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Chapter I

General Introduction

This doctoral thesis comprises 6 papers which currently are situated in a variety of phases throughout publication processes and deal with questions regarding Corporate Social Responsibility (CSR) and Environmental, Social, Governance (ESG). Peer review status or publication information including the respective journal's VHB-JOURQUAL3 rating as well as information regarding presentation of the paper at conferences and workshops are presented on the title page of each chapter.

The main underlying pattern of all included papers is the question whether and in which way shareholders and investors evaluate CSR efforts. In this context, two opposing theories serve as foundation of the investigations: On the one hand, Friedman's (1970) doctrine that a firm's only purpose is to maximize shareholder value in conjunction with the assumption that CSR investments might be a waste of valuable resources (Barnea and Rubin, 2010), and on the other hand Freeman's (1984) stakeholder theory. According to this stakeholder-focused school of thought, shareholders can still experience growth of value even when managers include stakeholder considerations into the operational decisions. Firms engaging in CSR aspects experience support by their stakeholders and are provided with (rather scarce) resources (Deng et al., 2013). Moreover, these efforts facilitate improved reputation that can lead to better performance (see e.g. Brammer and Pavelin, 2006; Berman et al., 1999; Carmeli et al., 2007) and increased shareholder value (see e.g. Jain et al., 2016). Consequently, positive evaluations of CSR efforts in the following chapters indicate supportive results for the stakeholder theory whereas comparatively negative evaluations would corroborate the shareholder theoretical argumentation.

In chapter II the paper "Doing safe by doing good: Non-financial reporting and the risk effects of corporate social responsibility" is presented. This chapter investigates whether investors perceive risk-reducing capabilities of firm's CSR efforts differently in the EU or U.S. disclosure regimes. Although the equity risk-reducing effect is well-established in literature (Oikonomou et al., 2012; Diemont et al., 2016; Sassen et al., 2016; Monti et al., 2018; Albuquerque et al., 2020) little is known about the importance and effects of non-financial disclosure obligations and the comparison of different regimes in this context. The findings indicate a more pronounced risk-reducing effect for firms in the EU disclosure system than for U.S. firms. The study argues that in line with goal-framing theory (Lindenberg, 2000, 2003; Lindenberg and Foss, 2011) the European (mandatory) CSR disclosure regime steers investors' attention to especially focus on CSR issues when evaluating firm risk. Consequently, in the European context firm CSR efforts are perceived as particularly risk-mitigating compared to the less CSR disclosure-focused U.S. reporting regime.

The juxtaposition of the risk-reducing capability of CSR efforts for EU and U.S. firms is also the intention in the following chapter III. The title of the paper in this chapter is "Corporate Social Responsibility and Credit Risk". It particularly deals with a comparison of the aforementioned regional differences between U.S. and EU in CSR aspects with a special focus on credit risks. The findings indicate that in the EU environmental and social engagements of firms lead to lower market-based credit risk assessments while in the U.S. only environmental efforts are granted with lowered market-based credit risks. Interestingly, the credit ratings do not reflect risk-reductions induced by positive ESG efforts in both regions.

The evaluation of CSR efforts is especially relevant for the assessment of firm risk. However, CSR engagement might also be associated with value implications. Chapters IV and V shed light on (mis)valuation-related developments for firms and funds that might stem from considerations of ESG aspects in the investment process — the trend of sustainable investing. Chapter IV with the paper "Corporate social responsibility and market efficiency: Evidence from ESG and misvaluation measures" shows that ESG engagement of firms might be associated with misvaluation of U.S. firms. The trend of sustainable investing (see e.g. Renneboog et al., 2008) leads to relatively higher valuations in comparison to true value assessments, i.e. increased over- and decreased undervaluation. In a similar vein, the paper "The sustainability trap: Active fund managers between ESG investing and fund overpricing" in chapter V investigates these effects for U.S. mutual funds. Higher CSR ratings of fund portfolios go along with higher fund overpricing. This is particularly relevant since the comparatively new Active Fund Overpricing (AFO) measure introduced by Avramov et al. (2020) tries to capture fund investment skill through the consideration of fund overpricing. Hence, a main implication of the paper is to acknowledge the effect of CSR issues for fund pricing in order to avoid a misjudgment of the fund managers' skill.

The last two chapters investigate CSR matters on a more granular level. The comparatively new paper "Zooming in on CSR: Which aspects of CSR are relevant for companies' equity risk?" in chapter VI targets the subcategories of Refinitiv's ESG score. Analogously to chapter II equity risk effects are analyzed but now for a sample of European firms and with a special focus on the individual aspects of ESG. Indeed the results indicate that specific categories — namely the environmental innovation, human rights and community engagement as well as a CSR strategy — can facilitate an equity risk-reducing capability for European firms. Other aspects seem not to be assessed as particularly relevant for equity risk.

Finally, the last paper "The glass cliff myth? Evidence from Germany and the U.K." in chapter VII studies an explicit subcategory of ESG issues: gender questions in management. This paper investigates the existence of the "glass cliff" for German and U.K. directors. The term glass cliff was proposed by Ryan and Haslam (2005) and describes the issue that women often only reach those leadership positions that can be described as precarious and close to a 'cliff'. However, the analyses do not reveal the glass cliff to be present for female German and U.K. board directors between 2005 and 2015.

Chapter II

Doing safe by doing good: Non-financial reporting and the risk effects of corporate social responsibility

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Doing safe by doing good: Non-financial reporting and the risk effects of corporate social responsibility

Abstract

We compare the effects of corporate social responsibility (CSR) on firms' equity risk under two different (non-)financial reporting regimes: the risk-based U.S. and the content-based EU system. We observe a strongly negative CSR-risk relation in the EU, but hardly any in the U.S. In correspondence with goal-framing theory, we find several moderating effects on this association, depending on the reporting regime: *(i)* A highly volatile market environment strengthens the risk-reducing effect of CSR in the U.S. system, but not in the EU; *(ii)* Rising CSR awareness buttresses the risk-reducing effect of CSR in the EU, but weakens it in the U.S.; *(iii)* Risk reductions are most strongly associated with social and governance rather than environmental activity in the EU regime, while there are no such individual effects in the U.S. Despite these differences, we observe that return-to-risk ratios decrease similarly with CSR activity in both the U.S. and EU system over the period 2003 - 2017.

JEL Classification: G11; G32; G34; O16; Q56

Keywords: Non-financial reporting; corporate social responsibility; ESG; sustainability; equity risk; stock return; dynamic panel estimation

II.1 Introduction

Over the past few years, non-financial corporate activities such as those referring to environmental, social and governance (ESG) matters — often subsumed as sustainability or corporate social responsibility (CSR)[1] — have become increasingly important for corporate managers. The UN Global Compact-Accenture CEO study in 2016 reports that 90 percent of global CEOs see it as a personal responsibility to ensure that their company has a core purpose and role in society (United Nations, 2016). A similar survey in 2019 indicates that 71 percent of CEOs believe that "business can play a critical role in contributing to the Global [Sustainable Development] Goals" (United Nations, 2019). This trend has been paralleled by an increasing interest of financial market participants to invest sustainably: According to the 2018 Global Sustainable Investment Review, the amount of assets invested along sustainability criteria reached $30.7 trillion globally; sustainable investment in the U.S. makes up 25.7% of total managed assets, in Europe the proportion is even higher at 48.8% (USSIF, 2019).

Despite the strong interest in CSR from both firm managers and capital markets, as of yet no unified framework for companies to report on their non-financial activities exists, however. What is more, there is not even a global consensus on the obligation for non-financial reporting at all (Berg et al., 2020). The divergence of reporting needs with regard to CSR becomes plainly apparent when comparing the U.S. with the European approach: Security laws require U.S. firms to disclose all those issues which might pose a material *financial risk*, irrespective of whether they pertain to CSR or not. This contrasts with the EU regime where the CSR strategy of 2011 and the ensuing Non-Financial Disclosure Regulation (EU Directive 2014/95) clearly set out the *content* of what has to be reported. Against the backdrop of a strong and growing demand for CSR information from capital market participants, this divergence of reporting approaches hence gives rise to the question whether investors perceive the effects of CSR activities

[1]As CSR, sustainability and ESG are used interchangeably we mainly refer to CSR in this study. With regard to reporting, we mostly refer to non-financial disclosures as this appears to be the established term from a regulatory perspective.

differently, depending on the disclosure regime.

Indeed, goal-framing theory suggests that this might be the case (Lindenberg, 2000, 2003; Lindenberg and Foss, 2011). According to this theory, a person's perception of a decision situation and their eventual decision are related via overarching goals which can be normative, gains-oriented or hedonic: The prevalent goal frame steers attention towards specific pieces of information and options and away from others. For our analysis, we make use of the fact that the prevalence of a goal frame is manipulable. Particularly normative goals — to "do what is right" — are strongly dependent on supporting signals from the surrounding environment (Etienne, 2011). We argue that this is exactly what reporting regimes do: They act as cues that help different goal frames to become prevalent or "focal". More precisely, we hypothesize that the content-focused European reporting regime represents a pure normative goal signal that steers investors' attention to corporates' socially responsible actions per se. The risk-focused U.S. disclosure system, in contrast, predominantly supports the gains-oriented goal frame which should induce investors to scrutinize sustainable corporate activities only if they are financially relevant.

In order to test the mediating role of the reporting system on sustainable investing decisions, we refer to a channel that is already well-established in the empirical literature: the risk-reducing effect of CSR (Oikonomou et al., 2012; Diemont et al., 2016; Sassen et al., 2016; Monti et al., 2018; Albuquerque et al., 2020). This effect is often explained by CSR activities creating "moral capital" (Godfrey, 2005; Godfrey et al., 2009) or reducing firms' profit elasticity via product differentiation (Jagannathan et al., 2017; Albuquerque et al., 2020).[2] To differentiate clearly between the two reporting regimes' effects, we examine moderating factors on the risk-reducing role of CSR that should make CSR issues more focal either in the content- or in the risk-based disclosure regime. If we can show that these factors have a moderating impact that is

[2]By focussing on the CSR-risk channel, we deliberately make it difficult to find differences between the two disclosure regimes in our analyses. This is because not only the content-based European system might lead investors to perceive a strong CSR-risk relation because of specific CSR issues based on a normative goal frame, but also the risk-focused U.S. reporting system could induce investors to consider specifically the risk aspects from CSR based on a gains-oriented goal frame.

aligned with goal-framing theory, this should be seen as robust evidence of a mediating role of the (non-)financial disclosure regime with regard to the perception of CSR.

Our analyses provide us with four sets of results based on data of 1,113 U.S. and 746 European companies from 2003 to 2017. First, we show that perceived firm risk, approximated via a battery of different equity-market based risk measures, decreases along with CSR under the European, but barely under the U.S. disclosure regime. We make sure that our results are robust against potential endogeneity concerns by applying different estimation techniques, employing different approximations of reporting regimes and considering a host of control variables.

Second, we find evidence for moderating effects of different factors on the CSR-risk relation that are predominant in either the U.S. or the European disclosure system. More precisely, we hypothesize and show that an elevated market volatility raises attention towards financial risks in investors' decisions so that CSR issues become more focal even in the risk-based U.S. disclosure system, strengthening the CSR-risk relation there. For EU firms, in contrast, we observe no such moderating effect. We furthermore conjecture that stronger awareness of CSR activities should act as an additional cue to strengthen the CSR-risk relation in the content-focused European disclosure system. Supporting this hypothesis, we find that stronger CSR awareness, approximated by the proportion of firms voluntarily reporting on their CSR activities in the geographic area, buttresses the risk-reducing effect of corporate sustainability in the EU. However, in the U.S. stronger CSR awareness decreases the CSR-risk relation. These findings confirm our presumption that the focus of the disclosure regulation indeed affects investors' perception of risk effects following from corporate sustainability.

Our third set of results examines the mediating role of the disclosure regime on the CSR-risk relation in more detail and isolates the different sustainability components, i.e. environmental, social and governance (ESG) matters. Re-running our panel analyses on these individual ESG components instead of the aggregated CSR score shows that for European firms the risk reduction is driven by social and governance activities, whereas environmental activities do not play a role. It hence seems to be the case that the content-based reporting approach of the EU leads investors to more comprehensively perceive the risk impact of less "visible" issues such as social as compared to environmental matters (Cormier and Gordon, 2001; Görgen et al., 2020). For U.S. companies, in contrast, there is no evidence of individual risk-reducing effects of environmental, social or governance activities in isolation.

Our final set of analyses examines further consequences of the mediating role of non-financial disclosures. Based on a portfolio approach, we question whether the return per unit of risk increases or decreases with higher CSR activity under either of the two reporting systems. In accordance with earlier studies considering individual CSR activities such as environmental issues (Görgen et al., 2020) or social aspects (Fabozzi et al., 2008; Hong and Kacperczyk, 2009), we show in a first step that equity portfolios of firms with higher CSR indeed yield lower returns. This negative return effect of CSR is significant both under the U.S. and the EU disclosure regime and is of almost similar magnitude. Surprisingly, when we combine the CSR-return effect with the CSR-risk effect by building average return-to-risk ratios in a second step, we find that the reduced risk for higher CSR portfolios is not able to fully compensate the lower returns. Rather, return-to-risk ratios decrease with increasing CSR. This result is robust with respect to the different equity risk measures that we employ and it holds both under the U.S. and European disclosure regime.

In sum, our findings indicate that the (non-)financial disclosure regime indeed frames investors' perceptions regarding the risk effects of CSR activities. The content-based European reporting system gives rise to significant equity risk reductions due to CSR that are further strengthened by voluntary corporate reporting raising the general awareness of sustainability as a normative goal. Furthermore, this content focus of the EU disclosure regime induces investors to consider particularly the risk effects of social and governance matters that may be less in the center of current public attention but that have deep cultural roots in Europe. The risk-based U.S. disclosure regime, in contrast, channels attention towards a potential risk-reducing role of CSR only if a volatile market environment lets a stabilization appear particularly beneficial to achieve more utilitarian goals. Surprisingly, return-to-risk ratios decrease with increasing CSR level under both disclosure regimes, so that the lower risk seems to be outweighed by even lower returns from sustainable investments, irrespective of the reporting standard surrounding the investment decisions.

The remainder of this paper is structured as follows. Section II.2 reviews the literature and derives the hypotheses. Section II.3 presents the data and delineates the variables construction. Section II.4 outlines the research design of our firm-level analyses. Section II.5 presents our main results regarding the mediating role of the (non-)financial reporting regime for the CSR-risk relation and provides further insights on the portfolio level. Section II.6 discusses potential implications of our results and concludes.

II.2 Background and hypotheses

II.2.1 Related literature

Ever since Friedman's (1970) early arguments on the role of corporate social responsibility have the effects of CSR been examined in numerous scientific studies. In contrast to the still extensively discussed impact on financial performance,[3] the association between CSR and firm risk appears much less disputed. Godfrey (2005) is one of the first to claim that CSR activities allow companies to create "moral capital", thus cushioning stakeholders' sanctions in case of negative events similar to an insurance (Godfrey et al., 2009). Relatedly, Albuquerque et al. (2020) argue that CSR represents a product differentiation strategy which allows firms to generate a more loyal customer base and reduce the price elasticity of demand, thus decreasing systematic risk. Jagannathan et al. (2017) furthermore emphasize that negative sustainability events may cause severe changes in consumer tastes or regulations that can lead to large swings in asset prices. Avoiding these rare events via effective CSR should therefore lead to lower (extreme) risks for these firms.

