on financial reform in Chinese media.²

Following Westermeier, Campbell-Verduyn, and Brandl (this volume), we adopt the *infrastructural gaze* and bring the history of the digital yuan into a broader conversation with scholarship concerned with large technical systems in different societal and historical contexts. There are two benefits gained from using "infrastructure" as a sensitizing concept in the study of currency digitalization in the PRC. First of all, existing scholarship concerned with the history of large technical systems such as the Chinese digital payments infrastructure provides us with a set of assumptions concerning the mechanisms through which infrastructural change occurs. Specifically, this strand of scholarship suggests that new large technical systems are rarely ever built from scratch. Rather, new infrastructures often depend in crucial ways on existing technical systems. Thus, infrastructural change frequently operates through a mechanism which is sometimes called *layering*. Layering refers to the construction of new sociotechnical entities on top of already existing ones and to the reassembling of existing sociotechnical entities in novel ways. We will show that layering adequately

describes several aspects of the development of a state-backed currency in the PRC.

The second advantage of exploring currency digitalization in the PRC through the infrastructural gaze is that it directs our attention toward the interplay between sociotechnical systems across multiple geographical scales (Bernards and Campbell-Verduyn, 2019, pp. 779–780; Zhang, Cui, and Campbell-Verduyn, 2023). Thus, at the level of the PRC, the digital yuan amounts to a network of several distinct sociotechnical entities, while at the level of the global economy the digital yuan is itself a node in an emerging network linking several payment spaces to one another. As we will show, this means that the objective socioeconomic function of the e-CNY depends, crucially, on the evolution of the structure of this emerging transnational network in which the Chinese digital payment infrastructure is embedded.

2 A History of Multiple Layers: The Digital Yuan and End of Finance as We Know It?

As a rule, large-scale technical systems evolve continuously. This change rarely ever occurs as a sudden wholesale replacement of one sociotechnical system by another (Bernards and Campbell-Verduyn, 2019, p. 778). Rather, as infrastructure scholars Edwards, Jackson, Knobl, and Bowker have pointed out, more often than not new infrastructures are constructed on top of existing ones, so that “many infrastructures [...] are themselves deeply embedded within and dependent on other infrastructures” (Jackson et al., 2007). When infrastructural change occurs through such a cumulative process, with one type of technology being added upon another, infrastructure scholars refer to this process as *layering* (e.g., Reilley and Scheytt, 2019). By focusing on the layered character of many sociotechnical systems, scholars can develop some critical distance with respect to assertions from social actors making overly bold claims regarding the “disruptive” socioeconomic impact of certain new technologies (Bernards and Campbell-Verduyn, 2019,

pp. 779–780). Indeed, while the notion *disruption* emphasizes a fundamental discontinuity between new technologies and past social practices and technological systems, the concept of *layering* frames technological change as a path-dependent, incremental and cumulative process (Star, 1999, pp. 381–382; Anand, Gupta, and Appel, 2018, p. 12). *Layering* is an apt metaphor to describe how the history of currency digitalization in the PRC unfolded and, by using it, we can show how a policy proposal that had the inherent potential to completely overhaul the financial system as it exists gradually morphed into an additional layer on top of the current institutional arrangement (Larue, Fontan, and Sandberg, 2020, p. 120; Ortiz, 2021; Mozorov, 2022).

Since the late 1990s, currency digitalization has been a topic of discussion off and on within the Chinese central bank as well as in the broader ecosystem of economic experts involved in the elaboration of financial policy in the PRC. On several occasions, the issue arose in reaction to the development of new products and services by private sector entities which facilitated payment in online retail transactions. Thus, calls for RMB digitalization often went hand in hand with statements underlining the necessity to enlarge the Bank’s purview in the quickly growing online economy, where it might otherwise be marginalized. Around the turn of the millennium, two economists of the People’s Bank, Xie Ping and Yong Lin, published a research paper raising the question of the potential costs and benefits of a publicly issued digital currency (Xie Ping 谢平 and Yin Long 尹龙, 2001). According to the two authors, the question of currency digitalization had become urgent in the wake of the steady increase in commercial transactions taking place on online platforms and due to the fact that the rise of this new internet economy had incentivized private companies to issue their own form of unregulated electronic money, in this case, prepaid cards. These two related changes could potentially weaken the efficiency of the monetary policy instruments in the Bank’s arsenal. Thus, the fundamental issue at stake in the discussion concerned the

future role of the People's Bank in an economic environment which was undergoing structural transformation. The two authors remained skeptical as to whether the central bank should attempt to provide a digital version of its currency for the sprawling internet economy or whether it should simply accept the gradual transformation of its role in a changing economic environment. Ultimately, they argued that an intervention might indeed hinder private sector innovation and would cause regulators to settle for a technologically mediocre solution.

In keeping with this skeptical line of argument, over the following years the People's Bank maintained a relatively lenient stance toward private sector initiative in the realm of digital payments. This was evident with respect to both cryptocurrencies, and bitcoin in particular, and third-party payment providers, such as Alipay and WeChat Pay. Thus, during the early 2010s, thanks to a comparatively tolerant policy toward cryptocurrencies, China grew into the single most important global hub for bitcoin mining and trading. In December 2013, Chinese regulators made a first step toward a tightening of regulations by defining bitcoin as a digital commodity, as opposed to a currency, since it lacked legal tender status (PBoC, 2013). Nevertheless, instead of immediately shutting down bitcoin mining and trading activities on Chinese soil, authorities at first contented themselves with tightening regulations whenever the value of the cryptocurrency suddenly appreciated and the market seemed to overheat (Campbell-Verduyn, 2018, pp. 99–103). Similarly, when several technology companies, most notably Alibaba, developed their own payment services, Chinese regulators did not treat them as financial service providers at first, leaving the sector more or less unregulated (Liu, 2021; Wang, 2021; Chorzempa, 2022).

Toward the middle of the 2010s, against the backdrop of a general shift in regulation of digital finance and cryptocurrencies in the PRC (Wang, 2021; Zhang, Cui, and Campbell-Verduyn, 2023), certain reform-minded policy experts began to advocate for the development of a new nationwide

state-operated payment infrastructure which could support the digital economy. Xie Ping, the coauthor of the 2001 research paper, provided an important impetus to the renewal of these discussions after having played a leading role in the reform of public shareholding (Wang, 2015, p. 616) and having occupied a central position in the largest Chinese sovereign wealth fund. In the early 2010s, Xie coauthored a series of widely cited research articles about the digitalization of financial services in China.³ The steady digitalization of financial services had fundamental implications for the entire economy, leading to the emergence of a new regime of financial intermediation for which they coined the term “internet finance” (互联网金融) (Xie, Zou, and Liu, 2015). Foreign observers rendered the unwieldy “internet finance” simply as “fintech” (Schueffel, 2016). For Xie and his coauthors, however, “internet finance” meant something far more consequential than the mere application of new technological solutions to old problems. Rather, its emergence would amount to nothing less than a complete overhaul of the existing financial system and the consolidation of a new regime of financial intermediation which would ultimately replace the financial industry in its entirety.

Xie and his coauthors framed the rise of internet finance as a process of financial “democratization” and “disintermediation,” since the then-current “elitist” financial system conferred undue power to a small number of professionals who made far-reaching choices on behalf of their customers. In the decades to come, this industry would gradually be replaced by a single state-controlled online platform on which individual citizens could make financial decisions on their own. In their view, all financial transactions, retail as well as wholesale payments and securities transfers, would be realized via this state-operated system without the interference of any further intermediary. Indeed, as they explained, in the internet finance system “individuals and organizations (moral persons) alike will have accounts at the central bank's payment center.” In this institutional configuration, the “system of bank accounts at commercial banking institutions

would cease to exist” (谢平 Xie Ping and 邹传伟 Zou Chuanwei, 2012, p. 13).⁴

The term “internet finance,” as well as the idea that it was necessary to construct new public payment channels in the age of the internet economy, quickly caught on. Thus, between 2014 and 2015, then-Premier Li Keqiang repeatedly endorsed the “healthy development of internet finance” as a priority for public policy (Gruin and Knaack, 2020, p. 380). However, the underlying societal project to do away altogether with the private financial sector did not gain much traction among political elites. Indeed, when the People’s Bank made its first public announcement about the digital currency in 2016, in its broad outline, the project seemed like a realization of Xie’s original proposal: It was a digital retail payment system operating on the ledger of the central bank. However, in contradistinction to Xie’s favored scenario, representatives of the People’s Bank took great care to explain that the new system would not threaten the private banking industry. Thus, in one of the earliest statements about the concrete technical design of the new digital currency in 2016, the Bank’s Vice-Governor Fan Yifei underlined that the digital yuan could in theory be developed single-handedly by the central bank, but that the Bank preferred nevertheless to cooperate with existing financial institutions since this would make implementation easier (范一飞 Fan Yifei, 2016). The first technical blueprint of the payment system was published in 2018 (姚前 Yao Qian, 2018) and confirmed this model in which private corporations and the central bank would work hand in hand, a configuration which came to be known as the two-tier model (二元体系). In this model, private sector entities would function as intermediaries between the central bank and households, purchasing the digital currency from the central bank and then distributing it, not unlike cash.

Not only did the two-tier model not undermine the fundamental role of the private financial industry in the distribution of money, it also did not threaten the economic power of the country’s two corporate

giants in the field of digital payments, Alipay and WeChat Pay. Regarding the latter two, Xie Ping had once advocated a more radical proposal, arguing that the development of a public infrastructure for digital payments should be used as an opportunity to break the duopoly in the field of digital payments (谢平 Xie Ping, 2020). However, as it turned out, both companies quickly came to be associated with the digital yuan project. Thus, both Alipay and WeChat Pay developed functions to allow users of their applications to make payments via the digital yuan platform operated by the People’s Bank. Furthermore, both companies contribute to the technological development of the new infrastructure, with Alipay said to contribute its integrated development environment as well as its distributed database system, OceanBase (Liu, 2021). Hence, whereas some of the early rhetoric surrounding the digital yuan framed currency digitalization as a means to build a new financial mechanism at the heart of the Chinese political economy, the project actually transformed into a supplementary layer in the existing “ecology of money infrastructures” (cf. Rella, 2020).

3 The Varying Scope of the Digital Yuan and the Transnational “Race” to Develop a CBDC

In the history of the modern nation-state, infrastructures have been instrumental in logistically unifying territory (Mann, 1984; Maier, 2012; van Laak, 2018). Yet, as Nick Bernards and Malcolm Campbell-Verduyn (2019) have underlined, the geography of infrastructures rarely overlaps with the spatial patterning of political authority. Infrastructures rarely end at the territorial boundaries of the nation-state because part of their function is to create linkages allowing for all kinds of circulation across political frontiers. Thus, even seemingly “national” infrastructures are frequently embedded in a transnational web of technical systems. The characteristics of this international network, which serves as the

broader context of the infrastructure, determines the utility, function, and reach of the latter in crucial ways. The same holds true for the digital yuan, whose potential socio-political impact has been fundamentally altered by the rise of a transnational central bank digital currency (CBDC) movement in the latter half of the 2010s.