Based on these arguments, a host of empirical papers has studied the association between CSR and firm risk, employing various types of risk measures: Luo and Bhattacharya (2009) report a negative relation between CSR and idiosyncratic risk for U.S.

[3]See for instance Margolis et al. (2009); Hong and Kacperczyk (2009); Dhaliwal et al. (2011); Ghoul et al. (2011); Friede et al. (2015) for a broad overview of different results.

firms. Sassen et al. (2016) find that CSR reduces total and idiosyncratic risk for European firms. Salama et al. (2011) examine the impact of environmental and social corporate activity on systematic risk in the U.K. and find a small negative effect. Oikonomou et al. (2012) show for a sample of S&P500 firms that the equity risk increasing effect of irresponsible corporate activities is actually stronger than the risk-reducing effect of responsible activities. Jo and Na (2012) demonstrate that CSR activities of firms in controversial industries, i.e. alcohol, tobacco or gambling, reduce total firm risk more than of those in non-controversial industries. Kim et al. (2014) consider the effect of CSR on stock price crash risk and report a negative relation for U.S. firms. A negative CSR-risk relation is also confirmed by Hoepner et al. (2021) who examine engagement by an activist investor with respect to social and governance strategies. Finally, Albuquerque et al. (2020) report that U.S. firms with higher environmental and social ratings display lower stock return volatility during the first weeks of the Covid-19 pandemic.

This literature pays only little attention to differences between individual jurisdictions and their potential role for the CSR-risk relation, however. Among the few studies to do so, Monti et al. (2018) examine several moderating factors of the CSR-risk relation in a global data set from 2002 to 2015. They find that the risk-reducing role of CSR is stronger in countries with weak security regulation and disclosure requirements and where financial information is less widely spread. We follow in this vein and focus on the question whether (non-)financial reporting standards mediate the CSR-risk relation. Based on a more homogeneous dataset compared to the global study by Monti et al. (2018), we build our argument on a behavioral microfoundation, combined with elements of cognitive science and social psychology, in the form of the goal-framing theory.

Goal-framing theory relates motivation and cognition of individuals via overarching goals that are based on either an individual or a supra-individual mindset (Lindenberg, 1993, 2000; Lindenberg and Foss, 2011; Foss and Lindenberg, 2013). In doing so, goal-framing theory distinguishes between three overarching goals: a hedonic goal, which comprises the desire to improve the way one feels at this moment, a gains goal, which expresses the desire to improve one's (financial) resources, and a normative goal, which comprises the desire to act appropriately in the service of a collective entity. When a goal becomes focal, it frames a situation by steering attention to or away from pieces of information, consideration of alternatives and employment of knowledge to form a decision (Etienne, 2011). In order to influence behavior in this way, i.e. to become focal, goals need to be activated by situational cues. Indeed, the strongest cues in the environment seem to come from observation of other people's goal frames (Aarts et al., 2004; Keizer et al., 2008) and particularly normative goals need strong support from such cues or goal signals in order not to succumb to the more easily activated individual-oriented (gains or hedonic) goals. In fact, sustainability-related activities of individuals have been shown to be framed strongly by such normative goals (Lindenberg and Steg, 2007; Bilandzic et al., 2017; Chakraborty et al., 2017; Hameed and Khan, 2020).

II.2.2 Hypotheses

Based on this behavioral microfoundation, we conjecture that (non-)financial reporting standards might act as situational cues according to goal-framing theory: They may activate an overarching goal, which then steers an individual investor's cognition by drawing attention to certain pieces of information and alternative options.[4] In addition, observing other market participants' decisions, which will be based on the same overarching goal if covered by the same reporting standard, should create further cues, making the respective goal even more focal. We test this argument with regard to investors' risk perceptions of firms' sustainability activities, as risk cognitions have been shown to be particularly susceptible to framing effects (Stössel and Meier, 2015), and compare two disclosure systems with completely different treatment of sustainability matters: The U.S. system, where companies remain exempt from compulsory CSR disclosures to date, and the EU regime that requires CSR disclosures from 2014 on but where sustainability has been the focus of many earlier regulatory initiatives (Cahan et al., 2016).

[4]Our hypothesis in this regard runs in parallel to Etienne (2011) who argues that regulation is an important way to order priorities and uses goal-framing theory to explain the effectiveness of compliance management systems.

More precisely, security laws require U.S. firms to disclose all financially material issues, irrespective of whether they pertain to CSR or not (Christensen et al., 2018, 2021). Regulation S-K, which sets out the ongoing reporting requirements of public companies, in this respect refers to those "trends or uncertainties that have had or [...] will have a material favorable or unfavorable impact on net sales or revenues or income from continuing operations" (Item 303). By emphasizing the effect on financial outcomes — sales, revenues, income — as the criterion for whether to report (non-financial) matters or not, the U.S. regulation can be seen as strongly *risk-focused*: Independent of a specific context, any aspect that conveys a financial risk has to be publicly disclosed.

This contrasts with the regulation in the European Union where a mandatory non-financial reporting regime was adopted in 2014 after a lengthy public discussion on the topic. As early as 1997, the European Commission initiated a Sustainable Development Strategy with the objective to maintain economic growth while supporting environmental protection as well as social cohesion (European Commission, 2021). For French, U.K. and Danish companies some sustainability disclosure was actually mandatory even in the 2000s (Jackson et al., 2020). Though these disclosures were mostly narrative, they nevertheless focused on a clear set of (mainly environmental and employment-related) issues (Havercroft and Reisberg, 2014; Aureli et al., 2018). Based on these early experiences, the European Commission's CSR strategy of 2011 was among the first broad initiatives to define corporate social responsibility succinctly as "the responsibility of enterprises for their impacts on society" (European Commission, 2011). Many commentators perceived this as a paradigm shift that alleviated the voluntariness of the concept and made companies responsible for society (Roberts and Markley, 2011). Based on this strategy, the directive on non-financial reporting (EU Directive 2014/95) was passed in 2014 and transferred into national laws that prescribe sustainability reporting for large, capital-market oriented companies from business year 2017 on. According to the directive, European firms need to disclose the "development, performance, position and impact" of their activities regarding "environmental, social and employee matters, respect for human rights, corruption and bribery matters" (European Union, 2014).

In contrast to the U.S. regulation, the recent European directive and its regulatory predecessors hence clearly set out the informational elements of what shall be reported and can therefore be seen as strongly *content-based* in this respect.

From these distinct characteristics of the two disclosure frameworks, we derive the following first hypothesis: We believe that the content-based EU reporting regime lets a normative goal frame become prevalent, inducing investors to perceive corporate activities that are "good for society" more strongly. This leads them to take investment decisions that give rise to a strong risk-reducing effect of CSR as deduced from the ensuing stock price development. The risk-focused U.S. reporting system, in contrast, does not let the normative goal become prevalent. Instead, it falls back to the more utilitarian gains-goal frame. As CSR activities are among a multitude of further risk drivers to be considered under a gains-goal, the observed CSR-risk relation should therefore be generally weaker for U.S. firms.

Hypothesis 1: *The equity risk-reducing effect of CSR activities is generally stronger for firms under the EU than under the U.S. disclosure regime.*

The mediating role of the reporting system for the general CSR-risk relation referred to in hypothesis 1 may, however, be overlayed by various other goal signals that could further moderate the way investors perceive risks under either of the two reporting frameworks. Indeed, Lins et al. (2017) and Monti et al. (2018) show that investors perceive CSR as particularly stabilizing in crisis periods, and Diemont et al. (2016) report a significant relation between CSR and tail risks only in extreme market conditions. Correspondingly, we conjecture that market volatility may act as a cue that lets sustainable corporate actions appear particularly helpful under the gains-goal frame of the risk-focused U.S. reporting regime. As, in contrast, a higher surrounding market volatility should not increase the "oughtfulness" of CSR in general, we do not expect this moderator to strengthen the CSR-risk relation under the normative goal frame of the EU dislosure system to the same extent.

Hypothesis 2a: *The surrounding market volatility moderates the CSR-risk relation more strongly under the U.S. than the EU disclosure regime.*

Vice versa, we posit that goal signals that serve to support the normative goal frame per se should be expected to strengthen the CSR-risk relation particularly under the EU reporting framework. As the strongest cues are reported to come from other people's goals in the same decision situation (Aarts et al., 2004; Keizer et al., 2008), we argue that more broad-based awareness of CSR activity should strongly support a normative goal frame. We approximate CSR awareness with the proportion of firms per geographic area (U.S. or EU) that (voluntarily) report on their CSR activity and posit the following hypothesis:

Hypothesis 2b: *CSR awareness moderates the CSR-risk relation more strongly under the EU than the U.S. disclosure regime.*

Relatedly, we expect the different facets of corporate sustainability to play more pronounced individual roles for investors' risk perceptions under the European disclosure regulation as compared to the U.S. regime that does not take the contextual basis of risk effects into account. This argument follows Cesario et al. (2013) who point out that, even within goal framing, the content of a message can be more important than the positive or negative framing with respect to a recommended behavior. Since social aspects have traditionally played a more important role for European firms[5] and stakeholder concerns have regularly been taken more seriously (Aguilera et al., 2006; Matten and Moon, 2008), we conjecture that investors in European firms are particularly sensitive towards the risk effects of social corporate activities. Only the media attention on environmental issues might have been strong enough to steer cognition towards environmental issues also under the U.S. reporting regime so that investors may have been perceptive also to the risk effects of this sustainability component (Alok et al., 2020). In general, however, we believe that the individual ESG facets play a stronger role for European as compared to U.S. firms and posit the following hypothesis:

[5] For example, the German Codetermination Act of 1976, for instance, gives employees a strong representation on companies' boards and leads German firms to consider employee concerns very seriously (Gorton and Schmid, 2004; Frick and Lehmann, 2005). For further information on the use of codetermination on European boards, see also Davies and Hopt (2013).

Hypothesis 3: *Individual environmental, social and governance activities show a stronger negative relation with firm risk under the EU as compared to the U.S. disclosure regime.*

To conclude our analysis, we also consider whether the disclosure regime affects the realized return from CSR. This might be seen as a natural consequence of goal framing since returns are supposed to compensate for the perceived risk of a security: If risk perceptions change, investors' behavior and therefore also realized returns should change. A simple consideration of abnormal returns based on CSR activity, however, does not fully answer the question regarding the preferableness of a CSR-based investment strategy. Rather, both return and risk need to be considered at the same time to find out whether realized returns change more or less strongly with rising CSR level than risk. As there is no clear argument in which way the return-to-risk ratio might be affected by the disclosure regime, we refrain from stating a (directional) mediating effect in our final hypothesis:

Hypothesis 4: *Equity portfolios display return-to-risk ratios that are dependent on the portfolio firms' CSR activities under both disclosure regimes.*

II.3 Data and variables construction

II.3.1 Sample

Our sample consists of all publicly listed companies in the U.S. and in the EU that have received CSR ratings from Refinitiv over the time period 2003 to 2017. Coverage of the Refinitiv database, an enhancement and replacement of the earlier ASSET4 database that started publishing CSR scores in 2002, has evolved over time: Irrespective of whether the firms communicate their CSR activities, the constituents of ever more stock-market indices have been covered by the rating process. Due to these rigorous inclusion rules, the Refinitiv database has been shown to exhibit minimal selection bias as compared to the providers of other CSR ratings (Desender and Epure, 2015).[6]

Panel A in Table II.1 shows that the number of rated firms in our sample increases over time, both in the U.S. and in the EU. Overall, our data set consists of 9,266 firm-year observations in the U.S. sample and 8,928 firm-year observations in the EU sample. While the number of observations is slightly higher in the EU sample in the early years, this changes later on. Particularly in the last three years of our sampling period, we have noticeably more U.S. observations. Panel B in Table II.1 shows the sample breakdown according to country. The largest number of firms in the EU sample is headquartered in the U.K., followed by France and Germany.

Table II.1: Firm sample distribution per year in Panel A and country in Panel B for the U.S. and EU.

Panel A: Time composition

U.S.			EU		
Year	N	%	Year	N	%
2003	208	2.24%	2003	251	2.81%
2004	282	3.04%	2004	378	4.23%
2005	300	3.24%	2005	460	5.15%
2006	371	4.00%	2006	489	5.48%
2007	398	4.30%	2007	523	5.86%
2008	519	5.60%	2008	559	6.26%
2009	583	6.29%	2009	575	6.44%
2010	649	7.00%	2010	608	6.81%
2011	683	7.37%	2011	643	7.20%
2012	696	7.51%	2012	657	7.36%
2013	702	7.58%	2013	667	7.47%
2014	732	7.90%	2014	697	7.81%
2015	1,029	11.11%	2015	770	8.62%
2016	1,059	11.43%	2016	799	8.95%
2017	1,055	11.39%	2017	852	9.54%

Continued on next page

[6]The Refinitiv CSR scores also appear to be quite consistent with other large CSR databases such as the ones by Bloomberg or MSCI (Dorfleitner et al., 2015).

Table II.1 – continued from previous page

Total	9,266	100%	Total	8,928	100%
Panel B: Country composition					
U.S.			EU (cont'd)		
Country	N	%	Country	N	%
United States of America	9,266	100%	Greece	130	1.46%
			Hungary	27	0.30%
EU			Ireland; Republic of	277	3.10%
Country	N	%	Italy	374	4.19%
Austria	157	1.76%	Luxembourg	86	0.96%
Belgium	293	3.28%	Malta	9	0.10%
Cyprus	7	0.08%	Netherlands	398	4.46%
Czech Republic	30	0.34%	Poland	150	1.68%
Denmark	253	2.83%	Portugal	85	0.95%
Finland	305	3.42%	Spain	475	5.32%
France	1,053	11.79%	Sweden	643	7.20%
Germany	947	10.61%	United Kingdom	3,226	36.13%
Gibraltar	3	0.03%	Europe (Total)	8,928	100%

Table II.2 provides the sample breakdown regarding the industry composition according to TRBC Economic sector codes. The table shows that the U.S. sample features the largest number of firms in the financial and consumer cyclical goods industry. In the EU sample most firms belong to the industrials sector followed by the consumer cyclical goods industry. The strongest differences in the industry composition are with regard to technology firms, of which there is a strong overweight in the U.S. sample, and with regard to industrials, which are more prevalent in the EU sample.

Table II.2: Firm sample distribution per year in Panel A and country in Panel B for the U.S. and EU.

U.S.			EU			Difference EU-U.S.	
Industry	N	%	Industry	N	%	Difference	t-Value
Basic Materials	678	7.3%	Basic Materials	907	10.2%	2.8%***	6.804
Cons. Cyclicals	1,661	17.9%	Cons. Cyclicals	1,670	18.7%	0.8%	1.359
Cons. Non-Cyclicals	647	7.0%	Cons. Non-Cyclicals	632	7.1%	0.1%	0.254
Energy	681	7.3%	Energy	569	6.4%	-1.0%***	-2.603
Financials	1,653	17.8%	Financials	1,324	14.8%	-3.0%***	-5.49
Healthcare	804	8.7%	Healthcare	528	5.9%	-2.8%***	-7.162
Industrials	1,388	15.0%	Industrials	2,009	22.5%	7.5%***	13.078
Technology	1,133	12.2%	Technology	471	5.3%	-7.0%***	-16.658
Tele. Services	103	1.1%	Tele. Services	386	4.3%	3.2%***	13.458
Utilities	518	5.6%	Utilities	432	4.8%	-0.8%**	-2.278

Remark: This table shows the industry breakdown according to the TRBC Economic sector code as well as differences between the EU and U.S. Differences between the EU and U.S. sample are calculated and tested for significance using t-tests. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

II.3.2 Variables construction

Dependent variables

We use different measures of firms' equity risk on an annual basis as dependent variables in our firm-level analyses. Following Jagannathan et al. (2017), we take great care in not only examining standard, symmetric equity risk measures but also consider asymmetric and tail risks. With regard to standard equity risk measures, we employ the annual stock *volatility* (σ), which is calculated from daily stock returns that we obtain from Refinitiv. *Idiosyncratic risk* (σ_ϵ) of company i in year t is derived as the volatility of the stock return that is not explained by the company's β according to the capital asset pricing model.

In addition to these two standard equity risk measures, we capture the potentially extreme character of CSR risks in the form of *value at risk* (VaR) and *conditional value at risk* ($CVaR$). Value at risk measures the predicted maximum loss over a given horizon within a specific confidence interval (Jorion, 2007). We calculate it as the 5%-quantile based on the empirical daily stock return distribution for every year. Conditional value at risk corresponds to the mean value of returns below the VaR-threshold. Both *VaR* and *CVaR* are reported in absolute values, so that higher numerical values reflect higher risk. We capture further downside risks via *lower partial moments* (*LPMs*) of the second and third order: *LPM(0,2)* and *LPM(0,3)*. They are calculated as the square and cube root of the semi-variance and semi-skewness below the 0%-return-threshold (Bawa, 1975; Fishburn, 1977), as this allows to compare results metrically. Detailed descriptions and calculations of the dependent variables are presented in Panel A in Appendix I.A.

Explanatory variables

We follow established practice and use the Refinitiv CSR ratings to approximate corporate sustainability activity as our main explanatory variable (Ioannou and Serafeim, 2012; Cheng et al., 2013; Dorfleitner et al., 2018; Breuer et al., 2018; Jackson et al., 2020; Flammer, 2021). The *CSR* score published by Refinitiv is allegedly one of the most comprehensive reflections of a company's sustainability activity and comprises individual environmental, social and governance pillars. Based on more than 400 measures collected annually from companies' and other public disclosures, the environmental component considers issues such as resource use, emissions, and innovation, the social component focuses on the workforce, human rights, community and product responsibility while the governance component is concerned with management issues, shareholder relations and CSR strategy (Refinitiv, 2020). CSR scores are typically published annually but may be adjusted in case of significant firm-specific events (Oikonomou et al., 2012; Berg et al., 2020).

As percentile rank scores, all environmental and social categories are benchmarked against the TRBC Industry Group, while the governance categories are benchmarked against the respective Country Group (Refinitiv, 2020). Our main analyses employ the comprehensive CSR score per firm as main explanatory variable, but we also consider the individual CSR pillars' scores (*Environment, Social and Governance*) in the analyses of Section II.5.4. We translate all scores so that they take values between 0 and 1, where higher values indicate higher sustainability activity. It should be noted that Refinitiv does not backfill data on CSR issues that becomes available in later years. The scores are hence based on data that would have been available for all market participants at the respective point in time.

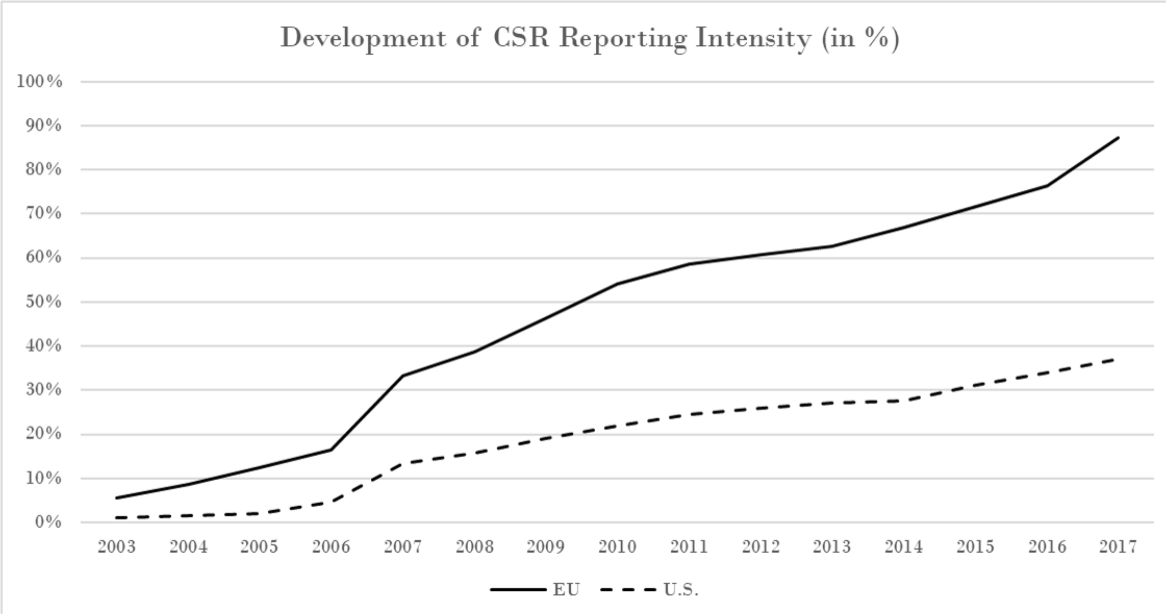
Moderating factors

In order to study the role of the reporting system for the CSR-risk relation in more detail, we consider the effect of two moderating factors. The first is the equity market volatility σ_{m_t}. As it is supposed to capture the volatility in the market surrounding the investor's decision, we use the annual volatility of the daily Fama-French developed market returns in our sample.

As our second moderating factor we consider the annual proportion of firms in the respective U.S. and EU sample that (voluntarily) publish CSR or sustainability reports. These non-financial reports may be integrated in the companies' annual reports, they could also be stand-alone reports or may be web-based — provided they are updated on an annual basis and consist of substantial information regarding at least the environmental and social aspects of operations. Figure II.1 shows the development of this *CSR Reporting intensity*[7] over time. As can be seen, though the proportion of firms reporting on CSR activities increases over time in both subsamples, there is a much higher reporting intensity among European firms compared to U.S. companies (Stolowy and Paugam, 2018).

[7] This variable is abbreviated in tables as *CSR Rep. intensity*.

Figure II.1: Development of CSR Reporting Intensity in the U.S. and the EU.



Remark: This figure illustrates the development of the CSR Reporting Intensity in the U.S. and EU over time according to the sample of firms investigated in this study. The underlying measure captures the percental proportion of companies in the sample that publish a CSR report. The solid line illustrates the reporting intensity in the EU and the dashed line in the U.S.

Control variables

We employ three sets of control variables in our firm-level analyses: firm-specific variables, country-specific variables and time dummies. Our choice of firm-specific controls follows (Titman and Wessels, 1988; Capon et al., 1990; Brailsford et al., 2002) and includes *Leverage* (ratio of total liabilities to total assets), *Size* (natural logarithm of total assets), *Profitability* (operating income divided by total assets) and *Growth* perspectives (growth rate of total sales). These variables have been shown to influence the cost of equity in several earlier studies on the role of CSR (cf. Sharfman and Fernando (2008) or Ghoul et al. (2011)). In addition, we follow Hoepner et al. (2021) and include the *Dividend Yield* as an indication of the management's expectation of the level and volatility of future earnings. Moreover, dividend payments have been shown to have a direct impact on the return distribution in the sense that high dividend payments reduce stock volatility (Oikonomou et al., 2012). We winsorize these firm-specific control variables at 1% in order to limit the influence of outliers.

Our choice of country-specific control variables is guided by Monti et al. (2018) who show that legal aspects and proxies for the financial information environment may affect the risk-reducing role of CSR. More precisely, we consider whether the country uses a civil or common law system in the form of a dummy variable (*Civil Law*), we capture the mandated *Interim Reporting Frequency* of corporates in the country according to DeFond et al. (2007), we employ the scores of *Legal Enforcement* and *Aggregate Earnings Management* provided by Leuz et al. (2003), the effectiveness of a country's *Securities Regulation* according to Hail and Leuz (2006) and a measure of average corporate *Disclosure Requirements* following La Porta et al. (2006).[8] The careful inclusion of these variables allows to control for structural differences in the legal and financial environments of the investigated firms. We finally employ annual time dummies in all our firm-level analyses to narrow down the marginal effect of interest, the risk-reducing impact of CSR. A detailed description of all variables is given in Appendix I.A.

II.4 Research design

Even though the relation between CSR and risk may be less prone to endogeneity problems than the relation between CSR and firm value (Cheng et al., 2013), we nevertheless cannot exclude that biases may result from OLS or fixed effects panel estimations. Endogeneity can arise due to *(i)* measurement error in the explanatory variable (the CSR score in our case), *(ii)* omitted explanatory variables in the regression or *(iii)* reverse causality between the explanatory and the dependent variable (firm risk in our case). If not successfully dealt with, endogeneity may lead to inconsistent estimations so that standard inference testing will not allow a reliable verdict on the effect of interest (Roberts and Whited, 2013; Li, 2016).

[8] Due to space constraints we abbreviate the aforementioned variables in tables the following way: *Interim Rep. Freq.*, *Aggr. Earn. Mgmt.*, *Sec. Reg.* and *Disc. Requ.*.

To deal with these concerns, we take several attenuating measures: First, we address the concern of a potential measurement error by not only examining the relation between the total CSR score and firm risk, but also by considering the effect of the individual ESG pillars in isolation (see Section II.5.4). This should allow us to assess the CSR-risk relation more comprehensively and robustly. Second, in order to reduce the problem of omitted variables in our analyses, we make use of an extensive number of firm- and country-specific control variables that have been shown to be relevant in the earlier literature. In addition, we include year-fixed effects in all our firm-level analyses to control for unobservable time effects and hence facilitate the identification of the marginal effect of interest. We furthermore address a potential selection bias via employment of an extensive propensity score matching procedure for our main analysis of hypothesis 1 (see Section II.5.2). This procedure attempts to even out structural differences between the sample of EU and U.S. firms, thereby reducing the potential effect of unobservable variables.

Third, to approach the problem of reverse causality we start by examining whether our data show a dynamic relation between equity risk and CSR in the first place. Indeed, using dynamic OLS estimations following Eugster (2020), we establish some evidence of an intertemporal effect of past equity risk on present and future values of the CSR score.[9] As this indicates that reverse causality may be a valid concern for our question at hand, we follow Wintoki et al. (2012) and Eugster (2020) and derive a set of instruments from the dynamic relation between explanatory and dependent variable via a GMM estimation approach.[10] More precisely, we estimate equations of the following dynamic form, where the past realization of the dependent variable is considered among the explanatory variables:

$$y_{i,t} = \beta_1 y_{i,t-1} + \beta_2 \phi_{i,t} + \beta_3 x_{i,t} + \upsilon_i + \varphi_t + \epsilon_{i,t} \tag{II.1}$$

Here, $y_{i,t-1}$ represents the lagged dependent variable, i.e. firm risk in our case. $\phi_{i,t}$

[9] Results are illustrated in Appendix I.B.

[10] Dynamic panel GMM regressions are estimated using the Stata-command xtabond2 with the following options: twostep, robust, small, orthogonal and collapse. The lag length to determine the instruments is (3 3).

contains the explanatory variable(s), i.e. the CSR score and the CSR pillar scores, so that the coefficient β_2 demonstrates the contemporaneous impact of CSR on firm risk. $x_{i,t}$ is a vector of control variables. υ_i and φ_t are time-constant firm effects and firm-constant time effects, respectively. $\epsilon_{i,t}$ denotes the idiosyncratic error term in the regression.

In such a dynamic panel, the inclusion of the lagged dependent variable among the regressors captures the potential impact of time-varying omitted variables, hence, eliminating endogeneity effects stemming from reverse causality issues. In order to estimate this dynamic equation consistently, however, a two-step system-GMM estimation procedure has to be employed. This approach contains two equations for instrumenting the differences as well as the levels of the endogenous regressors. More specifically, the differences in endogenous variables are instrumented by the lagged historical levels of the respective variables (Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998).[11] Unfortunately, the condition for consistency of the GMM estimation cannot be taken for granted.[12] We therefore report a host of different test statistics with the estimation results. Most importantly, we have to consider a general tradeoff in the choice of the instruments' lag length: While increasing the lag length makes the instruments more exogenous, this also tends to make them weaker, i.e. less relevant to explain the potentially endogenous explanatory variable of interest, the CSR score. We hence not only describe the number of instruments used and the concrete choice of lag length for each regression. Rather, we also report the Hansen-J statistic, which allows to test if the respective instruments as a group are exogenous, and the AR(2) test for serial correlation in the level equation which would indicate a specification error. We

[11] If a simple fixed-effects estimation approach were used on this dynamic panel, this might lead the differenced error term $\Delta\epsilon_{i,t}$ and the lagged dependent variable $\Delta y_{i,t-1}$ to become correlated via $\epsilon_{i,t-1}$. By instrumenting the lagged dependent variable, $\Delta y_{i,t-1}$, with its deeper lag, for instance $y_{i,t-2}$, the GMM estimation approach delivers consistent result, but only if this instrument is uncorrelated with the error term, $\epsilon_{i,t-1}$.

[12] Rather, the stronger the correlation between the instrument, e.g. $y_{i,t-2}$, and the endogeneous variable $\Delta y_{i,t-1}$, i.e. the better the instrument, the more likely it becomes that this identifying condition is violated.

also apply robust standard errors in the GMM estimation as introduced by Windmeijer (2005).

II.5 Results

II.5.1 Descriptive statistics

Table II.3 reports the descriptive statistics of our data set. Panel A displays the different equity risk proxies as dependent variables. Mean values of equity risks are similar to those from the global sample in Monti et al. (2018). But EU firms show slightly higher standard risks as well as downside risks than the U.S. firms in our sample. According to the t-tests, all differences are significant.

With regard to the distribution of CSR scores in our sample (Panel B), we find the average CSR score to be much higher for the EU sample (at 0.58) than for the U.S. sample (0.52). This significant difference is particularly strongly driven by the much higher environmental score (0.62 vs. 0.50), but also the social score is higher in the EU sample (0.60 vs. 0.54). Only the governance score, which is benchmarked against the country group and, hence, follows a slightly different construction than the other two pillar scores, is slightly lower in Europe.

Panel C presents the moderator variables. While the average equity market volatility is similar in both samples, the CSR reporting intensity is much higher in Europe than in the U.S. (see also Figure II.1). With regard to firm-specific control variables in Panel D, we find that firms in the EU sample are smaller and show a lower revenue growth. At the same time, they have a higher leverage and offer a higher dividend yield. A comparison of the ownership structure i.e. the ratio of domestic to foreign ownership does not reveal any significant difference between U.S. and EU firms. The country-specific control variables show a higher interim reporting frequency, stronger legal enforcement, securities regulation and disclosure requirements for U.S. as compared to EU firms. The aggregate earnings management score, in contrast, is much higher for European than for U.S. companies.