Following the People's Bank's first public statement about RMB digitalization in 2016, the project received a great deal of attention in the international central banking community and beyond. Among foreign observers, one of the key questions concerning the new Chinese payment infrastructure was how the digital yuan would affect the global balance of geopolitical and geoeconomic power. Especially in the United States, experts and policymakers were quick to interpret the People's Bank's work on the digital currency as a possible threat to dollar hegemony and to frame currency digitalization as a race between the major global economies, which China was then leading due to its early engagement with digital payments (Chorzempa, 2021; Himes et al., 2021). Thus, work on currency digitalization in the PRC came gradually to be perceived as a sign of the country's economic superiority, rather than as a solution to a series of idiosyncratic problems which were specific to the Chinese payments sector.

An important aspect of this process was the rebranding of the digital yuan as a “central bank digital currency” or “CBDC.” In the second half of the 2010s,⁵ and especially in the context of the COVID-19 pandemic, the issue of CBDCs rose to prominence in the world of central banking and financial policy (Ortiz, 2021; Kuehnlenz, Orsi, and Kaltenbrunner, 2023; Swartz and Westermeier, 2023). Several international organizations, such as the Bank for International Settlements (BIS) and the International Monetary Fund (IMF), actively contributed to the promotion of the topic by subsuming a variety of dispersed initiatives undertaken by central banks across the globe under a common label, categorizing them first as “central bank *cryptocurrencies*” (Bech and Garratt,

2017) and then later as “central bank *digital currencies*” (BIS Committee on Payments and Market Infrastructures, 2018). The BIS in particular conducted surveys amongst central bankers about their stance toward CBDCs (Barontini and Holden, 2019; Boar, Holden, and Wadsworth, 2020; Auer et al., 2021; Kosse and Mattei, 2022, 2023), classified existing projects to show commonalities and differences (Auer et al., 2021), drafted scenarios for future implementation (BIS, 2021), and even actively participated in certain experimental projects via its Innovation Hub (BIS Innovation Hub, 2021). Think tanks such as the American Atlantic Council as well as journalistic outlets dedicated to blockchain and cryptocurrencies helped to draw attention to the issue of payment systems reform amongst a greater variety of actors beyond the limited community of central bankers.

While in the late 2010s, it seemed obvious to many commentators that China was leading in the race to develop a CBDC, being “the first major economy” to do so (Kumar and Rosenbach, 2020), there was no clear-cut consensus as to what the Chinese CBDC precisely was. In a widely remarked article first published in 2019, IMF economists Tobias Adrian and Tommaso Mancini-Griffoli (Adrian and Mancini-Griffoli, 2019, 2021) briefly discussed the Chinese model for developing a CBDC. For the authors, the Chinese model did not, however, refer to the retail payment system which the People's Bank had been working on since 2014. Instead, the authors focused on several regulatory changes concerning the third-party payment sector in the PRC. Their brief discussion of the Chinese model of currency digitalization described indeed what both authors termed a “synthetic CBDC.” Such a synthetic CBDC had come into being in the PRC after two related regulatory changes affecting the business model of the two main companies in the Chinese digital payment sector, Alipay and WeChat Pay.

First of all, in 2017, the central bank set up a clearinghouse, NetsUnion, which was in charge of handling all transactions

made via third-party payment applications (Xing, Hei, and Pu, 2018, p. 1221; Ba, 2022, pp. 211–220). The reform was intended to increase the monitoring capacity of the central bank over payments realized via the firm's applications. Before 2017, third-party payment providers such as the two technology giants had usually opened multiple accounts within the existing banking network, between which they moved funds following the transactions made by users. For officials at the People's Bank, this meant that payments made with the applications appeared only as bulk transfers between two different bank accounts belonging to the same payment corporation. When the People's Bank asked the companies for access to more detailed data, in some documented cases they refused (Yang and Liu, 2019; Yu, 2021, 2022). After the establishment of the new clearinghouse, individual transactions made via NetsUnion applications became visible to the central bank.

In June 2018, the legal framework for the two giant payment operators changed in another decisive way, as the People's Bank obliged both Alipay and WeChat Pay to deposit 100% of their customers' funds in their custody into accounts at the central bank, instead of reinvesting them (Carstens, 2018, p. 9). In the PRC, neither of those measures had initially been conducted under the banner of the "digital yuan." Yet, in conjunction, these two legal changes had led to a situation in which payments made via WeChat Pay and Alipay came to bear characteristics similar to those described in blueprints for CBDCs: Retail payments with the two applications could be monitored by the central bank and they were realized with liabilities entirely backed by reserves. This institutional setup was the "Chinese model" of constructing a CBDC, according to the IMF's researchers (Adrian and Mancini-Griffoli, 2019, 2021). The "Chinese CBDC," thus defined, neither necessitated the use of any new technologies in the realm of payments, nor commanded any considerable amount of public investment in the construction of a novel infrastructure. Rather, for the creation of

a synthetic CBDC in the PRC, it had been sufficient to impose tighter regulations on formally private entities already operating in the field of digital payments.

Within the Chinese politico-administrative elite, the label "CBDC" was not uncontested. While certain Chinese governmental agencies willingly took up the idea that China was leading in the race to develop a CBDC (State Council of the PRC, 2019), in 2020, former Governor of the People's Bank, Zhou Xiaochuan, explicitly refuted the notion that the digital yuan was a CBDC (Zhou, 2020). Zhou argued that the key difference between the digital yuan and an ideal-typical CBDC lay in their respective liability structures: Whereas CBDCs were ultimately the liability of the central bank, the digital yuan would be a liability of the private financial sector backed by some amount of central bank reserves. This view was ultimately contradicted upon the June 2021 publication of a white paper on the digital yuan in which the People's Bank stated that the digital yuan was actually its own liability and that the private sector would merely be charged with distributing it. Furthermore, the white paper explicitly labeled the digital yuan as a "retail CBDC" (Working Group on E-CNY Research and Development of the People's Bank of China, 2021, p. 4). The digital yuan had thus become a CBDC and the People's Bank the leading institution in the transnational race toward monetary modernity.

The rise of a transnational CBDC movement had thus led to an accumulation of symbolic capital by the People's Bank. The second, and arguably more important, consequence of the multiplication of CBDC initiatives across the globe was the fact that it created a new window of opportunity for Chinese policymakers to reconsider the purpose the Chinese digital currency might serve. Most notably, it opened up new possibilities for the digital yuan to contribute to the broader restructuring of international financial infrastructures and thereby to strengthen the RMB's role in the global economy. From early on, officials at the People's Bank had repeatedly refused the

notion that the digital yuan was intended to alter the function of the currency in the international monetary architecture. Thus, Mu Changchun, head of the central bank's digital currency institute stated that there was no direct causal link between the international use of the Chinese currency and its material form (Mu, 2020). According to Mu, international use depended first and foremost on economic fundamentals and then other structural variables of the economic system, a position which has found multiple echoes in the scholarly community (Prasad, 2021; Eichengreen, 2022; Peruffo, Cunha, and Haines, 2023). Similarly, former People's Bank Governor Zhou Xiaochuan reiterated this point, stating during a public conference that the initial intention of the project had never been to influence international wholesale payments (Xu Wei, 2022). Rather, the digital yuan had been conceived with "shopping in mind" and the cross-border use of the digital yuan would probably remain limited to small retail transactions.

However, against the background of payment system reform in other countries, the digital yuan could become a tool to experiment with new ways of linking the Chinese payment system to systems operating in other jurisdictions. In early 2021, the People's Bank publicized its participation in a joint collaborative "multiple CBDC" project conducted in partnership with the Bank of Thailand, the Bank of the United Arab Emirates, and the Monetary Authority of Hong Kong: Project mBridge. The explicit aim of the collaboration was to establish a shared platform for interbank settlements in all four jurisdictions based on a commonly operated blockchain. In the first joint report about the advancement of the project, Mu Changchun argued that mBridge was yet another threshold in the brief history of the digital yuan. In the same context, he stated once more that the currency was first and foremost a payment instrument for domestic retail transactions (BIS Innovation Hub, 2021, p. 13). With Project mBridge, the digital yuan had, however, acquired an undeniable transnational dimension.

4 Conclusion

This chapter has provided a brief history of currency digitalization in the PRC since the turn of the millennium by drawing on a variety of publicly accessible sources including newspaper and journal articles. In this endeavor, we have borrowed insights about the dynamics and mechanisms of infrastructural change from a selection of works by scholars concerned with the development of large technical systems in other societal and historical contexts. Application of this "infrastructural gaze" has helped us to formulate two distinct arguments. First of all, in a way similar to many other large societal infrastructures, during its early years the construction of the digital yuan was at times presented as a means to completely overhaul existing sociotechnical systems. Yet, when work on the project began in earnest over the second half of the 2010s, a process of layering unfolded, whereby the digital yuan came to rely on already existing sociotechnical systems. Second, not unlike other sociotechnical systems, the digital yuan is embedded in a transnational network of financial infrastructures which crosses national boundaries. The nature and structure of this transnational network determines in crucial ways the ultimate sociopolitical function that the digital yuan plays and will play in the international political economy.

Notes

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2. The articles, coming from a variety of Chinese newspapers, have been accessed and downloaded through the platform Wiser, to which

we obtained access via the Staatsbibliothek Berlin. Articles were selected when they contained the name of a Chinese official who was, at the time of the article's publication, a member of the board of governors of the PBoC and the name of the Chinese digital currency. The search string, containing several Boolean operators, was the following: (周小川 OR 刘士余 OR 潘功胜 OR 金琦 OR 郭庆平 OR 李东荣 OR 胡晓炼 OR 王华庆 OR 易纲 OR 范一飞 OR 陈雨露 OR 张晓慧 OR 杨子强 OR 殷勇 OR 王鸿津 OR 刘国强 OR 徐加爱 OR 郭树清 OR 朱鹤新 OR 刘桂平) AND (央行数字货币 OR 数字人民币 OR 数字货币电子支付).

3. As of August 2023, one of the Chinese-language articles published in 2012 (Xie 谢平 and Zou 邹传伟, 2012) has been cited 1,867 times according to the metrics of Google Scholar.
4. Our translations.
5. The Google N-Grams Viewer suggests that, before 2016, there was not a single mention of "Central Bank Digital Currencies." The biggest rise occurs between 2018 and 2019. The current data ends in 2019.

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Infrastructure for Inclusion

Evaluating China's Financial Infrastructure and Financial Inclusion

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Financial infrastructure is of decisive importance in efforts to enhance financial efficiency and promote economic growth (Amable and Chatelain, 2001; Bossone, Mahajan, and Zahir, 2003). This chapter explores how the development of China's financial infrastructure also affects financial inclusion. For a long time China had lagged behind in terms of conventional financial inclusion, but China's digital financial inclusion (DFI) is rapidly developing (Bei, 2017; Jiao, 2019).¹ One of the most important catalysts has been the development of digital financial infrastructure, particularly digital credit infrastructure and digital payment infrastructure. This chapter first examines the concepts of financial infrastructure and financial inclusion and their Chinese contexts. It then traces the historical evolution of financial inclusion in China since 1949 and lastly dissects the significant role of digital financial infrastructure in promoting Chinese DFI since around 2013.