Table II.3: Descriptive statistics for the U.S. and EU sample.

	U.S.						**EU**						**Difference EU-U.S.**	
	Firm-year obs.	Mean	Median	SD	Min	Max	Firm-year obs.	Mean	Median	SD	Min	Max	Difference	t-Value
Panel A: Risk measures														
σ [%]	9,266	2.023	1.720	1.063	0.809	6.921	8,928	2.123	1.871	0.918	0.803	6.329	0.100***	6.806
σ_ϵ [%]	9,266	1.626	1.378	0.856	0.660	5.785	8,928	1.740	1.536	0.776	0.651	5.963	0.113***	9.328
VaR [%]	9,262	3.163	2.664	1.710	1.214	10.651	8,927	3.375	2.960	1.514	1.210	9.730	0.212***	8.824
CVaR [%]	9,262	4.502	3.817	2.428	1.680	15.391	8,927	4.705	4.137	2.149	1.669	14.561	0.203***	5.97
LPM(0,2) [%]	9,266	1.996	1.702	1.032	0.783	6.548	8,928	2.073	1.836	0.893	0.767	5.956	0.077***	5.373
LPM(0,3) [%]	9,266	2.587	2.186	1.413	0.958	8.992	8,928	2.660	2.324	1.241	0.929	8.282	0.073***	3.679
Panel B: CSR variables														
CSR	9,266	0.524	0.511	0.176	0.099	0.979	8,928	0.577	0.583	0.161	0.078	0.959	0.053***	21.254
Environment	9,264	0.502	0.472	0.224	0.030	0.990	8,925	0.616	0.634	0.203	0.025	0.993	0.114***	35.783
Social	9,264	0.538	0.526	0.196	0.047	0.990	8,925	0.598	0.611	0.200	0.048	0.991	0.059***	20.123
Governance	9,266	0.531	0.539	0.216	0.034	0.991	8,928	0.510	0.509	0.206	0.010	0.990	-0.021***	-6.835
Panel C: Moderator variables														
σ_{mt} [%]	9,266	0.842	0.777	0.388	0.365	1.927	8,928	0.847	0.777	0.397	0.365	1.927		
CSR Rep. Intensity	9,266	0.241	0.260	0.103	0.012	0.370	8,928	0.531	0.586	0.237	0.055	0.874	0.290***	107.523
Panel D: Firm-specific control variables														
Leverage	9,266	0.614	0.612	0.214	0.087	1.408	8,928	0.626	0.629	0.198	0.018	1.165	0.012***	3.95
Sales Growth	9,266	0.093	0.060	0.264	-0.509	2.284	8,928	0.079	0.050	0.308	-1.382	2.861	-0.014***	-3.267
Profitability	9,266	0.083	0.075	0.099	-0.539	0.393	8,928	0.081	0.070	0.087	-0.328	0.417	-0.002	-1.409
Size	9,266	22.825	22.670	1.350	19.216	26.748	8,928	22.543	22.439	1.758	17.771	28.361	-0.282***	-12.161
Dividend Yield [%]	9,266	1.921	1.375	2.246	0.000	12.439	8,928	2.010	1.347	2.364	0.000	10.732	0.089***	2.607
Domestic Owner.	9,242	112.730	49.693	1,565	0.197	110,816	8,864	80.965	5.836	3,093	0.000	286,525	-31.765	-0.877

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Table II.3 – continued from previous page

	U.S.						**EU**						**Difference EU-U.S.**	
	Firm-year obs.	Mean	Median	SD	Min	Max	Firm-year obs.	Mean	Median	SD	Min	Max	Difference	t-Value
Panel E: Country-specific control variables														
Interim Rep. Freq.	9,266	4.000					8,209	2.115	2.000	0.320	2.000	3.000	-1.885***	-567.557
Legal Enforcement	9,266	9.500					8,616	8.998	9.200	0.833	6.800	10.000	-0.502***	-58.006
Sec. Reg.	9,266	1.000					8,616	0.546	0.600	0.166	0.200	0.700	-0.454***	-262.634
Disc. Requ.	9,266	1.000					8,616	0.656	0.670	0.172	0.250	0.830	-0.344***	-192.765
Aggr. Earn. Mgmt.	9,266	2.000					8,616	12.918	12.000	6.756	5.100	28.300	10.918***	155.557
Civil Law	9,266	0.000					8,928	0.607	1.000	0.489	0.000	1.000	0.607***	119.504

Remark: This table presents the descriptive statistics for the U.S. sample, the EU sample as well as a comparison of both samples. Differences between the EU and U.S. sample are calculated and tested for significance using t-tests. *Panel A* provides descriptive statistics for the equity risk measures, *Panel B* for the CSR variables, *Panel C* the moderator variables, *Panel D* firm-specific control variables and *Panel E* country-specific control variables. Descriptions of these variables are provided in Appendix I.A. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

II.5.2 The mediating role of the reporting regime — Hypothesis 1

In order to study whether the reporting system plays a mediating role for the CSR-risk relation, we run a panel regression where we test the influence of the firms' CSR activity, measured via the CSR score, on equity risk. We employ a dummy variable for the U.S. reporting framework, so that the coefficient of the CSR score itself captures the risk effect of CSR activity only for firms whose stocks are traded under the EU disclosure framework. To assess the effect under the U.S. regime, this coefficient has to be added to that of the interaction term of the U.S. dummy with the CSR score, as the interaction picks up the difference in this effect between the two reporting regimes. Due to careful consideration of a comprehensive set of control variables, which cover different aspects of the legal and financial environment in our dataset, the U.S. dummy variable should allow us to capture precisely the diverging effects of the two reporting systems on equity risk that we are interested in.

Table II.4 reports the results from the system GMM estimation procedure.[13] As can be seen, the CSR variable shows a highly significant, negative coefficient: Stronger CSR activity of firms in the EU disclosure system indeed reduces their equity risk. The effect is consistent in all regressions, i.e. for all equity risk proxies, and is particularly strong for value at risk and conditional value at risk. This indicates that it is indeed the extreme risks that seem to be most effectively reduced via CSR. With regard to the economic size of the effect, our results imply for instance that an increase in the CSR score by one standard deviation (0.161) decreases the conditional value at risk by 0.717%. Given that the mean of this variable for European firms is 4.705%, this is a non-negligible reduction.

[13]It should be noted that the number of observations in the descriptive statistics differs from the number in the regression output due to the introduction of the lagged dependent variable(s) as well as due to data availability issues regarding the country-specific control variables.

Table II.4: CSR and equity risk — The mediating role of the reporting regime.

	(1)	(2)	(3)	(4)	(5)	(6)
	σ	σ_ϵ	VaR	CVaR	LPM(0,2)	LPM(0,3)
L.dep. var.	0.482***	0.446***	0.541***	0.495***	0.502***	0.447***
	(13.759)	(9.437)	(15.171)	(10.772)	(12.144)	(8.059)
CSR	-1.320***	-1.054**	-2.961***	-4.454***	-1.877***	-2.438***
	(-2.601)	(-2.376)	(-3.590)	(-3.473)	(-3.459)	(-2.907)
U.S.	-1.144***	-0.957***	-2.570***	-3.704***	-1.549***	-1.922***
	(-3.238)	(-3.121)	(-4.438)	(-4.014)	(-3.983)	(-3.156)
CSR*U.S.	1.368***	0.958**	3.689***	5.158***	2.128***	2.479***
	(2.684)	(2.203)	(4.629)	(3.883)	(3.830)	(2.724)
Leverage	0.178	0.358	-0.099	-0.604	-0.283	-0.472
	(0.498)	(1.086)	(-0.180)	(-0.691)	(-0.766)	(-0.812)
Profitability	-2.670***	-2.134***	-4.116***	-6.657***	-2.842***	-4.161***
	(-5.484)	(-4.805)	(-5.514)	(-5.535)	(-5.617)	(-5.144)
Size	0.028	0.029	0.047	0.088	0.040	0.066
	(0.503)	(0.557)	(0.497)	(0.614)	(0.676)	(0.718)
Sales Growth	0.943*	0.902*	1.584*	2.215*	0.935*	1.416*
	(1.797)	(1.699)	(1.702)	(1.693)	(1.736)	(1.723)
Dividend Yield	-0.008	-0.024	-0.008	0.003	0.008	0.023
	(-0.376)	(-1.104)	(-0.221)	(0.062)	(0.341)	(0.653)
Interim Rep. Freq.	0.123	0.139*	0.148	0.218	0.091	0.116
	(1.549)	(1.831)	(1.071)	(1.037)	(1.023)	(0.900)
Legal Enforcement	-0.030	-0.017	-0.074	-0.086	-0.039	-0.034
	(-1.009)	(-0.597)	(-1.553)	(-1.131)	(-1.217)	(-0.716)
Sec. Reg.	-0.031	0.129	-0.055	-0.059	-0.029	-0.008
	(-0.158)	(0.663)	(-0.162)	(-0.113)	(-0.133)	(-0.024)
Disc. Requ.	-0.043	-0.228	0.017	0.068	0.035	0.043
	(-0.176)	(-1.000)	(0.040)	(0.104)	(0.125)	(0.108)
Aggr. Earn. Mgmt.	-0.004	0.000	-0.008	-0.007	-0.003	-0.002
	(-0.481)	(0.043)	(-0.507)	(-0.310)	(-0.302)	(-0.122)
Civil Law	-0.071	-0.155	0.002	-0.151	-0.095	-0.234
	(-0.657)	(-1.548)	(0.009)	(-0.547)	(-0.833)	(-1.296)
Constant	1.014	0.576	2.336	3.235	1.377	1.504

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Table II.4 – continued from previous page

	(1) σ	(2) σ_ϵ	(3) VaR	(4) CVaR	(5) LPM(0,2)	(6) LPM(0,3)
	(0.815)	(0.467)	(1.090)	(1.017)	(1.048)	(0.739)
Firm-year Obs.	15,804	15,804	15,791	15,791	15,804	15,804
Obs.	1,859	1,859	1,856	1,856	1,859	1,859
No. of Instruments	29	29	29	29	29	29
F-stat	425.7	189.1	569.4	419.6	411.8	266
Hansen test (p)	0.331	0.584	0.552	0.461	0.424	0.393
AR (2) p-Value	0.118	0.178	0.752	0.156	0.517	0.057
Lag specification	(3 3)	(3 3)	(3 3)	(3 3)	(3 3)	(3 3)
Year-fixed Effects	yes	yes	yes	yes	yes	yes

Remark: This table presents the dynamic panel estimation of the effects of the *CSR* score on companies' equity risk for the full data set of U.S. and EU firms. Coefficients are estimated according to equation II.1 using the two-step system GMM estimator introduced by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). The dependent variables are the stock volatility σ in model (1), idiosyncratic risk σ_ϵ in model (2), *VaR* in model (3), *CVaR* in model (4) as well as the second and third order lower partial moments *LPM(0,2)* in model (5) and *LPM(0,3)* in model (6). The dummy variable *U.S.* equals 1 if a company is headquartered in the U.S. and 0 for European companies. The interaction term $CSR * U.S.$ multiplies the *CSR* score with the *U.S.* dummy variable. *L.dep. var.* denotes the lagged value of the respective dependent variable. Descriptions of all variables are provided in Appendix I.A. Standard errors are clustered at the firm level and t-statistics are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The interaction term of the CSR score with the U.S. dummy, however, shows a strongly significant, positive coefficient, indicating that for firms under the U.S. reporting framework the risk-reducing effect of CSR is much weaker. Indeed, comparing the coefficient sizes we have to conclude that with the exception of idiosyncratic risk there is hardly any negative impact of CSR on equity risk in the U.S.: In most regressions, the positive coefficient of the interaction term simply counterbalances the negative coefficient of the CSR score. The significantly negative coefficient of the U.S. dummy per se supports our earlier observation that the U.S. firms in our sample in general show smaller equity risk than the European companies. It should be furthermore noted that the test statistics for the system GMM estimation, reported in the lower part of Table

II.4, validate the reliability of the overall identification: Our instruments are exogenous (according to the Hansen J-test for over-identifying restrictions) and our estimation does not suffer from serial correlation (AR(2) test of second-order serial correlation in the residuals).

Taken together, these first results support hypothesis 1 that the negative CSR-risk relation is stronger under the EU disclosure framework than under the U.S. reporting system. We nevertheless acknowledge that the U.S. and EU sample are different across many dimensions (see Tables II.2 and II.3). Though we control for important firm- and country-specific variables, we cannot exclude that further unobservable characteristics unduly affect our estimation. In order to alleviate this concern, we therefore employ a matching approach to make the two subsamples more comparable and rerun our analysis on this matched sample. The matching procedure uses propensity-score nearest-neighbor matching (Rosenbaum and Rubin, 1983) based on all firm-specific control variables, the firms' industry (TRBC Economic sector codes) and the respective years.[14] The quality of the matching can be seen from post-matching descriptive statistics that are reported in Appendix I.C. The matching is indeed able to even out most of the differences in the control variables between the two samples.

Table II.5 reports the GMM estimation results from the matched sample. Though the findings are slightly weaker, they still support our earlier conclusions: The CSR score displays a consistently negative coefficient in all regressions, but it is significant only when the conditional value at risk and the lower partial moments of second and third order are used as dependent variables. Our results still imply an economically significant size of the effect: An increase in the CSR score by one standard deviation (0.159) in the matched sample decreases the conditional value at risk by 0.54%. Similarly to our earlier results, the interaction term with the U.S. dummy shows a positive

[14] In the first step of the matching process, we employ an EU-Dummy as dependent variable, i.e. we match U.S. firms to EU firms. The technical settings for the matching procedure rely on the Stata command psmatch2 and include the following items: one nearest neighbor is matched, no replacement, caliper of 0.2 and the applied estimator is a logit regression. The matching process is performed for each year separately. The caliper setting ensures a minimum level of comparability between EU and U.S. firms.

coefficient which however loses significance only in the regressions for idiosyncratic risk and value at risk.

Table II.5: The mediating role of the reporting regime in a matched sample approach.

	(1)	(2)	(3)	(4)	(5)	(6)
	σ	σ_ϵ	VaR	CVaR	LPM(0,2)	LPM(0,3)
L.dep. var.	0.604***	0.486***	0.648***	0.639***	0.637***	0.583***
	(5.440)	(6.195)	(7.591)	(6.627)	(6.712)	(4.274)
CSR	-0.936	-0.577	-2.018	-3.396**	-1.500**	-2.008**
	(-1.176)	(-0.696)	(-1.124)	(-2.135)	(-2.454)	(-2.108)
U.S.	-0.781**	-0.342	-1.745	-2.943***	-1.247***	-1.523**
	(-2.098)	(-0.795)	(-1.552)	(-2.798)	(-3.064)	(-2.231)
CSR*U.S.	1.269*	0.450	2.975	5.011***	2.111***	2.564**
	(1.913)	(0.578)	(1.563)	(2.804)	(3.034)	(2.197)
Leverage	0.642	1.222	0.541	0.285	0.107	0.136
	(0.631)	(1.095)	(0.286)	(0.167)	(0.166)	(0.131)
Profitability	-1.532	-1.180	-5.008	-5.245	-2.093	-2.998
	(-0.576)	(-0.725)	(-1.551)	(-1.038)	(-1.042)	(-0.818)
Size	-0.163	-0.217	0.032	-0.174	-0.083	-0.105
	(-0.595)	(-0.984)	(0.116)	(-0.433)	(-0.551)	(-0.391)
Sales Growth	-1.329	-2.131	2.594	-0.401	-0.392	-0.329
	(-0.321)	(-0.733)	(0.542)	(-0.053)	(-0.138)	(-0.063)
Dividend Yield	0.076	0.092	-0.051	0.056	0.038	0.027
	(0.549)	(0.900)	(-0.247)	(0.184)	(0.334)	(0.146)
Constant	4.573	5.416	1.068	7.239	3.334	4.453
	(0.873)	(1.324)	(0.175)	(0.811)	(1.024)	(0.765)
Firm-year Obs.	10,767	10,767	10,763	10,763	10,767	10,767
Obs.	1,700	1,700	1,700	1,700	1,700	1,700
No. of Instruments	23	23	23	23	23	23
F-stat	478.2	155.1	312.9	468.1	497	318.8
Hansen test (p)	0.001	0.008	0.115	0.015	0.005	0.009
AR (2) p-Value	0.909	0.568	0.850	0.141	0.440	0.100
Lag specification	(3 3)	(3 3)	(3 3)	(3 3)	(3 3)	(3 3)

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Table II.5 – continued from previous page

	(1) σ	(2) σ_ϵ	(3) VaR	(4) CVaR	(5) LPM(0,2)	(6) LPM(0,3)
Year-fixed Effects	yes	yes	yes	yes	yes	yes

Remark: This table presents the dynamic panel estimation of the effects of the *CSR* score on companies' equity risk for the matched data set of U.S. and EU firms. Propensity score matching is applied and described in detail in Section II.5.2. Coefficients are estimated according to equation II.1 using the two-step system GMM estimator introduced by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). The dependent variables are the stock volatility σ in model (1), idiosyncratic risk σ_ϵ in model (2), *VaR* in model (3), *CVaR* in model (4) as well as the second and third order lower partial moments *LPM(0,2)* in model (5) and *LPM(0,3)* in model (6). The dummy variable *U.S.* equals 1 if a company is headquartered in the U.S. and 0 for European companies. The interaction term $CSR * U.S.$ multiplies the *CSR* score with the *U.S.* dummy variable. *L.dep. var.* denotes the lagged value of the respective dependent variable. Descriptions of all variables are provided in Appendix I.A. Standard errors are clustered at the firm level and t-statistics are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

So far, we have approximated the differences between the two disclosure regimes solely via a dummy variable indicating the U.S. system. Though we are confident that our estimation model allows this dummy to reliably capture the relevant difference in the framing effects of the two reporting regimes, we attempt to distinguish between them also in a more refined way. We therefore repeat our analysis and use the *Difference* in *CSR reporting intensity* between the EU and the U.S. sample as an alternative proxy. Though sustainability reports are offered voluntarily by most firms in our sample, we argue that the reports' contextual focus should nevertheless allow us to approximate more closely the different framing of investors' risk perceptions in the content- vs. risk-based reporting systems. In order to be able to interpret the variable *DiffCSR Reporting* in a similar way to the U.S. dummy, we calibrate it so that it takes a value of 1 for the U.S. reporting system and values between 0 and 1 in the EU disclosure regime. More precisely, we calculate it as

$$DiffCSRReporting_{EU_t} = 0 \leq 1 - (CSRRep.intensity_{EU_t} - CSRRep.intensity_{U.S._t}) \leq 1 \tag{II.2}$$

so that a larger difference in the proportion of firms reporting on CSR issues in the EU versus the U.S. leads to a smaller variable. It comes hence close in design to the earlier U.S. dummy and is therefore quite similar to interpret.

Table II.6 shows the results from this regression. In line with our earlier findings, we observe a strongly significant, negative coefficient of the CSR score. This negative effect is set off by a similarly strongly significant, but positive coefficient of the interaction term with the *DiffCSR Reporting* variable. Again, this may be interpreted as a much weaker, barely existent negative association between CSR activity and equity risk for firms under the U.S. disclosure framework.

Table II.6: The mediating role of the reporting regime approximated by regional differences in CSR reporting.

	(1)	(2)	(3)	(4)	(5)	(6)
	σ	σ_ϵ	VaR	CVaR	LPM(0,2)	LPM(0,3)
L.dep. var.	0.463***	0.460***	0.518***	0.474***	0.475***	0.417***
	(11.45)	(8.754)	(11.95)	(9.097)	(9.858)	(6.807)
CSR	-10.15***	-6.923***	-18.92***	-29.54***	-12.45***	-17.04***
	(-4.827)	(-3.909)	(-5.328)	(-5.373)	(-5.381)	(-4.782)
DiffCSR Reporting	-5.869***	-4.026***	-10.82***	-16.64***	-7.001***	-9.544***
	(-4.927)	(-4.047)	(-5.358)	(-5.308)	(-5.285)	(-4.728)
CSR*DiffCSR Reporting	9.130***	6.152***	17.29***	26.71***	11.21***	15.16***
	(4.888)	(3.929)	(5.520)	(5.423)	(5.414)	(4.706)
Leverage	0.319	0.425	0.200	-0.215	-0.105	-0.255
	(0.713)	(1.072)	(0.272)	(-0.195)	(-0.226)	(-0.367)
Profitability	-1.669***	-1.378***	-2.094**	-3.489**	-1.544**	-2.417**
	(-2.787)	(-2.636)	(-2.198)	(-2.240)	(-2.379)	(-2.364)
Size	0.278***	0.200**	0.537***	0.834***	0.351***	0.492***
	(2.984)	(2.495)	(3.336)	(3.502)	(3.517)	(3.293)
Sales Growth	1.090*	1.040*	1.978*	2.584*	1.053*	1.594*
	(1.886)	(1.787)	(1.833)	(1.793)	(1.803)	(1.852)
Dividend Yield	-0.046	-0.051*	-0.086*	-0.107	-0.038	-0.036
	(-1.617)	(-1.895)	(-1.769)	(-1.465)	(-1.241)	(-0.779)
Constant	2.477*	1.761	3.722	6.043*	2.665*	3.493*

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Table II.6 – continued from previous page

	(1) σ	(2) σ_ϵ	(3) VaR	(4) CVaR	(5) LPM(0,2)	(6) LPM(0,3)
	(1.889)	(1.433)	(1.585)	(1.763)	(1.871)	(1.659)
Firm-year Obs.	15,804	15,804	15,791	15,791	15,804	15,804
Obs.	1,859	1,859	1,856	1,856	1,859	1,859
No. of Instruments	29	29	29	29	29	29
F-stat	303.1	155.6	380.2	284	276.6	190.4
Hansen test (p)	0.082	0.368	0.117	0.052	0.054	0.067
AR (2) p-Value	0.027	0.108	0.482	0.668	0.759	0.286
Lag specification	(3 3)	(3 3)	(3 3)	(3 3)	(3 3)	(3 3)
Year-fixed Effects	yes	yes	yes	yes	yes	yes
Country-specific controls	yes	yes	yes	yes	yes	yes

Remark: This table presents the dynamic panel estimation of the effects of the *CSR* score on companies' equity risk for the full data set of U.S. and EU firms. Coefficients are estimated according to equation II.1 using the two-step system GMM estimator introduced by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). The dependent variables are the stock volatility σ in model (1), idiosyncratic risk σ_ϵ in model (2), *VaR* in model (3), *CVaR* in model (4) as well as the second and third order lower partial moments *LPM(0,2)* in model (5) and *LPM(0,3)* in model (6). According to equation II.2 the variable *DiffCSR Reporting* equals 1 if a company is headquartered in the U.S. and lies between 0 and 1 for European companies. The interaction term $CSR * DiffCSRReporting$ multiplies the *CSR* score with the *DiffCSR Reporting* variable. *L.dep. var.* denotes the lagged value of the respective dependent variable. Descriptions of all variables are provided in Appendix I.A. Standard errors are clustered at the firm level and t-statistics are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

We finally consider hypothesis 1 also in a globalized capital market context and test whether the mediating role of the reporting regime is independent of the investors' country of origin. This is important as the investors' origin might also shape their risk perceptions, e.g. for cultural reasons (Hofstede, 1980; Oyserman et al., 2002). Controlling for such investor origin should allow us to further narrow down the observed risk effect to the disclosure system that rules the investment firms. We therefore repeat our initial analysis and include the fraction of domestic (EU or U.S.) relative to foreign (EU or U.S.) stock holders per company as another variable of interest. We interact this *Domestic Ownership* variable with the CSR score, the U.S. dummy and also build a three-way interaction of the variables.

Table II.7 shows the results. As Domestic Ownership is a continuous variable, the base effect of the CSR score now refers only to European firms that have zero domestic ownership, i.e that are held fully by U.S. investors. Supporting our earlier results, the CSR variable still shows a negative coefficient that is significant in all regressions. Even U.S. investors hence seem to perceive a risk-reduction from stronger CSR for firms under the content-based EU disclosure system. The insignificant *CSR*Domestic Ownership* interaction term reveals no different risk-perceiving views if firms are held by larger fractions of European investors. While the interaction term of the CSR score and the U.S. dummy keeps its significantly positive coefficient in most regressions, just as before, it is interesting to see that the three-way interaction with the Domestic Ownership variable does not display a significant coefficient. Hence, irrespective of whether a firm in the U.S. disclosure regime is held by domestic or foreign investors, a higher CSR score is associated with a less negative risk effect as compared to a firm in the EU reporting system.

Table II.7: The mediating role of the reporting regime and investors' origin.

	(1)	(2)	(3)	(4)	(5)	(6)
	σ	σ_ϵ	VaR	CVaR	LPM(0,2)	LPM(0,3)
L.dep. var.	0.375	0.437	0.554***	0.476***	0.501***	0.438***
	(1.645)	(1.341)	(9.992)	(8.815)	(9.457)	(7.164)
CSR	-1.822**	-1.567**	-5.144***	-6.631***	-3.076***	-3.790***
	(-1.992)	(-2.242)	(-4.911)	(-4.070)	(-4.045)	(-3.464)
U.S.	-1.409***	-1.157***	-3.205***	-4.085***	-1.778***	-2.114***
	(-2.611)	(-3.153)	(-4.626)	(-3.840)	(-3.747)	(-2.959)
Domestic Ownership	0.002	0.001	-0.002	-0.002	-0.002	-0.002
	(0.385)	(0.283)	(-0.519)	(-0.482)	(-0.988)	(-0.850)
CSR*U.S.	1.300	1.214	4.927***	5.778***	2.569***	2.802***
	(0.949)	(1.046)	(5.939)	(3.898)	(4.037)	(2.668)

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Table II.7 – continued from previous page

	(1) σ	(2) σ_ϵ	(3) VaR	(4) CVaR	(5) LPM(0,2)	(6) LPM(0,3)
U.S.*Domestic Ownership	-0.003	-0.001	-0.001	-0.003	-0.002	-0.002
	(-0.478)	(-0.214)	(-0.276)	(-0.436)	(-0.478)	(-0.482)
CSR*Domestic Ownership	-0.004	-0.002	0.004	0.006	0.004	0.005
	(-0.404)	(-0.262)	(0.543)	(0.511)	(1.017)	(0.889)
CSR*Domestic Ownership*U.S.	0.008	0.004	0.003	0.007	0.003	0.004
	(0.546)	(0.262)	(0.319)	(0.433)	(0.423)	(0.409)
Leverage	-0.129	-0.019	-0.682	-0.779	-0.479	-0.592
	(-0.273)	(-0.038)	(-0.868)	(-0.807)	(-0.954)	(-0.928)
Profitability	-2.294***	-1.917***	-4.143***	-6.562***	-2.650***	-3.936***
	(-3.104)	(-2.649)	(-4.149)	(-4.197)	(-3.918)	(-3.792)
Size	0.162	0.085	0.148	0.214	0.099	0.143
	(1.154)	(0.601)	(1.460)	(1.481)	(1.474)	(1.525)
Sales Growth	1.396	0.561	0.198	0.952	0.206	0.607
	(0.856)	(0.276)	(0.103)	(0.652)	(0.255)	(0.647)
Dividend Yield	-0.010	-0.020	0.045	0.065	0.037	0.058
	(-0.277)	(-0.346)	(0.990)	(0.984)	(1.234)	(1.369)
Constant	-0.918	0.332	2.477	2.391	1.131	0.817
	(-0.302)	(0.100)	(0.758)	(0.685)	(0.680)	(0.367)
Firm-year Obs.	15,238	15,238	15,227	15,227	15,238	15,238
Obs.	1,824	1,824	1,823	1,823	1,824	1,824
No. of Instruments	34	34	34	34	34	34
F-stat	1,505	1,614	1,817	1,530	1,560	1,257
Hansen test (p)	0.018	0.023	0.050	0.128	0.156	0.213
AR (2) p-Value	0.493	0.184	0.820	0.177	0.591	0.053
Lag specification	(3 3)	(3 3)	(3 3)	(3 3)	(3 3)	(3 3)
Year-fixed Effects	yes	yes	yes	yes	yes	yes
Country-specific controls	yes	yes	yes	yes	yes	yes

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Table II.7 – continued from previous page

Remark: This table presents the dynamic panel estimation of the effects of the *CSR* score as well as *Domestic Ownership* on companies' equity risk for the full data set of U.S. and EU firms. Coefficients are estimated according to equation II.1 using the two-step system GMM estimator introduced by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). The dependent variables are the stock volatility σ in model (1), idiosyncratic risk σ_ϵ in model (2), *VaR* in model (3), *CVaR* in model (4) as well as the second and third order lower partial moments *LPM(0,2)* in model (5) and *LPM(0,3)* in model (6). The dummy variable *U.S.* equals 1 if a company is headquartered in the U.S. and 0 for European companies. The interaction terms ($CSR * U.S.$, $U.S. * Domestic\ Ownership$ and $CSR * Domestic\ Ownership$) multiply the *CSR* score, the *U.S.* dummy and the *Domestic Ownership* with each other. Finally, the model includes a three-way interaction of the *CSR* score, the *U.S.* dummy and *Domestic Ownership*. *L.dep. var.* denotes the lagged value of the respective dependent variable. Descriptions of all variables are provided in Appendix I.A. Standard errors are clustered at firm-level and t-statistics reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Our findings from testing the mediating role of the (non-)financial disclosure system hence support hypothesis 1: As conjectured, we observe that the content-focused European reporting framework leads investors to perceive the risk-reducing effect of CSR activities much more strongly than the risk-focused U.S. reporting regime. Various robustness checks make us confident that we have indeed derived valid evidence of a mediating role of the disclosure system. Nevertheless, as goal-framing theory emphasizes the importance of situational cues particularly for a normative goal to become focal, we test the influence of further moderating factors on the CSR-risk relation. If they show different effects under the two reporting regimes that are in line with the theory, this should corroborate our main findings even more comprehensively.