1 Financial Inclusion and Financial Infrastructure in the Chinese Context

1.1 Financial Inclusion: International and Chinese Perceptions

Before examining the empirical impacts of financial infrastructure on financial inclusion, it is necessary to clarify several concepts. The origin of the concept “financial inclusion” is usually traced back to 2005 when the United Nations (UN) adopted the term “inclusive financial system” to publicize the International Year of Microcredit 2005. The idea's empirical origin can be seen in the establishment of rural credit cooperatives (RCCs) in China (early 1950s), the Grameen Bank in Bangladesh (1976), the People's Bank of Indonesia, and similar institutions. The pioneer of advocating financial inclusion, the World Bank Group (WBG), defines financial inclusion as “individuals and businesses hav[ing] access to useful and affordable financial products and services that meet

their needs – transactions, payments, savings, credit and insurance – delivered in a responsible and sustainable way” (World Bank, 2019). This definition emphasizes accessibility, affordability, commercial sustainability, and responsibility. Accessibility in this context means “a consumer has sufficient physical proximity to access points – including branches, agents, automated teller machines (ATMs), and other outlets or devices – to enable him or her to easily select and use a range of financial products and services” (WBG and PBOC, 2018, p. 5). Affordability means that these financial products and services are affordable for most customers, particularly low-income consumers. Commercial sustainability implies that the goal of providing these products and services is not to increase the level of social welfare, but to seek business profit. Responsibility requires that these products and services “be responsibly delivered to consumers and that the policy objectives of financial inclusion align with those of financial stability and market integrity.” The four features provide benchmarks for measuring financial inclusion.

Drawing on this definition and adding to these four key elements, the Chinese government also stresses “opportunity equality” by noting that “financial inclusion means providing financial service for all social strata and groups with appropriate and valid financial services, at affordable cost, based on the principle of opportunity equality and commercial sustainability” (State Council of China, 2015; WBG and PBOC, 2018, p. 6). Here, opportunity refers to the possibility for potential customers to use financial services, as determined by their accessibility and affordability, and opportunity equality means that all customers ideally have an equal possibility to use the same financial services.

Financial inclusion has both normative and commercial objectives. Normatively, financial inclusion is the opposite of financial exclusion and targets the unbanked. Commercially, financial inclusion, unlike charity and social welfare, seeks economic gain. The two objectives would appear to be conflicting since the majority of the business profits in the financial sector comes from a

small percentage of customers, as the Pareto principle would lead us to expect. The traditional financial system in China had not found an efficient way and sufficient justification to simultaneously ensure the accessibility, affordability, commercial sustainability, responsibility, and opportunity equality of the financial services that are provided – that is, until the emergence of financial infrastructure innovation.

1.2 Financial Infrastructure: Narrow and Broad Understandings

Financial infrastructure has narrow and broad meanings. In its narrow sense, financial infrastructure has been widely regarded as a synonym for financial market infrastructure (FMI). As the Bank for International Settlements (BIS) and International Organization of Securities Commissions (IOSCO) jointly pointed out, “an FMI (financial market infrastructure) is defined as a multilateral system among participating institutions, including the operator of the system, used for the purposes of clearing, settling, or recording payments, securities, derivatives, or other financial transactions” (BIS and IOSCO, 2012). FMIs explicitly include five key types: payment systems (PSs), central securities depositories, securities settlement systems, central counterparties, and trade repositories (BIS and IOSCO, 2012). In a broad sense, as emphasized in this book, financial infrastructure refers to all tangible facilities and intangible rules and arrangements relating to financial activities.

Drawing on this definition and classification, in the *Work Plan for Coordinated Supervision of Financial Infrastructure* jointly released by the People’s Bank of China (PBOC) and other government departments, “financial infrastructure refers to the system and institutional arrangement that provides basic public services for all kinds of financial activities, with a pivotal position in the operation of financial markets.” Furthermore, “China’s overall supervision of financial infrastructure includes [the] financial assets registration and depositories system, clearing and settlement system (including central

counterparties carrying out centralized clearing business), trade facilities, trade repositories, important payment system and basic credit system” (PBOC, 2020). Thus, China’s official definition of financial infrastructure tends to be narrower, along the lines of the definition of BIS and IOSCO. This chapter and book adopt the broader meaning of financial infrastructures, which encompasses both object and relations.

2 Evolution of Financial Inclusion in China: Effects of Conventional Financial Infrastructures

The evolution of China’s financial inclusion can be divided into five stages, and the five features of financial inclusion (accessibility, affordability, commercial sustainability, responsibility, and opportunity equality) can be used to evaluate and compare these stages. In addition to detailing the development of China’s financial inclusion, this section will discuss the role of conventional financial infrastructures, specifically credit infrastructure and payment infrastructure, during these stages. Credit infrastructure includes laws, management, institutions, standards, and markets related to credit reporting. By providing third-party evaluation, credit infrastructure can reduce information asymmetry and transaction costs, thereby indirectly improving the level of financial inclusion (Huang, 2018). As the cornerstone of any financial system, payment infrastructure generally encompasses the accounts, instruments, systems, organizations, and regulations that support payments. Payment infrastructure has a direct effect on financial inclusion by, for example, expanding coverage of financial services and improving settlement efficiency. This section reviews the evolution of financial inclusion in China and examines the impacts of financial infrastructure on financial inclusion.

2.1 “Planned” Exclusion (1949–1978)

At this stage, from the founding of the People’s Republic of China in 1949 to the implementation of the Reform and Opening-up

policy in 1978, credit infrastructure was nearly absent and payment infrastructure was relatively backward. In addition to the agriculture department of the PBOC and the establishment of the People’s Construction Bank of China in 1954 as a subsidiary of the Ministry of Finance, two other institutions contributed during this stage to promoting financial inclusion by providing rural financial services. One was the RCCs, a new type of financial institution launched in 1951 that developed quickly thereafter.² The other was the establishment of the Agricultural Bank of China (ABC) in 1955.

Under the planned economy system, government departments had full access to personal information and there was no urgent need to create a credit infrastructure (Huang, 2018). The PBOC performed the dual functions of central bank and commercial bank, playing the roles of clearing, settlement, and supervision simultaneously. It thus established a highly centralized “National Interbank” three-stage clearing system (Guo, 2014). A notable feature of this system was a manually operating interbank, which means “people fill in the payment information by hand and deal with different payment and capital settlement business through postal delivery” (Li, 2017, p. 348). This system was highly inefficient: The average transit time to complete wire transfer business was 3.4 days; the average transit time of letter transfer business within the province was 5.5 days; the average transit time outside the province was 7.8 days, and the longest was 15 days (Liu and Wang, 1996). It was not until the early 1990s that the manually operating interbank was gradually replaced by an electronic one. Overall, the backwardness of financial infrastructure, especially payment infrastructure, largely restricted financial inclusion during this period.

Even though under the slogan “one village, one cooperative” the number of RCCs had quickly increased and they covered nearly 100 million rural households by 1956 (Zhang et al., 2010), accessibility was still low because of the geographic size of China and the great distances between villages. Rural finance in this period provided only basic

services, mainly saving. There were few appropriate financial services for rural farmers, and they were hardly affordable. Under the centrally planned economic system, the only objective of the financial system was to fulfill the political and economic tasks allocated by the central or local governments, rather than operate as if in a market economy and survive market competition. Therefore, commercial sustainability was low and the responsibility these limited financial services had was likewise low. Under the socialist political economic ideology that stresses social equality and collective ownership, equality was relatively high.

2.2 Initial Institutional Construction (1979–1992)

From 1979 on, China's credit infrastructure began to develop, but it was not yet able to really contribute to financial inclusion. In February 1985, the Shanghai Branch of the Industrial and Commercial Bank of China established the Shanghai Economic Information Consulting Company, the first credit information agency in China. In March 1988, the Shanghai Far East Credit Rating Co., Ltd. was established, which was the first professional credit rating agency independent of the banking system of China. Nonetheless, these agencies mainly targeted big companies, so credit systems for small and medium-sized enterprises (SMEs) and individuals were still underdeveloped.

Meanwhile, payment infrastructures were under construction, contributing to financial inclusion in some ways. The development of payment infrastructure in this period was mainly reflected in bank cards and PSs. In the late 1970s, bank card business was introduced to China. In March 1985, the Zhuhai Branch of the Bank of China (BOC) issued the Pearl River Card, the first bank card in China. In 1986, the BOC's Beijing Branch issued China's first credit card, the Great Wall Card. As for PSs, the PBOC began to construct a national electronic network based on a professional satellite communication network in 1989. On April 1, 1991, the electronic interbank system (EIS) was

put into trial operation, initially realizing the electronic processing of cross-bank payment and clearing business in China (Li, 2017). Compared with the manually operating interbank, the EIS greatly enhanced financial efficiency, as well as financial inclusion (Wu, 1995).

Consequently, the situation of financial inclusion during this period was largely and generally improved compared to the one under the command economy. The diversification and increase of bank and non-bank financial service providers, with each assigned a distinct service realm, increased the accessibility and responsibility of financial services. Examples include the then newly created rural cooperative foundations targeting local village farmers and the postal savings schemes (resumed in 1986), which mainly focused on absorbing loans and facilitating savings and remittance in rural areas (Zhang et al., 2010). The market-oriented reform and the resulting rise in competition increased the sustainability of the financial system and the affordability of financial services to some degree, though the competition was still insufficient. Banks operated under the administrative "priority sector guidance," a significant part of financial resources was distributed to state-owned banks in the form of policy loans, and local governments steered bank lending to state-owned enterprises (Sparreboom and Duflos, 2012, p. 8). The introduction of market competition, though at an initial stage, broke the faith in absolute collective ownership and social equality, released forces of economic growth, and thus created higher demand for financial services.

2.3 Financial Inclusion 1.0 (1993–2004)

Credit infrastructures for SMEs started to develop after 1999 when the former State Economic and Trade Commission issued the "Guidance on Establishing a Pilot SME Credit Guarantee System" (Credit China, 2012). For individuals, however, the credit infrastructure started from a weaker base. Not until 1997 was Shanghai approved by the PBOC as the first city to pilot personal

credit reporting (Huo, 2015). In April 2000, the real-name savings deposit system was put into effect in China, which, by requiring the depositor's name, helped restrain dishonest financial activities and promote the development of consumer credit (Shen, 1999). After entering the new century, Chinese authorities paid unprecedented attention to credit investigation. In November 2003, the Credit Information System Bureau of the PBOC was established, marking the official launch of the construction of a modern credit system.

China's PS advanced significantly in this stage as well. In 1995, the PBOC implemented the "Sky-Earth Connection" project to improve the processing speed of the EIS. Another milestone was the establishment in 2002 of China UnionPay, led by the PBOC. In December 2004, the first generation of the China UnionPay System was officially put into operation. The system "aimed to build a wide coverage area, the full range of business, handling powerful, stable and efficient integration of bank card information exchange platform" (Li, 2017, p. 380), and has had a far-reaching impact on financial inclusion.