II.5.3 Moderating factors and the CSR-risk relation — Hypotheses 2a and 2b

As risk perceptions tend to be influenced by the surrounding market environment (Lipkus, 2007; Vlaev et al., 2009), hypothesis 2a posits that the risk-focused U.S. disclosure regulation leads market participants to consider the risk-reducing effect of CSR more strongly in volatile market phases. We argue that this is explained by the fact that a volatile market acts as a cue for the gains goal which emphasizes the importance of reducing financial risks. Since CSR activity has been shown to be a particularly effective stabilizing force in crisis situations (Lins et al., 2017; Monti et al., 2018; Diemont et al., 2016), we expect that in these market phases the gains goal frame indeed induces investors to perceive the risk-reducing effect of CSR in the U.S. disclosure regime. The normative goal frame activated by the content-based EU system, which focuses on the "oughtfulness" of CSR activities, in contrast, should lead investors to perceive any CSR-risk effect irrespective of the market environment.

In order to assess whether the surrounding market volatility moderates the CSR-risk relation any differently under the two reporting systems, we approximate the market volatility in year t (σ_{m_t}) by the volatility of the daily Fama-French developed market returns. Again, we employ a dummy variable for the U.S. reporting regime and consider differential effects between the two disclosure frameworks via an interaction term of the U.S. dummy with the CSR score and the market volatility. Our main interest regarding the moderating effect of the market volatility is on the estimated coefficient of this three-way interaction in comparison with the simple interaction of the CSR score and the market volatility. It has to be noted, however, that since the market volatility is a continuous variable, the base effects of the individual variables have to be interpreted with caution. Due to the design of our regression model, the coefficient of the CSR score, for instance, has to be interpreted as the effect of an increase in the CSR score for firms under the EU disclosure regime in years with a hypothetical market volatility of zero.

Table II.8 presents the system-GMM estimation results. As before, we observe a consistently negative coefficient of the CSR score, a negative coefficient of the U.S. dummy and a positive coefficient of their interaction term. Due to the design of the estimation model referred to above, these need to be interpreted slightly more restrictive as describing the effects in years with zero surrounding market volatility. Most importantly, however, we observe that the interaction term of the CSR score with the market volatility shows a highly significant, positive coefficient while the interaction term of the CSR score with the market volatility and the U.S. dummy shows a highly significant, negative coefficient that is even larger in absolute size. In sum, this indicates that a more volatile market decreases the risk-reducing effect of CSR under the EU reporting framework but strongly increases it under the U.S. system. Taking together the effect of the base variables with the interaction terms, we find that higher CSR activity induces investors to perceive a risk-reducing effect under the U.S. disclosure regime only for sufficiently high volatility of the surrounding market. This clearly supports hypothesis 2a.[15]

Table II.8: The moderating role of market volatility.

	(1)	(2)	(3)	(4)	(5)	(6)
	σ	σ_ϵ	VaR	CVaR	LPM(0,2)	LPM(0,3)
L.dep. var.	0.559***	0.566***	0.721***	0.616***	0.601***	0.509***
	(9.241)	(7.783)	(8.025)	(8.061)	(8.962)	(7.435)
CSR	-5.735	-4.623	-14.359*	-14.446*	-6.291*	-5.528
	(-1.580)	(-1.642)	(-1.864)	(-1.786)	(-1.833)	(-1.290)
U.S.	-4.002***	-2.584**	-8.906***	-10.051***	-4.227***	-4.402***
	(-2.896)	(-2.521)	(-2.969)	(-3.225)	(-3.233)	(-2.796)
σ_{m_t}	-7.988***	-4.920***	-19.422***	-18.044***	-7.411***	-6.358**
	(-3.389)	(-2.789)	(-3.825)	(-3.272)	(-3.292)	(-2.214)
CSR*U.S.	5.340***	3.289**	12.311***	14.089***	5.835***	6.006***
	(3.094)	(2.494)	(3.323)	(3.511)	(3.510)	(2.910)
σ_{m_t}*U.S.	9.095***	4.973***	21.640***	20.709***	8.735***	8.301**
	(3.343)	(2.613)	(3.735)	(3.247)	(3.314)	(2.430)
CSR*σ_{m_t}	10.930***	6.480**	26.850***	25.080***	10.678***	9.627**
	(3.006)	(2.421)	(3.468)	(2.997)	(3.098)	(2.195)
CSR*U.S.*σ_{m_t}	-15.925***	-8.781***	-38.183***	-36.459***	-15.379***	-14.576**
	(-3.347)	(-2.651)	(-3.756)	(-3.259)	(-3.332)	(-2.434)
Leverage	1.150	0.526	2.191	1.587	0.677	0.482

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[15] It should be noted that the set of instruments in the system GMM estimation appears strong and exogenous according to the test statistics. However, there is some indication of serial correlation in the error terms of the first-stage estimation for some regressions so that the instruments may not be fully relevant in all equations.

Table II.8 – continued from previous page

	(1) σ	(2) σ_ϵ	(3) VaR	(4) CVaR	(5) LPM(0,2)	(6) LPM(0,3)
	(1.532)	(1.132)	(1.356)	(0.936)	(0.923)	(0.548)
Profitability	-0.061	-0.309	3.227	-0.086	-0.097	-1.971
	(-0.041)	(-0.285)	(0.997)	(-0.025)	(-0.067)	(-1.126)
Size	0.292	0.295	0.844	0.702	0.324	0.223
	(1.075)	(1.345)	(1.448)	(1.174)	(1.274)	(0.713)
Sales Growth	0.758	0.460	0.947	1.685	0.777	1.412
	(1.124)	(1.120)	(0.682)	(1.071)	(1.123)	(1.496)
Dividend Yield	-0.087	-0.061	-0.216*	-0.196	-0.077	-0.051
	(-1.474)	(-1.557)	(-1.652)	(-1.428)	(-1.347)	(-0.740)
Constant	-3.181	-3.049	-10.815	-6.939	-3.445	-1.704
	(-0.782)	(-0.954)	(-1.209)	(-0.785)	(-0.916)	(-0.383)
Firm-year Obs.	15,804	15,804	15,791	15,791	15,804	15,804
Obs.	1,859	1,859	1,856	1,856	1,859	1,859
No. of Instruments	33	33	33	33	33	33
F-stat	81.15	79.38	50.51	89.73	83.80	100.1
Hansen test (p)	0.989	0.171	0.407	0.637	0.470	0.555
AR (2) p-Value	0.000	0.000	0.001	0.028	0.007	0.843
Lag specification	(3 3)	(3 3)	(3 3)	(3 3)	(3 3)	(3 3)
Year-fixed Effects	yes	yes	yes	yes	yes	yes
Country-specific controls	yes	yes	yes	yes	yes	yes

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Table II.8 – continued from previous page

Remark: This table presents the dynamic panel estimation of the effects of the *CSR* score as well as the developed market volatility (σ_{m_t}) on companies' equity risk for the full data set of U.S. and EU firms. Coefficients are estimated according to equation II.1 using the two-step system GMM estimator introduced by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). The dependent variables are the stock volatility σ in model (1), idiosyncratic risk σ_ϵ in model (2), *VaR* in model (3), *CVaR* in model (4) as well as the second and third order lower partial moments *LPM(0,2)* in model (5) and *LPM(0,3)* in model (6). The dummy variable *U.S.* equals 1 if a company is headquartered in the U.S. and 0 for European companies. The interaction terms ($CSR * U.S.$, $\sigma_{m_t} * U.S.$ and $CSR * \sigma_{m_t}$) multiply the *CSR* score, the *U.S.* dummy and the index volatility σ_{m_t} with each other. Finally, the model includes a three-way interaction of the *CSR* score, the *U.S.* dummy and σ_{m_t}. *L.dep. var.* denotes the lagged value of the respective dependent variable. Descriptions of all variables are provided in Appendix I.A. Standard errors are clustered at the firm level and t-statistics are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

We next consider the effect of a moderating factor that is supposed to act as a cue for the normative goal frame. We believe that the proportion of firms publishing CSR reports should raise the general awareness with regard to sustainability activities, therefore supporting the normative goal frame of the content-based European reporting framework additionally. As a consequence, we expect to find a stronger risk-reducing effect of CSR activities in Europe with an increasing CSR reporting intensity. The risk-focused U.S. reporting regime, in contrast, should not incite investors to perceive a stronger risk-reduction due to CSR even if the CSR reporting intensity increases as this should not chime with the gains goal activated under this regime. Rather, as this voluntary disclosure cannot be expected to present financially material information in the U.S., it should not affect investors' risk perceptions at all. To test hypothesis 2b, we include the CSR reporting intensity per region in the regression and also interact this variable with the CSR score. To test a moderating role of this factor, our main interest is, again, on the three-way interaction of the CSR score with the CSR reporting intensity and the U.S. dummy. As before, the fact that the CSR reporting intensity is measured on a continuous basis leads the base category to be firms in regions with zero CSR reporting intensity. The coefficient of the CSR score, for instance, has to be interpreted as the effect of an increase in the CSR score for firms under the EU disclosure regime in years where no other firm published a CSR report — a case that is purely hypothetical in our data set (see Figure II.1).

Table II.9 presents the corresponding results. Not commenting on the effects of the base case, we find that the estimated coefficients of the interaction term of the CSR score and the CSR reporting intensity are weakly significant and negative in all regressions: A higher CSR awareness, i.e. more firms reporting on CSR matters, strengthens the risk-reducing effect of CSR activities under the European reporting framework. The highly significant, positive estimated coefficients of the three-way interaction made up of the CSR score, the CSR reporting intensity and the U.S. dummy, in contrast, implies the opposite for firms under the U.S. reporting regime: Here, more firms reporting on CSR matters lead to a less negative CSR-risk relation.

Table II.9: The moderating role of CSR awareness.

	(1)	(2)	(3)	(4)	(5)	(6)
	σ	σ_ϵ	VaR	CVaR	LPM(0,2)	LPM(0,3)
L.dep. var.	0.554***	0.623***	0.632***	0.593***	0.577***	0.517***
	(10.687)	(5.605)	(13.164)	(8.962)	(9.815)	(7.109)
CSR	11.809***	12.171***	16.695***	29.006***	11.818***	16.415***
	(3.593)	(2.720)	(3.508)	(3.508)	(3.508)	(3.002)
CSR Rep. Intensity	4.605	10.560*	8.542*	5.670	1.916	-0.205
	(1.433)	(1.922)	(1.814)	(0.733)	(0.602)	(-0.039)
U.S.	9.460***	10.135***	13.325***	22.799***	9.281***	12.830***
	(3.499)	(2.678)	(3.436)	(3.360)	(3.346)	(2.838)
CSR*CSR Rep. Intensity	-6.329*	-11.169*	-8.436*	-15.478*	-5.744*	-7.920
	(-1.852)	(-1.910)	(-1.721)	(-1.874)	(-1.693)	(-1.411)
CSR*U.S.	-18.120***	-20.202***	-25.085***	-44.453***	-18.030***	-25.318***
	(-3.418)	(-2.624)	(-3.287)	(-3.348)	(-3.328)	(-2.840)
CSR Rep. Intensity*U.S.	-12.105***	-7.135***	-15.995***	-36.156***	-15.011***	-23.767***
	(-5.660)	(-3.275)	(-5.288)	(-6.650)	(-6.655)	(-6.644)
CSR*CSR Rep. Intensity*U.S.	26.587***	25.093***	40.446***	66.247***	27.270***	37.274***
	(4.434)	(3.305)	(4.636)	(4.331)	(4.380)	(3.703)

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Table II.9 – continued from previous page

	(1)	(2)	(3)	(4)	(5)	(6)
	σ	σ_ϵ	VaR	CVaR	LPM(0,2)	LPM(0,3)
Leverage	0.629	0.655	0.500	0.534	0.182	0.204
	(1.059)	(1.042)	(0.557)	(0.364)	(0.297)	(0.231)
Profitability	-2.672**	-0.032	-4.649***	-6.683***	-3.153***	-4.521***
	(-2.537)	(-0.017)	(-3.120)	(-2.649)	(-3.050)	(-2.769)
Size	-0.325	0.251	-0.600*	-0.790	-0.382*	-0.504
	(-1.489)	(0.628)	(-1.896)	(-1.565)	(-1.797)	(-1.462)
Sales Growth	0.726	0.741	1.354	1.834	0.783	1.206
	(1.193)	(1.219)	(1.349)	(1.201)	(1.208)	(1.267)
Dividend Yield	0.004	-0.071	0.029	0.025	0.027	0.042
	(0.088)	(-1.056)	(0.380)	(0.209)	(0.549)	(0.583)
Constant	-1.266	-13.886	0.980	-2.647	0.270	0.073
	(-0.200)	(-1.226)	(0.106)	(-0.177)	(0.044)	(0.007)
Firm-year Obs.	15,804	15,804	15,791	15,791	15,804	15,804
Obs.	1,859	1,859	1,856	1,856	1,859	1,859
No. of Instruments	33	33	33	33	33	33
F-stat	187	82.93	270.7	187.5	182.5	131.8
Hansen test (p)	0.955	0.986	0.530	0.660	0.721	0.853
AR (2) p-Value	0.135	0.022	0.513	0.185	0.456	0.050
Lag specification	(3 3)	(3 3)	(3 3)	(3 3)	(3 3)	(3 3)
Year-fixed Effects	yes	yes	yes	yes	yes	yes
Country-specific controls	yes	yes	yes	yes	yes	yes

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Table II.9 – continued from previous page

Remark: This table presents the dynamic panel estimation of the effects of the *CSR* score as well as the *CSR Rep. Intensity* on companies' equity risk for the full data set of U.S. and EU firms. Coefficients are estimated according to equation II.1 using the two-step system GMM estimator introduced by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). The dependent variables are the stock volatility σ in model (1), idiosyncratic risk σ_ϵ in model (2), *VaR* in model (3), *CVaR* in model (4) as well as the second and third order lower partial moments *LPM(0,2)* in model (5) and *LPM(0,3)* in model (6). The dummy variable *U.S.* equals 1 if a company is headquartered in the U.S. and 0 for European companies. The interaction terms ($CSR*U.S.$, *CSR Rep. Intensity*U.S.* and $CSR*$*CSR Rep. Intensity*) multiply the *CSR* score, the *CSR Rep. Intensity* and the *U.S.* dummy with each other. Finally, the model includes a three-way interaction of *CSR* score, *CSR Rep. Intensity* and the *U.S.* dummy. *L.dep. var.* denotes the lagged value of the respective dependent variable. Descriptions of all variables are provided in Appendix I.A. Standard errors are clustered at the firm level and t-statistics are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The results from these two types of tests hence support hypotheses 2a and 2b: There are strong moderating effects of factors that may be interpreted as goal signals according to goal-framing theory. Market volatility, acting as a cue for a gains goal, strengthens the negative association between CSR activities and equity risk under the risk-focused U.S. disclosure system, while a higher CSR awareness via corporate reporting acts as a cue for a normative goal and hence strengthens the negative CSR-risk relation under the content-focused EU reporting framework.