Corresponding changes related to financial inclusion at this stage mainly include the following aspects. First, the degree of commercialization of the financial sector had been further increased with the purpose of enhancing its sustainability. Consequently, the policy-driven operations that sought primarily to improve financial inclusion began to commercialize. For instance, the ABC separated its policy-related functions from its commercial operations in 1994; the four state-owned banks were restructured into four state-owned commercial banks (SOCBs) in 1995; the RCCs separated from the ABC in 1996 and began to operate more independently. These commercialization efforts, however, did not essentially enhance the commercial sustainability of the financial sector. Though RCCs had been playing a significant role in providing rural financial services, they "were left with heavy historical burdens, poor asset quality, and high potential risks" (Zhang et al., 2010, p. 23). Furthermore, the total burden of nonperforming loans (NPLs)

in the SOCBs was estimated at 3.3 trillion yuan by 1999 (Jiang and Yao, 2017, p. 21).

Second, despite the lackluster performance of the financial sector characterized by poor asset quality, high NPLs, and low profitability, the coverage of financial services in both rural and urban areas had been further expanded during this stage. RCCs' credit and payment infrastructures had spread to most rural areas. By 1995, the number of financially independent RCCs reached 50,000 and RCCs' loans accounted for more than 60% of total agriculture loans (Zhang et al., 2010, p. 21). The central bank PBOC adopted more monetary policy tools, instead of administrative orders or interventions, to increase rural enterprises' and households' access to credit. City commercial banks were created in the mid-1990s to restructure and consolidate urban credit cooperatives, and thus increased the financial service coverage of the SMEs and local residents (Jiang and Yao, 2017, p. 21).

Third, a remarkable change related to financial inclusion in this period was the emergence and development of bank and nonbank microfinance infrastructure. Learned from international experiences, microfinance was first brought to China in 1993. For example, the Rural Development Institute of the Chinese Academy of Social Sciences introduced the microfinance model of the Grameen Bank and established the first microfinance poverty alleviation model in China. Subsequently, policy-driven microfinance programs initiated by local and national governments began to develop, and state-owned financial institutions also expanded their conventional business to microcredit services. It was not until the end of the twentieth century that the microfinance development and regulation policy was formally put forward as an important part of the national poverty alleviation initiative (Du, 2005).

2.4 Financial Inclusion 2.0: Comprehensive Development (2005–2012)

During this stage, the government-led credit agencies rapidly developed. In March 2006, the Credit Reference Center of the PBOC

was formally established. China began to form a credit investigation model dominated by the PBOC (Jiao, 2019). By the end of March 2008, the population of individual persons recorded in the database was 600 million, of which 109 million had credit records, and, by the end of 2010, information had been collected on 2.15 million SMEs and 134 million farmers had established credit files (Huo, 2015). In terms of legislation, at the end of December 2012, the State Council of China (2013) passed the “Regulations on the Management of the Credit Reporting Industry,” which marked acknowledgment of the legal status of the credit-reporting industry (Huang, 2018).

Payment infrastructure continued to develop rapidly in this period as well, thus providing a strong impetus for financial inclusion. Most notably, China established modern PSs on the basis of the EIS. In June 2005, the High Value Payment System was launched and promoted nationwide; in June 2006, the Bulk Electronic Payment System (BEPS) was popularized throughout the country; and in June 2007, the Cheque Image System was also launched nationwide. Of the three systems, the BEPS is most critical for financial inclusion, as micropayments are often the first step for vulnerable groups to access financial services (Wu, 2013). In July 2009, the PBOC issued the “Guidance on Improving the Payment Service Environment in Rural Areas” (PBOC, 2015a), which proposed for the first time to develop a payment instrument system suitable for rural areas. The financial tools include bank cards, noncash payment tools, mobile payments, telephone payments, TV network payments, and the like.

From around 2005, China’s financial inclusion practices entered a new age, now under the banner of “financial inclusion” as formally conceptualized by the World Bank. Though the concept “financial inclusion” was translated and introduced into China shortly after its international debut, the Chinese government had not officially adopted it, let alone incorporated it into formal policies, until 2012, as will be discussed later.

The further modernization of China’s banking sector expanded the coverage and diversified the types of financial products and services offered, thus enhancing the commercial sustainability of China’s banking system. Among many achievements, the remarkable ones of this round of modernization include the restructuring of the SOCBs into joint-stock entities and purely commercial institutions, the establishment of the China Development Bank Cooperation as an ordinary commercial bank in 2008, the market-oriented reform of two other policy banks (the Export–Import Bank of China and the ABC of China), the reform of the RCCs between 2004 and 2006, and the creation of the Postal Saving Bank of China.

In addition to the modernization of traditional financial institutions and services, notable driving forces pushing forward financial inclusion in this period also included the rapid growth of microfinance and the initial development of digital finance. Since 2005, when the government encouraged nongovernment and overseas funds to engage in commercial microfinance, China’s microfinance quickly developed, as evidenced by the sharp increase in the number of microfinance companies. The legalization of informal credit was another important facilitating factor for the boom of microfinance in China, as this enabled the subsequent development of nonbank financial institutions, such as loan companies, mutual financial organizations, and private microfinance companies.

The initial development of internet finance emerged in this period as a potentially important force for improving financial inclusion. Although traditional financial institutions had already adopted financial technologies to upgrade their management and services before 2005, these developments were essentially limited to the partial digitalization of the traditional banking sector, and competition and challenges from nonbank financial institutions had not yet been evident. By contrast, in the period up to 2012, in addition to the further digitalization of the traditional financial system, various forms of digital financial services emerged in China,

mainly including nonbank third-party payment, peer-to-peer lending, crowdfunding, and internet insurance, which laid the foundation for the era of DFI in China.

3 Digital Financial Infrastructure since 2013: A New Stage of China's Financial Inclusion

The normative and commercial objectives of financial inclusion are hard to realize simultaneously through the traditional means of providing financial services, largely because of the Pareto principle mentioned earlier in this chapter. For instance, the flaws of micro-finance in improving financial inclusion become prominent, and skepticism emerges (as discussed by Shakya and Rankin, 2008; Duvendack et al., 2011; Bateman, 2014). In the period since 2013, China's financial inclusion has greatly improved (Guo et al., 2020), from the country being far behind the international pioneers to gradually becoming a global leader of DFI. This achievement has been mainly driven by the advances in digital financial infrastructures, including digital credit infrastructure and digital payment infrastructure.

3.1 Digital Credit Infrastructure: Indirectly Facilitating Inclusion

Digital credit infrastructure is the combination of digital technology with credit infrastructure, especially market-oriented credit-reporting agencies. The digital technologies include artificial intelligence, cloud computing, big-data analytics, machine learning, blockchain, and 5G, among others. Digital market credit agencies have gradually emerged since 2013. In January 2015, the PBOC issued the "Notice on Preparing for Personal Credit Reporting Business," allowing eight agencies, including Zhima Credit and Tencent Credit Information to prepare for personal credit-reporting business for the first time in history (PBOC, 2015b). This in turn marked the beginning of the marketization of China's credit-reporting business. It was not until May

2018 that China's first personal credit business license was issued – to Baihang Credit Services Corporation, shares of which were owned by the National Internet Finance Association of China (36%) and eight personal credit agencies, including Zhima Credit (each holding 8%) (Credit Shanxi, 2018). As of February 2022, there were 2 personal credit agencies (Baihang Credit and Pudao Credit) and 136 enterprise credit agencies in China (PBOC, 2022a). China's credit-reporting market has formed a two-wheeled development model of "government + market" (PBOC, 2018). The market agencies not only complement the role of the PBOC's Credit Reference Center but also significantly improve credit reporting through utilizing digital technologies.

The application of big-data analytics in the market-oriented credit-reporting agencies has shown significant advantages over traditional agencies represented by the Credit Reference Center of PBOC in promoting financial inclusion. Take personal credit reporting as an example. Here advantages for inclusion are mainly reflected in two respects. First, market-oriented agencies can collect and access more personal credit data and other information. As of early 2019, while the PBOC's Credit Reference Center recorded 990 million individuals, only 530 million people had loan records (Lei, 2021). Moreover, the Center focuses mostly on large loan customers and largely ignores small loans (Lei, 2021). By contrast, with access to information on a huge number of users, market-oriented agencies can easily obtain a variety of data, such as social relations and online shopping records. Notably, these agencies pay more attention to the people lacking or having no credit records in the traditional credit system. By 2020, among those without credit records were 40 million college students, 35 million graduates who had worked for less than five years, about 60 million people with minimum living allowances, and more than 80 million SMEs in China (Zhang, 2020). Leveraging digital technologies, particularly big data, market-oriented agencies have by now included most of them in the credit-reporting system

(Zhang, 2020), thus remarkably improving the level of China's financial inclusion.

Second, relying on digital-scoring models, the market-oriented credit agencies have dramatically improved the efficiency and reduced the cost of credit reporting. Unlike the traditional regression-scoring models, the credit evaluation based on big data is more about building neural networks, decision trees, random forests, machine-learning, and other models to process all kinds of information about borrowers, including consumption records and information related to travel, accommodation, property, vehicles, occupation, and the like (Yao et al., 2018). The traditional credit investigation mainly depends on historical data, which is quickly out of date (Peng and Wu, 2018). In contrast, big-data credit reports can be updated online in real time (He and Che, 2017), and large-scale data can be processed efficiently and economically through big-data computing software (Peng and Wu, 2018).

3.2 Digital Payment Infrastructure: Explicit Impact on Inclusion

Digital payment infrastructure has had a more direct impact on transforming China's financial inclusion in DFI. As discussed, the digital development of payment infrastructure is the result of the application of a series of digital technologies in the payment field, including cloud computing, bio-identification, QR (quick response) codes, and blockchain. In China, two digital

payment infrastructures have the potentially greatest impacts on financial inclusion: third-party mobile payments and digital RMB. As the latter is still in the pilot stage, we will focus mainly on the former.

Third-party mobile payments mainly refer to the mobile payment services offered by nonbank payment companies, especially internet payment companies. In China, Alipay and Tencent Finance together account for more than 90% of the third-party payment industry (Yang, 2019). Since 2013, mobile payments have experienced dramatic development in China. As shown in Figure 30.1, the total volume of third-party mobile payments increased more than 200 times, from 1.2 trillion yuan in 2013 to 249.2 trillion yuan in 2020.

The explosive growth of third-party mobile payments has revolutionized Chinese financial inclusion in terms of the five core features of financial inclusion mentioned: namely, accessibility, affordability, commercial sustainability, responsibility, and opportunity equality.

First, third-party mobile payments have greatly enhanced the accessibility of financial services. Although traditional payment infrastructures such as bank outlets, ATM, and POS (point-of-sale) terminals still play an important role, use of these traditional infrastructures has been shrinking. By the end of 2021, China had 947,800 ATM terminals, a decrease of 66,000 from the previous year (PBOC, 2022b). In contrast, by the end of June 2022, the total number of

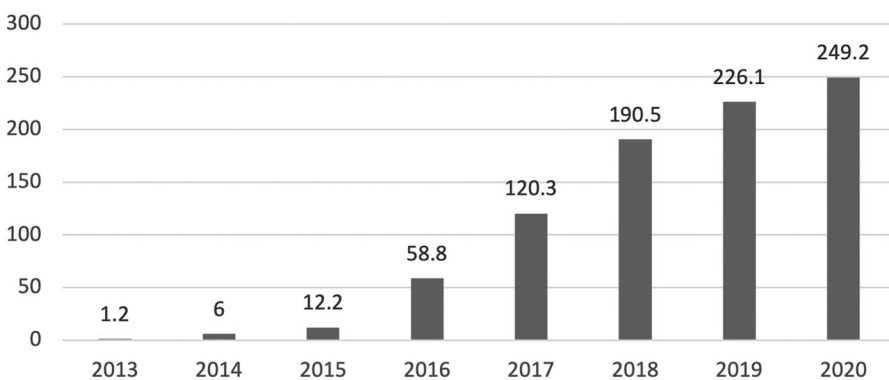


Figure 30.1 Third-party mobile payment transactions in China (1 trillion yuan).

Source: Authors' elaboration based on data from iResearch (2021).

cell phone subscribers in China reached 1.67 billion, a net increase of 25.52 million over 2021, twice as many as in 2010 (Ministry of Industry and Information Technology, 2010, 2022). Besides, as of June 2022, the number of internet users in China was 1.05 billion, with the internet penetration rate reaching 74.4% and the proportion of mobile internet access reaching 99.6% (CNNIC, 2022). According to PricewaterhouseCoopers, China's mobile payment penetration rate reached 86%, ranking first in the world in 2019 (PwC, 2019). Third-party mobile payments have made financial services significantly more accessible.

Second, third-party mobile payments and the digital technologies behind them have also enhanced the affordability of financial services. One of the key factors for affordability lies in reducing the operating costs of financial service providers. On one hand, the improved accessibility of mobile payments also reduces the cost of many financial services. In the field of rural credit, the annual interest rate of microfinance institutions and informal credit was relatively high, reaching 18% or 19%, or even 20%, due to traffic restrictions and other factors (Bei and Li, 2017). In contrast, the annual interest rates of Alipay's Jiebei and Tencent Finance's Weilidai are usually 14.6% and 10.95%, respectively (Wu, 2019). On the other hand, digital technologies can directly lower the cost of financial services. For example, based on cloud-computing technology, Alipay's single payment cost is 0.02 yuan, which is ten times lower than traditional payment methods (Bei, 2017).

Third, third-party mobile payments have more potential for business sustainability. Due to the aforementioned improvements in accessibility and affordability, these mobile payment agencies can achieve *boliduo Xiao* (a sales strategy to increase total revenue by selling goods at a low profit per unit price). In 2021, nonbank payment institutions processed 827.3 billion online transactions worth 294.56 trillion yuan (PBOC, 2021), including 249.2 trillion yuan in third-party mobile payments (see Figure 30.1). The profits of the third-party payment platforms are mainly from sinking funds, handling

fees, advertising revenue, and other value-added service income (Guo, 2021). Taking Alipay as an example, after the launch of Yu'E Bao in 2013, it absorbed 400 billion yuan of investment in less than a year (Lu, 2018). The revenue of Jiebei was 3.8 billion yuan, 11.2 billion yuan, and 11.8 billion yuan in 2016, 2017, and 2018, respectively, and the net profit was 1.8 billion yuan, 6.1 billion yuan, and 3.5 billion yuan, respectively (Zhongtai Securities, 2020).

Fourth, the third-party mobile payment agencies and the regulatory authorities have jointly safeguarded the responsibility of financial services. From the perspective of third-party mobile payment agencies, digital technology and companies' self-regulatory mechanisms are two important aspects to protect the interests of customers. Fintech companies establish risk control and prevention systems through technologies such as the Internet, big data, and cloud computing, as well as through internal regulatory institutions, thus reducing the risk of financial services (Peng and Wu, 2018). For example, Ant Group has established a consumer rights protection and management system based on architectural guarantees, internal control mechanisms, and platform construction (Ant Group, 2021). From the perspective of regulatory authorities, the PBOC and other government agencies have played critical roles. One of the representative events was the establishment of a common clearing platform for nonbank and third-party payment institutions, the NetsUnion Clearing Corporation, in August 2017. Another regulatory action was the Shanghai Stock Exchange's suspension of Ant Group from listing on the Science and Technology Innovation Board in November 2020.

Fifth, third-party mobile payments have technically promoted opportunity equality. Opportunity equality emphasizes breaking the Pareto principle and building solid financial systems and a more equal society. As mentioned, third-party mobile payments create more opportunities by improving accessibility and affordability. They can also contribute to increasing equality between users and regions.

For users, as the Ant Group claims, “we strive to enable all consumers and small businesses to have equal access to financial and other services through technology” (Ant Group, 2022). In particular, vulnerable groups can enjoy the same financial services as others, as long as they or their families have a cell phone. For regions, third-party mobile payments largely eliminate geographical and spatial limitations, enabling remote areas such as small mountain villages with less developed transportation links but good internet connections to have better access to financial services.

To conclude, the extent of financial inclusion is determined by many factors, among which financial infrastructure is most decisive. Digital financial infrastructures have transformed the conventional ways of conducting financial interactions and activities and made financial services more accessible. Meanwhile, financial infrastructures are not purely neutral and value-free at either the domestic or the international level. Within society, digitalization of the financial industry brings new redistribution effects, leading to new winners and losers. In the international system, the redistribution effects also exist among states, which has resulted in new forms of international power competition, such as the digital RMB versus other central bank digital currencies. The importance of financial infrastructures in domestic societies and international systems, as emphasized in this book, needs further exploration.

Notes

1. All translations of Chinese sources were undertaken by the authors.
2. By 1995, the number of RCCs had reached 159,000 (Zhang et al., 2010, p. 17).

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AI as Financial Infrastructure?

Edemilson Paraná

1 Introduction: Patterns behind Market Prices, an Old Obsession

John Maynard Keynes, the renowned economist, was also an outstanding mathematician – long before it became a ‘norm’ in the former discipline. Between the 1920s and 1930s, he amassed a mountain of data on securities trading in capital markets and set himself the task of identifying patterns among them. He believed there was a hidden law governing the movement of stock prices, a sentiment shared by many economists grounded in the classical tradition. However, to his disappointment, he found that the movements were almost entirely random. The behaviour of markets could not be predicted precisely. This only apparently prosaic discovery led to one of the greatest revolutions in twentieth-century economics; non-probabilistic uncertainty was elevated to the centre of economic analysis (Skidelsky, 2005). The simple yet powerful idea is that, since the future cannot be anticipated, uncertainty conditions economic agents to hold money instead of making spending decisions. Uncertainty

becomes the primary reason for fluctuations in investment and liquidity preference, in a game driven by agents’ expectations.¹

Nearly 100 years later, the penetration of artificial intelligence (AI) into financial markets continues to echo this same issue. Despite abundant critiques coming from non-conventional economics and social sciences, the hidden patterns of markets and their mathematical regularities continue to be obsessively sought, often without success. Increasingly sophisticated pricing and forecasting models were developed only to, despite their advances, prove limited and fail again, as the tragic cases of Long-Term Capital Management (LTCM) in 1998 (Quiggin, 2010, pp. 56–58) and the great financial crisis of 2008 (Tooze, 2019) didactically demonstrate.²

But what explains this relentless fight against contingency, this inglorious quest for control, at any cost, over unpredictability in the markets? Why would the verification of non-probabilistic uncertainty not have been enough to appease those who would continue this search? And why was the systemic coordination of markets with the aid of the

state, something that achieved relative success during some decades of the twentieth century, also insufficient? This chapter contextualizes these questions within our digital age, exploring AI as a financial infrastructure. The objective is to underscore the persistent connections it has with a volatile, crisis-prone system, challenging the commonly espoused notion of AI as a stabilizing force in finance.

Since the 2000s, the data-centric digital circuits in global finance have increasingly steered financial markets towards a comprehensive algorithmic mode of management (Campbell-Verduyn, Goguen, and Porter, 2017). Enthusiastically, AI is said to be the new frontier of this process. Following the meso-level ‘infrastructural gaze’ proposed by Westermeier, Campbell-Verduyn, and Brandl (this volume),³ this chapter interrogates the penetration of AI in capital markets as a combination of both continuity and change in finance. In doing so, it sheds light on the complexity arising from the interconnections of its micro and macro dimensions. Building on the Science and Technology Studies (STS) definition of infrastructures – as evolving socio-technical systems that combine human and non-human elements (Bernards and Campbell-Verduyn, 2019) – and on the political economy of digitalized finance (Paraná, 2019) – I reflect on AI as an ‘emergent’ financial infrastructure.

The increasingly infrastructural dimension of AI in capital markets comes from, first, an evolution from algorithmic trading and algorithmic financial governance, and secondly, from the rise of AI as a ‘general-purpose technology’ within the financial domain. Following this rationale, I draw on insights from Danielsson, Macrae, and Uthemann (2022) and Borch (2022) regarding AI and systemic risks, hypothesizing about the consequences of the ‘infrastructuralization’ of AI in capital markets, considering the micro–macro tension typical of capital accumulation, inequality, and crisis dynamics.

By ‘infrastructuralization’, that is, ‘becoming infrastructural’, I understand the remixing or re-establishing of socio-technical relations that position a

combination of processes and artefacts as crucial for economic reproduction. Importantly, infrastructures constantly (re-) emerge, particularly during stress events (Scholz, Schauer, and Latzenhofer, 2022). In depicting financial AI as ‘emergent’, I want to highlight that we should not perceive it as entirely ‘new’. Instead, it is linked to a longer history of developments in big data, algorithms, and even earlier forms of digitalization, all indicating this continuous ‘re-emergence’. By focusing on the sedimentation of somewhat but not entirely different socio-technical relations, an infrastructure perspective enables us to comprehend AI within a broader and more nuanced historical context.

Pursuing this argument, the chapter first delves into an overview of AI’s current applications in financial markets. At this point, it problematizes AI as a possible emergent financial infrastructure. It then proceeds to provide historical background around the dynamics and underlying principles of digitalized finance (Paraná, 2019), elaborating on the relations of finance and technology more broadly, and on the uptake of models, computation, and algorithms in the financial domain in particular. The chapter concludes by drawing the consequences (unpredictability, operational inefficiency, complexity, further concentration) and (systemic) risks arising from such an emergence of AI as a ‘new’ financial infrastructure, particularly those related to biases in data and data commodification, lack of explanation of underlying models, algorithmic collusion, and network effects. It does so by exploring the micro–macro tension, and the fallacy of composition, in financial AI.