II.5.4 Non-financial reporting and the individual CSR pillars — Hypothesis 3

As our database allows to break down the total CSR score into the three different CSR pillars, we are able to test whether the CSR-risk relation is driven by a particular CSR component and whether the importance of the individual pillars is different under the two disclosure regimes. This not only makes our overall conclusions more robust as it helps to alleviate concerns of measurement errors in the CSR score. It also allows to test whether the content-based European disclosure regulation succeeds in anchoring the normative importance of the different facets of sustainability compared with the more risk-based U.S. regulatory regime. In order to address these issues, we rerun the earlier analyses but replace the total CSR score with the individual scores for the environmental, the social and the governance pillar. As these pillars should be seen as orthogonal, reflecting mutually exclusive subcategorical aspects of the total CSR score, we use these explanatory variables simultaneously in one regression.[16]

Table II.10 reports the system-GMM estimation results. As we employ a U.S. dummy again, the coefficients for the CSR pillar scores represent the effects for firms under the European disclosure framework. Though we observe negative coefficients for all pillar scores, consistently significant effects are found only for the social pillar. With regard to the governance pillar, significant coefficients are obtained in the regression using the value at risk, the conditional value at risk and the lower partial moment of the second order as dependent variables. For firms under the European disclosure system, it hence seems to be mainly the social and partly also the governance activity that give rise to the risk-reducing effect of CSR.

With regard to the interaction terms with the U.S. dummy, we observe mainly negative coefficients of the environmental pillar that are, however, not significant. Surprisingly, the interaction terms with the *Social* pillar score display consistently significant coefficients that are positive. This indicates that, in contrast to firms in the European system, companies under the U.S. disclosure regime do not show lower equity risk following from higher social activity. A similarly offsetting effect is also observed with regard to the governance pillar that is, however, significant only in the regression where the value at risk serves as dependent variable. These observations lead us to conclude that while the content-based European non-financial disclosure system gives rise to individual risk-reducing effects of the social and governance pillar of corporate sustainability, there are no such individual pillar effects under the risk-focused U.S. regime.

[16]It should be noted that the number of observations in these estimations is slightly smaller as Refinitiv does not break down the total CSR rating into the three CSR pillars for all companies. Results remain qualitatively the same if we use only one CSR pillar in individual regressions.

Table II.10: CSR and equity risk — Individual CSR pillars.

	(1)	(2)	(3)	(4)	(5)	(6)
	σ	σ_ϵ	VaR	CVaR	LPM(0,2)	LPM(0,3)
L.dep. var.	0.477***	0.441***	0.542***	0.491***	0.500***	0.445***
	(13.424)	(9.313)	(14.727)	(10.488)	(11.932)	(7.938)
Environment	-0.192	-0.123	-0.129	-0.930	-0.309	-0.332
	(-0.470)	(-0.331)	(-0.190)	(-0.903)	(-0.721)	(-0.492)
Social	-0.707*	-0.679**	-1.571**	-2.027**	-0.920**	-1.321**
	(-1.907)	(-1.988)	(-2.537)	(-2.157)	(-2.378)	(-2.145)
Governance	-0.369	-0.140	-1.464***	-1.480*	-0.654*	-0.728
	(-1.126)	(-0.473)	(-2.737)	(-1.775)	(-1.880)	(-1.323)
U.S.	-1.281***	-0.997***	-3.008***	-4.145***	-1.732***	-2.125***
	(-3.400)	(-3.089)	(-4.766)	(-4.165)	(-4.128)	(-3.221)
Environment*U.S.	-0.169	-0.175	-0.286	0.148	-0.006	-0.112
	(-0.375)	(-0.424)	(-0.380)	(0.127)	(-0.013)	(-0.151)
Social*U.S.	1.547***	1.240**	3.257***	4.427***	1.864***	2.524***
	(2.881)	(2.534)	(3.591)	(3.243)	(3.333)	(2.906)
Governance*U.S.	0.282	0.026	1.554**	1.462	0.640	0.517
	(0.673)	(0.069)	(2.368)	(1.376)	(1.438)	(0.721)
Leverage	0.169	0.368	-0.159	-0.673	-0.306	-0.492
	(0.459)	(1.093)	(-0.271)	(-0.739)	(-0.796)	(-0.819)
Profitability	-2.687***	-2.117***	-4.168***	-6.754***	-2.862***	-4.189***
	(-5.372)	(-4.599)	(-5.274)	(-5.375)	(-5.434)	(-4.984)
Size	-0.001	0.005	-0.002	0.015	0.011	0.021
	(-0.015)	(0.095)	(-0.018)	(0.100)	(0.175)	(0.218)
Sales Growth	0.946*	0.879*	1.647*	2.219*	0.943*	1.427*
	(1.776)	(1.678)	(1.736)	(1.670)	(1.718)	(1.699)
Dividend Yield	-0.005	-0.024	0.010	0.016	0.014	0.030
	(-0.215)	(-1.064)	(0.254)	(0.276)	(0.557)	(0.807)
Constant	1.646	1.156	3.228	4.780	1.988	2.495
	(1.334)	(0.963)	(1.480)	(1.494)	(1.505)	(1.227)
Firm-year Obs.	15,802	15,802	15,789	15,789	15,802	15,802
Obs.	1,859	1,859	1,856	1,856	1,859	1,859

Continued on next page

Table II.10 – continued from previous page

	(1) σ	(2) σ_ϵ	(3) VaR	(4) CVaR	(5) LPM(0,2)	(6) LPM(0,3)
No. of Instruments	33	33	33	33	33	33
F-stat	366.1	167.5	464.4	353.9	349.5	228.8
Hansen test (p)	0.345	0.630	0.543	0.486	0.430	0.428
AR (2) p-Value	0.102	0.155	0.865	0.204	0.599	0.072
Lag specification	(3 3)	(3 3)	(3 3)	(3 3)	(3 3)	(3 3)
Year-fixed Effects	yes	yes	yes	yes	yes	yes
Country-specific controls	yes	yes	yes	yes	yes	yes

Remark: This table presents the dynamic panel estimation of the effects of the CSR pillar scores on companies' equity risk for the full data set of U.S. and EU firms. Coefficients are estimated according to equation II.1 using the two-step system GMM estimator introduced by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). The dependent variables are the stock volatility σ in model (1), idiosyncratic risk σ_ϵ in model (2), *VaR* in model (3), *CVaR* in model (4) as well as the second and third order lower partial moments *LPM(0,2)* in model (5) and *LPM(0,3)* in model(6). The dummy variable *U.S.* equals 1 if a company is headquartered in the U.S. and 0 for European companies. The interaction terms $Environment * U.S.$, $Social * U.S.$ and $Governance * U.S.$ multiply the three *CSR* pillar scores with the *U.S.* dummy variable. *L.dep. var.* denotes the lagged value of the respective dependent variable. Descriptions of all variables are provided in Appendix I.A. Standard errors are clustered at the firm level and t-statistics are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

In sum, our findings from these more detailed analyses of the CSR-risk relation support hypothesis 3. The fact that the social aspect of sustainability plays the dominant role for the CSR-risk relation under the EU reporting regime, supported in part by governance aspects, can be seen as a sign that the content-focused disclosure regime is indeed effective in steering attention. Obviously, these historically important matters for many European countries are sufficiently engrained in investors' cognition that the content-based reporting framework succeeds in activating the normative goal leading to their recognition. Given that environmental aspects have received a tremendous amount of media attention over the last few years, however, it is quite surprising to see that neither the European nor the U.S. reporting framework is able to raise sufficient awareness to lead to a mediating effect for this CSR pillar.

II.5.5 The risk-return tradeoff from CSR — Hypothesis 4

Since we have shown that CSR is able to reduce perceived firm risks, we expect investment returns to also decrease along with CSR scores as the lower risk makes less compensation necessary for bearing this risk as an investor. In the following, we will test this CSR-return relation. Our final objective, however, is to compare the CSR-risk with the CSR-return relation in order to answer the question whether there is an optimal level of CSR that allows to maximize the return-to-risk ratio from an investor's perspective. In parallel, we also examine whether such an optimization procedure delivers different results under the two disclosure regimes considered.

To study the CSR-return relation in a robust fashion, we resort to a factor estimation model on a portfolio basis. We report results from a Carhart (1997) four-factor model, but repeat the analysis also with a Fama and French (2015) five-factor model. As the results are very similar, we display the latter in Appendix I.D and discuss only the Carhart-model results in the main part of the paper. We hence consider market, size, value and momentum as risk factors in our model.[17] In order to test whether CSR constitutes a relevant risk factor in its own right, however, our main focus is on the question whether the intercept of ordered-portfolio regressions varies along with CSR. We therefore run an analysis where we first rank the companies in the U.S. and in the EU sample according to their CSR scores in every year.[18] Subsequently, we dissect each sample into quintiles, where Q1 denotes the 20% of firms with the lowest CSR ratings and Q5 the 20% of firms with the highest CSR ratings. Each of these value-weighted portfolios is annually reallocated according to the firms' CSR scores.[19] We then run the following regression for each quintile portfolio using monthly portfolio returns:

$$R_{i,t} - r_{f,t} = \alpha_i + \beta_{1,i} * RMRF_t + \beta_{2,i} SMB_t + \beta_{3,i} HML_t + \beta_{4,i} MOM_t + \epsilon_{i,t}\ . \quad \text{(II.3)}$$

Here, $R_{i,t}$ denotes the monthly portfolio return of the respective quintile portfolio in

[17] See Appendix I.A for a more detailed description of the risk factors.

[18] This procedure follows Gompers et al. (2003) who examine the impact of governance-based risks on stock returns.

[19] We also study equally-weighted portfolios in a robustness check. The results are qualitatively identical and illustrated in Appendix I.E.

USD[20]. $r_{f,t}$ is the monthly risk-free rate and $RMRF$ represents the CAPM or market factor, where the risk-free rate is subtracted from the Fama-French market return of the respective region. SMB_t, HML_t and MOM_t represent the size, book-to-market and momentum factors taken from Kenneth French's data webpage. The regression intercept α_i is our variable of interest, as it can be interpreted as the abnormal return due to CSR activity in excess of the return from a passive investment into the four risk factors. In addition to estimating alphas for each of these CSR quintile portfolios, we also construct a difference portfolio that amounts to a long position in the highest CSR quintile (Q5) and a short position in the lowest CSR quintile (Q1).

Table II.11 presents the results from such a portfolio return analysis for the U.S. and EU sample. For the U.S. sample, we find that investing into the most CSR-active companies, i.e. the top 20% (Q5), yields a significant abnormal return of 19 basis points per month. Investing into the quintile of firms with the lowest CSR scores, in contrast, delivers an even higher significantly positive alpha of 59.3 basis points. As a consequence, we find that the difference portfolio that is long in the 20% most CSR-active firms and short in the 20% most CSR-inactive firms yields a highly significant negative alpha of -40.3 basis points per month for the U.S. sample.

[20]Since Fama-French factors for European countries are calculated in USD, we work with European monthly returns in USD (Glück et al., 2020).

Table II.11: Four-factor portfolio model for the U.S. and EU.

	Panel A: U.S.						
	α	RMRF	SMB	HML	MOM	Obs.	Adj. R^2
Difference PF	-0.403***	0.005	-0.456***	0.230***	0.096***	180	0.303
(Q5-Q1)	(-3.184)	(0.141)	(-7.747)	(4.076)	(3.047)		
Q5	0.190***	0.916***	-0.218***	0.100***	-0.012	180	0.961
	(3.522)	(58.897)	(-8.724)	(4.195)	(-0.908)		
Q4	0.329***	1.013***	0.002	-0.064*	-0.014	180	0.930
	(3.948)	(42.143)	(0.061)	(-1.735)	(-0.691)		
Q3	0.435***	1.008***	0.096**	-0.116***	-0.109***	180	0.932
	(5.022)	(40.304)	(2.393)	(-3.002)	(-5.086)		
Q2	0.537***	1.040***	0.132***	-0.079	-0.044	180	0.898
	(4.906)	(32.929)	(2.606)	(-1.629)	(-1.621)		
Q1	0.593***	0.910***	0.238***	-0.129***	-0.108***	180	0.898
	(5.841)	(31.053)	(5.042)	(-2.862)	(-4.284)		

	Panel B: EU						
	α	RMRF	SMB	HML	MOM	Obs.	Adj. R^2
Difference PF	-0.451***	-0.054**	-0.654***	0.096	0.010	180	0.365
(Q5-Q1)	(-3.696)	(-2.053)	(-10.189)	(1.474)	(0.273)		
Q5	0.057	0.968***	-0.269***	0.157***	-0.036**	180	0.981
	(0.979)	(76.597)	(-8.759)	(5.010)	(-2.130)		
Q4	0.274***	0.991***	-0.182***	0.075	-0.100***	180	0.960
	(3.087)	(51.570)	(-3.886)	(1.586)	(-3.899)		
Q3	0.343***	1.106***	0.028	-0.229***	-0.040	180	0.924
	(2.679)	(40.009)	(0.412)	(-3.345)	(-1.082)		
Q2	0.560***	1.120***	0.278***	-0.174***	-0.121***	180	0.935
	(4.535)	(41.984)	(4.283)	(-2.643)	(-3.407)		
Q1	0.508***	1.022***	0.385***	0.060	-0.046	180	0.944
	(4.751)	(44.187)	(6.838)	(1.056)	(-1.475)		

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Table II.11 – continued from previous page

Remark: This table presents the Carhart (1997) four-factor model regressions of value-weighted monthly returns from firm portfolios sorted by their respective CSR score in the U.S. in Panel A and the EU in Panel B subdivided into quintiles. Q5 represents the companies with the highest CSR scores (top 20%) while Q1 comprises the companies with the lowest CSR scores (bottom 20%). Portfolios are reallocated annually. The difference portfolio represents a portfolio that is long Q5 companies and short Q1 companies. Coefficients are estimated according to equation II.3 using standard OLS regressions. Explanatory variables are *RMRF*, *SMB*, *HML* and *MOM*. The intercept (α) measures the abnormal return of the respective portfolio. Descriptions of all variables are provided in Appendix I.A. T-statistics are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

In addition to the decrease in alpha along with CSR activity, we find that also the sensitivity towards the size, the value and the momentum factors varies along with CSR activity. More precisely, the difference portfolio shows a negative loading with respect to the size factor and a positive loading to the value and momentum factor. This may be taken as an indication that the return effects reflected in the CSR-based difference portfolio are not driven by simple size differences of the companies in the quintile portfolios, nor by value differences or momentum effects in the quintile construction, but truly by sustainability-specific effects.

The results for the European sample are very similar. Here, the monthly abnormal return from the long-short portfolio is even more strongly negative at -45.1 basis points. Again, this result is driven by the particularly strong positive abnormal return from the portfolios with low CSR scores. A similar effect as in the U.S. case is also observed regarding the decreasing sensitivity towards the size factor with increasing CSR activity. As a consequence, we see a highly significant negative loading of this factor in the long-short portfolio that is even larger in absolute size than for the U.S. sample. In addition, the difference portfolio shows a highly significant negative sensitivity towards the market factor.