2 AI as a Financial Infrastructure?

In addressing the infrastructural aspect of financial AI, it is necessary to understand that the effects it produces – be they good or bad – do not occur solely through the development and dissemination of certain technical artefacts. Here, we can start by unpacking the concept of financial

infrastructure, brought forth by the Social Studies of Finance (SSF) literature in dialogue with that of STS and extensively developed throughout this volume.

Infrastructure can be a slippery and somewhat controversial concept (Silvast and Virtanen, *in press*). For the most part, infrastructures are viewed as social-technical relations and networks that enable or disable functions/actions (such as banking, payments, insurance, and trading), or, as stated, ‘systems through which basic but crucial enabling functions are carried out, but that tend to be taken for granted and assumed’ (Bernards and Campbell-Verduyn, 2019, p. 776). This means that infrastructures include not only physical technologies but also protocols, standards, and ideas (Edwards, 2003), encompassing both ‘hardware’ and ‘software’. Infrastructures bridge different scales of action, from micro to macro. This relational understanding of infrastructure focuses attention on multiple forms of agency in key choices and possibilities in both stable and unstable times. Building from Edwards (2003), Star (1999), and Hanseth and Monteiro (1998), as compiled by Bernards and Campbell-Verduyn (2019) and Silvast and Virtanen (*in press*), STS-inspired definitions of infrastructure point to the following features: facilitation (infrastructures have a supporting function), openness (they are shared by large communities and tend to be open to new entrants), durability (they tend to persist, evolving and extending, over time), centrality (they establish how core functions are deployed), and some level of obscurity (as they are constituted of ecologies of networks operating in the background, they can seem like black boxes for users).

AI surely exhibits some of these characteristics when it comes to financial markets – such as facilitation, openness, and obscurity – while, in a sense, it is still to be seen whether it is going to fully meet other strategic requirements, such as durability and centrality. However, if we take AI (mostly machine learning (ML)) as a second-generation development of automated trading, as argued by Borch (2021),⁴ it is on the

verge of achieving such a point of no return and coercive adoption on the part of various finance actors. Be this the case or not, the intellectual exercise I propose here, following the insights of Danielsson, Macrae, and Uthemann (2022), suggests that, once and if AI becomes pervasive to the point of becoming such an infrastructure for capital markets, as indications suggest, the outcomes should be the ones I will delineate. For that, my infrastructural gaze, while maintaining an eye on the details underpinning macro-level issues, focuses on emergent systemic concerns.

AI engines have been increasingly implemented in markets in recent years. This implementation takes place through different techniques and in different application sectors. The objective, in all cases, is to respond to the financial market factors popularized through the acronym VUCA – volatility, uncertainty, complexity, and ambiguity. The expansion of production and access to financial data of all kinds, coming from different sources and locations, the increase in computational-processing capacity, the expansion of the reach and speed of connectivity, the expressive profits of funds and financial companies based on AI, and intense competition in this information-sensitive sector have led AI to appear as a general-purpose pervasive technology in the functioning of markets,⁵ with different levels and forms of application. In Srnicek’s (2019) terms, ‘AI can become a utility, like electricity, like gas.’ AI, in sum, is being pitched as a potential ‘general condition of production’ (Dyer-Witthof, Kjosén, and Steinhoff, 2019, p. 31) for financial activities; in other words, a financial infrastructure.

Among the most used AI techniques are expert systems, genetic algorithms, fuzzy logic, neural networks, and ML (Milana and Ashta, 2021). These techniques can be used in combination depending on the application and its objectives. Among these, the most used is ML; and while deep learning has garnered considerable attention in recent years, the predominant AI technology within this context remains supervised learning (Li et al., 2023). Financial forecasting directed

to financial trading is the main subfield of AI used in finance. Although there is a growing body of literature on the promises of generative AI in finance (Ali and Aysan, 2023; Cao and Zhai, 2023; Dowling and Lucey, 2023; Lopez-Lira and Tang, 2023), its impact is still hard to discern and difficult to evaluate at this point.⁶ By all means, financial AI is mostly ML techniques applied in different domains.

Among the most relevant practical applications are credit scoring and rating, risk management, forecasting, fraud detection, accounting, financial advisory services, and financial trading (including news trading). These applications span across different agents, such as banks, financial institutions, fintech, funds, and trader dealing in various financial instruments.

Importantly, from an infrastructural perspective, the so-called intelligent layer of AI is just the apparently superficial layer (Pasquinelli and Joler, 2021). Such a layer is, nonetheless, of enormous importance. Proprietary models are kept under lock and key by financial market agents. However, these sophisticated models could do little or nothing without global high-speed connectivity, high computational-processing capacity, and an immeasurable amount of data produced, received, and catalogued from all parts. This is what ML, the still-dominant model for applying AI in financial markets, fundamentally requires: data/information, models/software, and hard/fast processing. Once strategically combined, these elements are the true game-changers for the dominant AI application technique in the markets.

In this regard, it is necessary to highlight that such applications are overdetermined by their materialities (Crawford, 2021; Steinhoff, 2021). They mobilize a large number of natural resources, human labour, and a whole complex of technical, institutional, political, and geopolitical factors that, as conditions of possibility, tend to go unnoticed (Dyer-Witheford, Kjosen, and Steinhoff, 2019; Pasquale, 2020). Thus, in a sort of fractal, thinking about the infrastructures behind AI is critical to thinking about AI as infrastructure. This involves

understanding why certain forms of automation were developed to the detriment of others and what social mobilization underpins such huge efforts in financial markets. However, this is only possible if we manage to bring to the analysis the different spatialities and temporalities expressed in the varied scales within which these processes are constructed (Corpataux and Crevoisier, 2016). Scalability – both geographical scales and scales of data and information processes within it – is fundamental to understanding not only what an AI system is, how it is produced, and how it works, but also to understanding the potential aggregate effects of its widespread application in a given sector. Scale is about power (Crawford, 2021): it is a product of power relations and entails and frames power dynamics.

That considered, stating that AI is being established as a financial infrastructure leads to new regulatory, institutional, and political disputes, along with emergent problems, tensions, and risks (Borch, 2022). Examining it from a meso-level infrastructural perspective enables us to focus on the emergent scale involving interactions and material aspects connecting individual agents to the broader financial dynamics and their collective relational outcomes. Importantly, this lens pushes us to see ‘emergence’ over a far longer period – way before generative AI and ChatGPT, for example – as I discuss in the Section 3.

3 The Computerization of Markets and Its Consequences

Although the widespread adoption of AI in financial markets may seem to indicate a new financial infrastructure combining big data, deep computation, and ML models, these ‘new’ infrastructures are built upon and broadly reproduce ‘older’ ones – models, computation, and automation in general (Muniesa, 2003, 2007; Pardo-Guerra, 2010; MacKenzie, 2015). More than supporting the STS accounts of infrastructures as never ‘settled’ and always emergent (Star, 1999; Edwards et al., 2009), this complex

combination of continuity and change merits an investigation into the underlying logic this dynamic entails and, particularly, the potential risks arising from its growing complexity. This section contemplates the deeper, longer links of financial AI with the ‘installed bases’ of what existed previously.

As a departure point, it is worth noting that from the 1960s onwards, with the continuous advancement of computation, the search for anticipation, control, and parameterization within financial markets that was mentioned in Section 1 has become increasingly reliant on technological development – as also occurred in other dimensions of social life.

Under capitalism, technological development must respond to competition in the market. This is especially valid for financial industries, defined by the fluidity of its main ‘commodity’ – capital itself in its financial and monetary form, and, more particularly, ‘fictitious capital’ (Mollo, Dourado, and Paraná, 2022). Such competition is not only intense but, above all, fast and, more than that, ultra-sensitive to information. That is why financial markets, in many cases, not only anticipate but prefigure the development and implementation of a special type of technology, information and communication technologies (ICTs). As finance attempts to anticipate futures, it lays the ground for presents. Therefore, anticipating other fields of application by a few decades, global-reaching ICTs spread and quickly imposed themselves as the basic infrastructure for the functioning of financial markets from the 1970s onwards. And with that, a world of new-old promises opened: communication, machines, the rapid exchange of information, and their automatic processing could finally help us find, through the discovery of hidden patterns in price fluctuations, not only the path to the most profitable investment strategies but, in general, greater control, transparency, predictability, rationality, and efficiency in the markets. It is as if Keynes did not solve the problem of non-probabilistic uncertainty in markets simply because he had no access to computers, big data, and

advances in modern mathematics. For some, it would only be a matter of time until these became available. The old *Western technofetichism* was updated, now under the banner of high-tech finance.

Along these lines, the prevailing perspective among major market players is a techno-solutionist approach to adopting these technologies (Campbell-Verduyn and Lenglet, 2023). This vision regards technology as neutral and external, almost magical, without acknowledging its co-construction within various social dimensions. This is a stance that is challenged by extensive scholarship within STS and SSF (see Pinzur, this volume). Thus, confirming the thesis of co-evolution and co-determination between finance, technology, and society, an evolved, ‘updated’ global financial market emerged, accelerating from the 1980s onwards. This would be an electronic market, globally interconnected, with negotiations in real time and increasingly mediated algorithmically. In particular, algorithmic trading and high-frequency trading (MacKenzie et al., 2012; MacKenzie, 2015) emerge within what I defined as ‘digitalized finance’, the new globally integrated socio-technical management system for the valorization of financial capital (Paraná, 2019). This occurs through the deployment of cutting-edge automated technologies, which accelerate the compression of space-time flows to obtain short-term liquid financial gains on a global scale.

Finance and technology have long been interconnected (Pérez, 2002; de Goede, 2005; Aji, 2020). Technology is not merely an external infrastructure but a fundamental component that plays a crucial role in market dynamics (Knorr Cetina and Bruegger, 2002a, 2002b; Pardo-Guerra, 2013). In this regard, a relevant fact that has largely gone unnoticed is that the implementation of mathematical models and trading algorithms in financial markets anticipates by a few decades their adoption in other fields of application that have become more popular, such as search engines and social media. It is possible to say that algorithmic governance (Zetzsche et al., 2018) goes from

Wall Street to Silicon Valley, and not the other way around, as is commonly thought. More particularly, as Joque (2022) indicated, the Bayesian and inductivist logic of neural networks make them particularly fit for the financial speculation drives. This anticipation demonstrates another important aspect: if finance operates in an increasingly technologized way, contemporary technological development is carried out more and more by mimicking the *modus operandi* of finance itself and its form of governance – leveraged and speculative, short-term, fast, individualizing, deregulating (Srniczek, 2016). Therefore, it is not by chance that financial companies increasingly resemble technology companies, and technology companies increasingly resemble financial institutions. The rise in prominence of the financial dimension of economies and the extensive digitalization of social life are mutually attractive processes in contemporary capitalism.

At this point, particularly from the mid-2000s, we can already observe the consolidation of some developments in these dynamics, which have been unfolding for several decades. Alongside the expansion of economic concentration at different levels and the additional difficulties in regulating

the markets that these processes entail, the operational complexity of the markets is increasing. In my previous work (Paraná, 2019), based on a comparative analysis of American and Brazilian financial markets, I identified what I have come to define as the ‘spiral of complexity of digitalized finance’. This spiral (Figure 31.1) is a feedback process that fuels the growing complexity of financial markets, to the point that even many financial operators – let alone the regulators – do not exactly know what is happening in the markets. ‘Flash crashes’ are a good example of how hard it can be to explain these phenomena. In my understanding, AI amplifies this process. The spiral illustrates how completely rational individual decisions can produce ‘irrational’ social outcomes. There are three basic steps to it.

First, in highly digitalized finance, the search for unexploited financial gains incentivizes leading players to invent, deploy, and refine the means needed to overcome the technological or regulatory obstacles that stand in the way of speculation. Secondly, the wide adoption of these new technologies leads to the emergence of new institutional configurations, new modes of action, and new operating dynamics; as a result, markets are

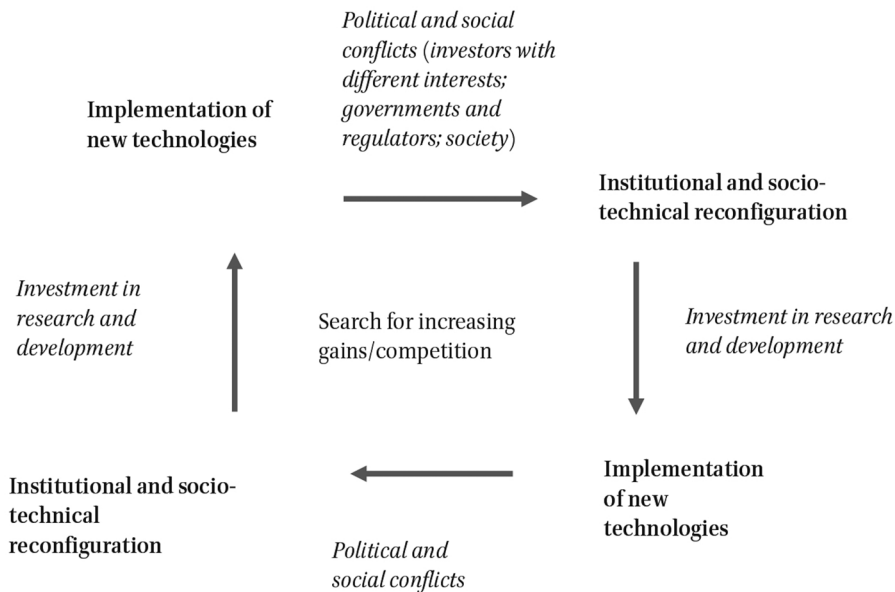


Figure 31.1 The spiral of complexity of digitalized finance.

Source: Paraná, 2019.

reconfigured, partly in response to the political and social conflicts that erupt. Finally, the ensuing emergence of a new institutional and technological environment encourages the development and implementation of even newer technical solutions. This cycle of growing complexity comes to entangle investors, regulators, tech companies, and other (often unwilling) participants. New systemic risks and instabilities proliferate as a result. This chapter explores it in the case of financial AI. Although the risks arising from pervasive AI adoption are new, I argue that the infrastructuralization of AI in finance, as defined earlier in this chapter, occurs along the same lines. This process underpins the spreading of AI through financial markets.

One of the main impacts that digital technologies (AI included) have on the market is to shorten space-time flows, that is, they make things faster and nearer.⁷ This increases the number and volume of trade operations and transactions. The digital systems behind those trades and transactions are immensely complex; they operate at immense speed and have tremendous learning and adaptive abilities. They make the job of regulating markets far more challenging (Pardo-Guerra, 2012; Arnoldi, 2016); there is too much systemic opacity and uncertainty involved. As regulators struggle to keep up, further concentration and centralization of capital within and between markets tend to occur. Those with more advanced technologies tend to enjoy higher competitive advantages and higher profits, leading therefore to centralization.

And here emerges another tension. As the global financial system became, in a sense, more unstable, opaque, and unpredictable – not least because of high-frequency trading and other innovations – it somehow needed to ground its operations in something that promised certainty, transparency, and predictability. This is where we find the new frontiers of this process: blockchain and, above all, AI. However, the same actors who seek stability and transparency through AI are the ones generating instability and opaqueness.

In some sense, AI's promises represent the actualization of an old paradox. While financiers need to amass information to tame

uncertainty, they themselves want to live in a low-information environment, avoiding the scrutiny of consumers, citizens, governments, and the media, at least as far as their own profit-making strategies are concerned. So, businesses always want almost full transparency from everyone but themselves. Their competitors – as well as governments and technocrats – have similar goals, producing, as a combined result, uncertain, risky, and rather opaque scenarios.

The struggle between these two tendencies – their particular combination in different contexts – is the key to understanding information governance in financial markets. It reflects the fundamental capitalist contradiction, that is, that production is a collective social process that, however, is privately conducted and controlled (Marx, 1992 [1867]). Since the underlying contradiction can never be properly resolved, all that these disputes can do is somehow precariously accommodate these self-cancelling tendencies.

Therefore, such a 'spiral of complexity' entails not only a rather uncontrollable dynamic but also a highly confusing one: few experts and operators can navigate it well (Lange, 2016; Lange, Lenglet, and Seyfert, 2019). On the other hand, the growing opacity of the markets becomes an element of control, leaving the management of strategic information in the hands of a closed elite of financial actors. Governments and regulators, but also small investors, those acting on the edges, become increasingly dependent on large funds, brokers, and financial institutions to manage their investments. This is usually done with very little transparency. And all of this, again, occurs in the name of efficiency, stability, and predictability. Opacity is the 'other', the truth of the quest for financial transparency. It is in this scenario that AI makes its way as an emergent financial infrastructure.

4 The Composition Fallacy in Financial AI

After this necessary historical contextualization, we can now return to the question, presented in the Section 1 of why the

obsession with controlling contingency and unpredictability, the search for patterns, and the pursuit of access to as much data and information as possible have not only persisted unabated but also intensified. Its answer lies in the individualized, albeit generalized, struggle not only for profit but for maximum profit as the foundation of survival against the competitive dynamics in financial markets. This finding may seem rather prosaic, but it helps to reveal another central problem for the elaboration of a reflection on the advance of AI in the markets: the problem of the ‘fallacy of composition’, particularly visible from a meso-level infrastructural gaze. The fallacy of composition indicates that the search for control to obtain growing profit generates, along with more profit, a greater lack of control. The insertion of AI in this process both reflects and amplifies it.

The principle of the fallacy of composition, extensively explored in economics,⁸ deals with the non-neutrality of aggregation and aggregates. In simple terms, the principle states that what is valid for the parts may not necessarily be valid for the whole. In short, the whole tends to be not only quantitatively but also qualitatively distinct from the parts. It is a logical dilemma related to the classic epistemological problem of inductivism versus deductivism, between empiricism and rationalism, in the philosophy of knowledge. In any case, the principle of the fallacy of composition helps us understand the critical phenomena of the digital economy. It explains, in part, the occurrence of the so-called network and platform effects, the sector’s tendency towards the ‘winner takes all’ model, and even the logic of ‘too big to fail’, which tends to encompass some of the main players in the market.

This leads to my core argument that the penetration of AI in capital markets has markedly different effects in the micro- and macroeconomic, or micro- and macro-social dimensions, which the meso focus of infrastructures helps us to see better. In the micro dimension, it is possible to concede that the advancement of AI actually delivers on some of its promises for some agents,

particularly the largest and best-positioned ones: greater profit, transparency, predictability, and efficiency. It is also possible to concede that, at the same level, AI contributes to accounting, supervision, and risk management in particular contexts. It is as if some agents – and the most notorious examples are the great hedge fund Renaissance Technologies of the legendary James Simmons and Robert Mercer and, more recently, BlackRock – had, with the help of powerful computers, big data, and AI, finally managed to solve the problem of numerical signals hidden in the markets to guide the best investment strategies.

However, this result is not verified in the topology of the aggregates – the one regulation and systemic risk assessment typically tend to focus on. Again, scale matters. At the macro level, the sign seems to be reversing, and we observe an increase in risk, unpredictability, and perhaps operational inefficiency in the markets – an effect that, as mentioned before, is accompanied by increasing concentration and inequality.⁹ In Section 5 I will unpack this argument, discussing some of the risks and problems of implementing AI in financial markets. This argument, it is worth noting, can only be built from an infrastructural perspective, in the expanded and systemic sense of the term – for both financial markets and AI.

5 Risks, Limits, and Challenges to Financial AI

These problems stem from the structural limitations of AI that are already widely known: the problem of biases in the data (Crawford, 2017; Eubanks, 2018), sometimes amplified by these systems, and the lack of explanation of their underlying models. To these, we can add the excessive trust deposited in artefacts and technical systems as exogenous and neutral, supposedly free from human errors and emotions, free from the so-called human factor. These problems are interrelated in a complex way in the markets; that is, ‘certain systemic conditions in markets can allow individual firms’

high-reliability practices to exacerbate market instability, rather than reduce it' (Min and Borch, 2022, p. 277).

Conditioning these limitations, we find the so-called problem of causality (Pearl and Mackenzie, 2018) – the fact that these systems 'learn' and operate based on data patterns and correlations, not on causality. These are systems that cannot give causal explanations for their actions, despite finding strong correlation and accuracy rates. This relates to explainability (Bracke et al., 2019), but goes beyond that. The absence of causal articulation removes some limitations but, above all, removes some advantages of human thought based on human language. Unlike machines, humans reason by combining emotions, rules, moral precepts, philosophical assumptions, flexible adaptive objectives, and a good dose of errors to elaborate theories and causal explanations for their actions. This gives us not only the most probable explanations obtained from statistical correlations but also explanations that may be highly improbable and still correct, such as the gravitation theory or the relativity theory, for example (Chomsky, Roberts, and Watumull, 2023). Given these limits, the interactional logic of markets (MacKenzie, 2019) poses a great challenge to financial AI. As Min and Borch (2022, p. 277) demonstrate, 'automated markets are characterized by tight coupling and complex interactions, which render them prone to large-scale technological accidents'.

Hypothesizing the role of AI as a central banker, Danielsson and colleagues (2022) present a compelling argument for why AI can potentially undermine financial stability by 'creating new tail risks and amplifying existing ones due to procyclicality, unknowable unknowns, the need for trust, and optimization against the system' (p. 1), hence 'increasing systemic risk'.¹⁰ While they focus on financial supervision (an imagined 'Bank of England Bot'), their rationale can be extended to the wider penetration of AI in other financial domains, in our terms, its broader dissemination as an emergent financial infrastructure. Their sharp focus on hidden logic, complex dynamics, and

aggregation problems demarcates a productive contrast to the sometimes circular and repetitive micro perspectives dominant in technical literature.

Expanding upon their insights, the first challenge confronting financial AI emanates from the reciprocal influence wherein economic agents responding to AI concurrently impact the system. Recognizing that the utility of AI hinges on the structural alignment with the task at hand, its optimal application occurs when addressing problems involving a solitary agent with fixed objectives and rules within a relatively predetermined space of action. Deviating from this idealized model introduces heightened complexities. Economic agents' decisions are substantially contingent upon the environmental and infrastructural framework within which they operate. Consequently, alterations in this milieu, instigated by the actions of AI, prompt agents to adjust the parameters governing their decisions. The behavioural responses inferred by the AI engine from historical data are contextual and may falter if the engine attempts to exploit them for control purposes. This nuanced interplay extends its ramifications to elements concerning the interrelationship between market agents and political systems. In essence, deploying a machine with predetermined objectives in a highly intricate environment yields unexpected behaviours.¹¹ As noted by Ashta and Herrmann (2021), there exists a 'technology-oriented' risk associated with 'overfitting patterns', potentially leading to the misinterpretation of data by algorithms within the dynamic and ever-evolving ecosystem of financial markets. In alignment with this perspective, Borch (2022, p. 9) contends that

ML-based trading systems may face severe risks when confronted with rapidly changing market settings that differ from those reflected in the training data. Most importantly, however, complex ML-based automated trading systems built on deep neural network architectures, are characterized by opacity: it is, as of yet, exceedingly difficult to understand how they arrive at their predictions and trading policies.

The second challenge of AI as financial infrastructure pertains to data access for market regulation and supervision. In digital businesses, although a significant part of data circulation is relatively open, facilitating various activities, data is increasingly treated as a commodity and private property (Rotta and Paraná, 2022; d'Alva and Paraná, 2024). Notably, in the digital economy, while ML and AI algorithms are mostly free and open source, the financial data used for their training are typically closed and proprietary (Bholat and Susskind, 2021). Although the financial system may appear to be the ideal use case for AI given its generation of seemingly infinite amounts of data, challenges such as measurement problems, data silos, and hidden interconnections limit the information that can be gleaned. Furthermore, agents might intentionally obscure the explainability of proprietary models to maintain a competitive edge. It is anticipated that many disputes between regulators and market agents will arise from these challenges.¹²

Another significant risk associated with AI penetration in finance concerns the dynamic of trust established in expert systems, whose functioning is not likely to be questioned until a serious failure occurs. When we observe AI performing well in low-level functions, it gives the green light to at least experimental adoption in higher-level functions. Cost savings on expensive human domain knowledge will provide additional incentives to adopt AI for trading and financial decision-making. While the issue of trust is present in the current set-up, crucial differences between human decision-makers and AI make the problem particularly pernicious. Determining how an AI reasons is more challenging than assessing a human decision-maker, and holding AI accountable presents additional complexities. Additionally, because we do not know how AI would react to the unknown-unknowns of economic dynamics – statistically irrelevant yet important causes of instability – the question of trust becomes increasingly pertinent as AI encroaches on meso-/macro-like problems.

Major stress events often arise from interconnections between seemingly disparate parts of the system, fuelled by political linkages that only manifest themselves once the stress is underway. Crises, by definition, are unexpected and non-statistically relevant events – black swans – that generally occur outside the universe of consideration of models looking for patterns in data.

Additionally, the widespread adoption of AI and the use of standardized models by numerous agents may lead to strategy convergence. It can unexpectedly heighten the interconnectedness of financial markets, increasing correlations among previously unrelated variables. These correlations may strengthen network effects, causing unforeseen shifts in market dynamics. As asserted by Danielsson, Macrae, and Uthemann (2022), AI is poised to exacerbate the inherent pro-cyclicality within the financial system. Essentially, AI is anticipated to magnify vicious economic cycles, where micro-level rationality leads to macro-level irrationality. AI's capacity to identify and adhere to superior risk management processes may result in a homogeneous set of techniques vulnerable to the same unknown-unknowns. Convergence in risk perception and management strategies across various AI applications, both in public and private sectors, could diminish the diversity that typically mitigates stress causalities. The risk assessment homogenization from self-reinforcing intelligent machine strategies may compromise the system's resilience. Moreover, the heightened performance of AI during periods of stability may foster increased trust, potentially encouraging additional risk-taking behaviour. In this manner, AI manifests as pro-cyclical, echoing Minsky's (2008, p. xii) proposition that 'stability is destabilizing'.

A distinct limitation of financial AI lies in its role in risk management, as extensively discussed by Danielsson, Macrae, and Uthemann (2022) and Danielsson and Uthemann (2023). While the theoretical understanding of fragility, fire sales, runs, and negative feedback loops is well established, their specific manifestations depend

on contextual factors, such as the current financial market structure and political environment. Despite training on comprehensive datasets that include detailed observations of past crises, AI may not identify all vulnerabilities due to its inability to reason causally. Unlike humans, AI relies on correlation rather than causation. Human regulators possess the capability to experimentally investigate and determine causal relationships, allowing them to respond proactively or reactively. While human regulators cannot predict unknown-unknowns, they possess historical, contextual, and institutional knowledge, enabling them to respond effectively. This is a notable contrast to AI, which lacks this capacity.

A final challenge involves the potential for increased coordination among economic agents in a system marked by widespread AI use, particularly when algorithms learn to cooperate. Research by Calvano and colleagues (2020) indicates that independent reinforcement-learning algorithms can sustain collusive equilibria in pricing games, maintaining prices above competitive levels. Unlike human actors, AI can facilitate tacit collusion without explicit instruction, potentially exacerbating market manipulation and raising legal and practical concerns for regulators. Paradoxically, transparency, often considered a positive attribute, may inadvertently foster coordination, potentially undermining financial stability, especially in scenarios like bank runs. These situations highlight instances where AI-induced behavioural adjustments can result in detrimental feedback loops.

6 Final Remarks

Trust in human decision-making comes from a shared understanding of values and the environment. AI's combination of built-in values, programmed objectives, and its understanding of the environment may not be intelligible to humans. While hypothetical scenarios can be executed through an AI engine to observe its decisions, soliciting a clear explanation remains challenging.

In summary, as the infrastructural gazing at the meso-level highlights, a tension exists between macro- and micro-financial problems, significantly influencing the utility and implementation of financial AI. Despite its fast penetration, effective operation in this environment necessitates capabilities beyond the current scope of AI, including an understanding of causality, global reasoning rather than local, and the identification of potential threats before they result in adverse outcomes (Borch, 2022; Danielsson, Macrae, and Uthemann, 2022).

AI, emerging as a financial infrastructure, introduces specific threats to the integrity of the entire financial system. Challenges stemming from the infrastructuralization of AI must be tackled by financial actors and regulators. A thorough understanding of these threats can be attained by adopting a perspective that considers the macro/meso/micro connections inherent in infrastructures. Addressing these concerns as systemic issues requires an integrated approach that encompasses not only the technical aspects but also the interrelated social, political, and economic dimensions.

Notes

1. Interestingly, Karl Marx had arrived at a similar conclusion several decades earlier. Marx believed that, at the macro level, the anarchic social organization of production carried out by markets tended to lack coordination and experience periodic crises that, given the complex nature of the system, could not be accurately predicted.
2. The LTCM was a highly leveraged hedge fund founded in 1994. Myron Scholes and Robert C. Merton, 1997 Nobel laureates in Economics for their work on the Black-Scholes model, were part of LTCM's board. Initially successful with annualized returns of 21%, 43%, and 41% in its first three years, LTCM's quantitative approach to investing faced a downturn in 1998, incurring a \$4.6 billion loss due to unforeseen events – the Asian Bubble of 1997 and the Russian Government's moratorium. To avert collapse, LTCM received a \$3.6 billion bailout from 14 banks,

- orchestrated by the Federal Reserve Bank of New York in 1998. Despite these efforts, LTCM was liquidated in early 2000.
3. Edwards (2003) famously delineated infrastructure into three levels: the micro level of individuals and small groups; the meso level of institutions such as corporations and standard-setting bodies; and the macro level of political economies and governments. Put differently, focusing on space-time flows and combined social-technical systems, by meso level, I mean the interactional emergent scale (infrastructures) and materialities that connect individual agents to aggregate financial dynamics and their combined relational outcomes, which, in cumulative steps, include institutions but are not restricted to them.
 4. First-generation automated trading employs algorithms to achieve goals oriented toward human objectives, whereas the second generation works with algorithmics itself to construct strategies (Borch and Min, 2023, p. 46).
 5. Bresnahan and Trajtenberg (1995) argue that a general-purpose technology presents the following three characteristics: (1) pervasiveness – it should spread to most sectors; (2) improvement – it should get better over time and, hence, continue lowering the costs to its users; and (3) innovation spawning – it should make it easier to invent and produce new products or processes.
 6. Shedding light on the Transformer and its impact on natural language processing, Luitse and Denkena (2021, p.2) argue that ‘the growing size of language models accelerates monopolization in the digital economy’. Supporting my argument in this chapter, they state that ‘LLMs point to the inherent accumulative tendency of capital and corporate ownership in the context of AI, and the subsequent corporate control and power over crucial AI infrastructures, which are associated with a number of societal risks.’
 7. Although one could contend that AI is much more about strategically leveraging hidden correlations between data and, therefore, not as prone to high-speed trading, I maintain that, when it comes to financial markets, acceleration is still at the forefront. ML techniques are directed to promote more encompassing and ‘intelligent’ strategies, but, above all, faster-anticipating analysis and trading automation. Financial AI represents the radicalization of the main trends already present in algorithmic and high-frequency trading: the shortening of space-time flows.
 8. In the *General Theory*, John Maynard Keynes (1936) famously identified the ‘paradox of thrift’ as an example of the fallacy of composition. In this scenario, if individuals collectively attempt to save more during economic downturns, overall demand decreases, leading to a reduction in total savings due to declines in consumption and economic growth.
 9. From interviews with significant figures within the financial industry, Ashta and Herrmann (2021) point to the risk of big-data players dominating the market. This echoes the growing concern about the tendency of Big Tech companies to monopolize knowledge, referred to as data-driven intellectual monopolies (Rikap, 2021; Rikap and Lundvall, 2022).
 10. This is being discussed not only in academic research. Multilateral global financial bodies, such as the Financial Stability Board (FSB, 2017), the Bank for International Settlements (Prenio and Yong, 2021), and the International Monetary Fund (Shabsigh and Boukherouaa, 2023), are also expressing similar concerns.
 11. One intriguing example of this is discussed in Danielsson (2022). It occurred in 1980 when an AI decision support engine named EURISKO employed a clever strategy to outperform all its human competitors in a naval wargame, deliberately sinking its own slowest ships to optimize manoeuvrability. As he rightly observes, this early instance of reward hacking illustrates the inherent challenge of trusting AI. How do we ensure it will consistently make the right decisions? A human admiral does not need to be explicitly told not to routinely sink their own ships (if they do, it requires high-level political acquiescence). In contrast, any current AI must be explicitly instructed. However, the real world is too complex for us to pre-specify rules covering every eventuality, inevitably leading AI to encounter cases where it makes critical decisions in a manner no human would. For a list of similar examples, see Krakovna (2018). For a deeper historical account of AI, see Pasquinelli (2023).
 12. Although there is a growing tendency to use synthetic data (Steinhoff, 2022) to overcome these challenges in different industries, its adoption is still limited in financial markets (Assefa, 2020; Strelcenia and Prakoonwit, 2023).

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