In order to integrate these results more comprehensively with our earlier findings, we run three supplemental analyses (results are presented in Appendices I.F to I.K). First, we repeat the analysis and differentiate between crisis and non-crisis periods, where we employ the NBER business cycle definition to identify crisis periods. We find that the significantly negative return effect from CSR is driven by the non-crisis months in our sampling period, though the difference portfolio retains its negative alpha in the EU sample also in the crisis period. The U.S. sample shows an insignificantly positive alpha in crisis months instead. Second, comparing the portfolio returns from the U.S. and EU sample more closely, we observe that the negative association between the CSR score and abnormal returns is even stronger for EU than U.S. firms in the two top CSR quintiles (Q4 and Q5). I.e., investing in firms with the strongest sustainability ratings delivers even lower returns under the content-based European reporting regime than under the risk-based U.S. disclosure system. Third, we study whether the individual CSR pillars drive the negative return effect and run the portfolio analysis after sorting firms according to the environmental, social and governance score individually. The negative CSR-return effect is confirmed for all CSR pillars, but is particularly strong with regard to the social pillar in both disclosure regimes.

According to these portfolio-level results, firms with lower CSR activity hence offer higher abnormal returns after controlling for the four risk factors market, size, value and momentum than firms with stronger CSR activity, both under the U.S. and EU disclosure regulation. Interpreted as a compensation for risk, these higher returns suggest that market participants associate lower corporate social responsibility with higher risk, thus asking for a higher return. While this observation at first sight appears to simply complement our findings on the CSR-risk effects so far, it also gives rise to the question whether one of the two effects dominates and whether the disclosure regime has a mediating impact on the risk-return tradeoff.

In order to test this issue, we hence need to combine the abnormal returns, i.e. alphas, due to CSR in each quintile portfolio with a proxy for the average risk per quintile portfolio. In essence, we are interested in the question what CSR-induced return a portfolio can realize, based on a given amount of risk. It needs to be noted that the alphas, by construction, are adjusted for the effect of well-established risk factors and hence should capture only the compensation for risk coming from CSR. To calculate the return-to-risk ratios, we match them with the full list of equity risk measures that we have employed so far, i.e. volatility and idiosyncratic risk, but also the different downside-risk proxies. In a further robustness check, we also consider the realized excess return (over the risk-free rate) that is unadjusted for the traditional risk factors and use it in the numerator to calculate the return-to-risk ratios. Table II.12 reports the corresponding results, where Panel A displays the findings from abnormal return-to-risk ratios and Panel B from excess return-to-risk ratios.

As can be seen from Panel A, with the exception of the ratio built with the idiosyncratic risk, all return-to-risk ratios increase throughout with decreasing CSR level both for the U.S. sample and the EU sample. Investing into firms with the lowest CSR activity hence delivers the highest abnormal return per unit of risk, if risk is approximated with either volatility, VaR, CVaR or lower partial moments. With regard to idiosyncratic risk, however, we find the highest return-to-risk ratio for the quintile of firms with an intermediate CSR score in the U.S. sample, and for the quintile of firms with the lowest CSR activity in the EU sample, though there is no continuous development along with CSR.

The excess return-to-risk ratios in Panel B confirm these results. Again, we find that the risk-return tradeoff is optimized for firms in the lowest CSR quintile with the exception of idiosyncratic risk. With regard to this particular risk proxy, we now observe the highest return-to-risk ratio for firms with the strongest CSR activity (Q5) both in the U.S. and the EU sample.

These results lead us to conclude that investing in firms with weak CSR activity allows to reap an abnormal return, over and above the return to be expected from these firms' sensitivity towards the traditional risk factors. Such an investment also yields a maximum excess return in total, i.e. including the return contribution of these traditional risk factors. Though firms that do not engage strongly in corporate social responsibility are indeed perceived to be exposed to higher risks than CSR-active firms, the higher return seems to more than overcompensate the higher risk.

Table II.12: Return-to-risk ratios for the U.S. and EU.

	U.S.						EU					
Panel A: α	$\frac{\alpha}{\sigma}$	$\frac{\alpha}{\sigma_\epsilon}$	$\frac{\alpha}{VaR}$	$\frac{\alpha}{CVaR}$	$\frac{\alpha}{LPM(0,2)}$	$\frac{\alpha}{LPM(0,3)}$	$\frac{\alpha}{\sigma}$	$\frac{\alpha}{\sigma_\epsilon}$	$\frac{\alpha}{VaR}$	$\frac{\alpha}{CVaR}$	$\frac{\alpha}{LPM(0,2)}$	$\frac{\alpha}{LPM(0,3)}$
Panel A: Risk measures												
Q5	0.053	1.840	0.036	0.024	0.048	0.038	0.035	2.358	0.020	0.015	0.035	0.028
Q4	0.080	2.254	0.057	0.038	0.074	0.058	0.059	2.447	0.032	0.025	0.056	0.043
Q3	0.101	2.492	0.071	0.047	0.097	0.077	0.074	1.854	0.055	0.034	0.080	0.060
Q2	0.120	2.217	0.086	0.057	0.107	0.084	0.088	2.306	0.065	0.040	0.088	0.067
Q1	0.143	2.234	0.118	0.073	0.145	0.109	0.104	2.874	0.064	0.047	0.102	0.077
Panel B: ER	$\frac{ER}{\sigma}$	$\frac{ER}{\sigma_\epsilon}$	$\frac{ER}{VaR}$	$\frac{ER}{CVaR}$	$\frac{ER}{LPM(0,2)}$	$\frac{ER}{LPM(0,3)}$	$\frac{ER}{\sigma}$	$\frac{ER}{\sigma_\epsilon}$	$\frac{ER}{VaR}$	$\frac{ER}{CVaR}$	$\frac{ER}{LPM(0,2)}$	$\frac{ER}{LPM(0,3)}$
Q5	0.250	8.672	0.170	0.113	0.225	0.179	0.140	9.331	0.080	0.060	0.140	0.110
Q4	0.281	7.905	0.199	0.131	0.260	0.205	0.172	7.123	0.094	0.074	0.163	0.126
Q3	0.295	7.316	0.208	0.137	0.285	0.227	0.202	5.030	0.149	0.093	0.217	0.162
Q2	0.316	5.831	0.225	0.150	0.281	0.220	0.235	6.149	0.174	0.107	0.234	0.179
Q1	0.333	5.218	0.275	0.169	0.339	0.253	0.250	6.873	0.152	0.111	0.243	0.185

Remark: This table presents ratios of average return to average risk from firm portfolios sorted by their respective CSR score. The portfolios are subdivided into quintiles where Q5 represents the companies with the highest CSR scores (top 20%) while Q1 comprises the companies with the lowest CSR scores (bottom 20%). U.S. firms and EU firms are treated individually. Portfolios are reallocated annually. α in *Panel A* measures the monthly abnormal return of the respective portfolio taken from the Carhart (1997) four-factor model in Section II.5.5. The *Excess Return* (*ER*) in *Panel B* is calculated as the average monthly realized return in excess of the risk-free rate. We use portfolio volatility σ, idiosyncratic risk σ_ϵ, *VaR*, *CVaR* as well as the second and third order lower partial moments *LPM(0,2)* and *LPM(0,3)* as risk measures. Descriptions of these variables are provided in Appendix I.A.

Overall, therefore, the investment return per unit of risk is more favourable for CSR-inactive firms than for those with strong CSR activities. This supports hypothesis 4: The return-to-risk ratio is indeed dependent on firms' CSR activity. This result holds under both disclosure regimes. Hence, the strong risk focus of the U.S. reporting system does not seem to affect the risk-return tradeoff due to CSR any differently than the more strongly content-based non-financial disclosure regime in the EU.

II.6 Conclusion

We study whether the (non-)financial disclosure regime mediates investors' perception of CSR-related equity risk. Indeed, our empirical results show that the CSR-risk relation is generally stronger in the EU than in the U.S. disclosure system. We argue that this is explained by reporting regimes acting as cues in the sense of goal-framing theory: The content-based European reporting system lets a normative goal frame become prevalent according to which investors see the merit of investing sustainably in general. It also seems to incite investors to recognize the individual CSR facets, in particular the social and governance pillar, for their investment decisions. The risk-based U.S. reporting regime, in contrast, appears to give rise to a gains goal frame. Under this, investors perceive CSR as relevant for their decision only if warranted, for instance, because of a sufficiently strong surrounding market volatility that lets CSR activities appear particularly attractive due to their insurance-like features.

Despite these differences in risk perceptions under the two disclosure regimes, we observe a generally decreasing return effect from CSR in both the U.S. and EU. What is more, we find that investors set to optimize the return-to-risk ratio of their investment would be well advised to consider CSR-inactive firms rather than firms with strong CSR activities. Though our analysis controls for different risk factors very carefully, we cannot, however, rule out that this result is driven by simple demand effects leading to a temporary overvaluation of CSR-active firms that should evaporate over time. Nevertheless, our relatively long sampling period (2003-2017) at least points to a medium-term effect that might even become larger in the current climate of an extremely strong demand for sustainable investments.

Our results give rise to several implications for market participants and regulators. First, investors should be aware of the fact that their investment decisions are framed by the way information is provided to them. Unless they actively engage in further data collection and analysis, investors in U.S. firms, for instance, might miss out on some information that could be relevant to them if they prefer to invest in a more sustainable way. More generally, if investors want to make sure that they assess firms similarly in a global portfolio they will need to abstain from simple firm comparisons based on data from different reporting regimes. Rather, they should deploy a cross-regime evaluation frame that they may have to build (and feed with information) on their own.

Second, it is important also for regulators to recognize that by prescribing certain disclosure rules, they influence investors by framing their decisions. European regulators, for instance, might see this as an extremely valuable instrument to reorient capital flows towards a more sustainable economy as set out in the EU Action Plan "Financing Sustainable Growth" (European Commission, 2018). By sharpening the future CSR disclosure regulation in this regard, the EU Commission should be able to leverage this objective even more effectively. Similar deliberations by the SEC should also help to transform capital flows into sustainable or "green" directions.

Our study deliberately focuses on equity investors' perceptions of CSR effects. But also credit investors' decisions might be framed by the disclosure regime so that a similar analysis could be worthwhile for debt market investments as well. Against the backdrop of a strongly growing market for green bonds, such a study might be particularly topical. As CSR reports very often address also further stakeholders, for instance customers, an analysis of mediating effects might even be broadened to these groups. A natural starting point to consider such questions would be to study consumers and the CSR-revenue effect for firms. Altogether, such analyses would help regulators to better assess the role of transparency requirements in general. Particularly for smaller firms, that increasingly come into the focus of CSR disclosure rules, this might be an important aspect to be considered.

Chapter III

Corporate Social Responsibility and Credit Risk

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Corporate Social Responsibility and Credit Risk

Abstract

We study the relationship between corporate social responsibility and credit risk for U.S. and European firms over the period 2003 to 2018. Differentiating between the various facets of corporate social responsibility shows that only environmental aspects are negatively related with various measures of credit risk for U.S. firms. For European firms, both environmental and social aspects are negatively associated with credit risk. Surprisingly, we find that credit ratings do not reflect the same contemporaneous relationship with corporate social responsibility. Our results are robust against different estimation methods.

JEL Classification: G11; G32; G34; O16; Q56

Keywords: Corporate social responsibility; ESG; sustainability; credit risk; credit rating

III.1 Introduction

Corporate social responsibility (CSR) has become an increasingly important aspect for equity investing, as there is mounting evidence that CSR strategies allow to reduce equity-related risks (e.g. Oikonomou et al., 2012). Sustainable firm strategies appear particularly effective in reducing extreme equity risks (e.g. Kim et al., 2014; Ilhan et al., 2020), which supports the idea of CSR acting as “moral capital” (Godfrey et al., 2009) insuring firms against stakeholders’ sanctions in case of negative events. Much less is known, however, about the impact of CSR on firms’ credit risk. This is also recognized by the EU’s 2018 Sustainable Finance Action Plan (European Commission, 2018) that calls for more research on the relation between environmental, social and governance (ESG) activities and credit risk. More precisely, Action 6 of the EU Action Plan calls for “better integrating sustainability in ratings and market research” and the EU has commissioned the European Securities and Markets Authority to assess in how far sustainability issues are already incorporated in credit ratings.

There are many reasons to believe that credit risk could be related with CSR. First, credit risk also exhibits certain extreme-risk characteristics as it refers to a company becoming insolvent, i.e. unable to pay its debts, which happens rarely. Following the same arguments as for equity risk, credit risk should therefore be influenced by the fact that strong CSR activities help to insulate firms’ profits against extreme changes in consumer tastes or regulatory interventions due to environmental or societal crises (e.g. Albuquerque et al., 2019). The ensuing CSR reputation (Soppe et al., 2011), however, also creates incentives to employ CSR in order to cover up corporate misbehavior (Diemont et al., 2016), which might be linked with agency conflicts (e.g. over- or underinvestment) and potentially even lead to insolvency. As a consequence, credit risk might also increase along with stronger CSR scores. Relatedly, reporting on CSR facets with particularly strong attention levels might lead both equity and debt investors to react either positively or negatively if their expectations are exceeded or disappointed (Benlemlih et al., 2016), with corresponding effects on market-based measures of risk.[1]

[1] There is also evidence that some core CSR elements such as management gender diversity show

We contribute to this discussion in a mainly exploratory analysis and examine the association between CSR and various measures of credit risk: credit default swap spreads, probabilities of default, distance to default and credit ratings. In this, we build on a comparably small strand of the literature that assesses the role of CSR for debt markets. Most of these studies consider U.S. firms and find a risk-reducing effect of sustainable firm strategies (e.g. Oikonomou et al., 2014), but there is only limited evidence from a European or international perspective (e.g. Stellner et al., 2015; Dorfleitner et al., 2020). This lack of geographically comparative analyses is particularly worrisome as country-specific issues have been shown to be demonstrably important for studying sustainability effects, due to different regulatory standards (Liang and Renneboog, 2017), company disclosure requirements (Hail and Leuz, 2006) or cultural attention to environmental and social aspects (e.g. Edmans et al., 2020; Lins et al., 2017). In this study, we therefore augment the existing literature by *(i)* examining the individual credit risk-relations of environmental, social and governance-based activities, *(ii)* analyzing the association with both market-based credit risk proxies and agency-based ratings and *(iii)* scrutinizing the effects for U.S. in comparison with those for European firms.

Based on various panel estimation techniques to account for potential endogeneity issues, we find that not all facets of CSR are negatively associated with credit risks. Rather, U.S. firms' market-based credit risk is negatively related only with environmental activities, whereas for European firms this holds for both environmental and social activities. Surprisingly, however, in neither subsample do the firms' credit ratings reflect these associations. Rather, European firms' credit ratings deteriorate with stronger environmental and social activities. Given the breadth and robustness of our findings — stretching over several measures of credit risk and stemming from different estimation methods — this indicates an apparent inconsistency of agency credit ratings with market-based proxies of credit risk.

no relation with accounting-based measures of risk (Bruna et al., 2019).

III.2 Data

Our sample consists of all publicly listed companies in the U.S. and in the EU that have received CSR ratings from Thomson Reuters (formerly ASSET4) over the time period 2003 to 2018.[2] Our final dataset comprises 11,124 firm-year observations in the U.S. sample and 9,682 firm-year observations in the EU sample. For each firm in our sample, we employ different proxies for credit risk: First, we consider a company's one- and five-year credit default swap (*CDS*) spread, which is the fixed premium paid by the protection buyer to the protection seller for the respective time period to receive compensation in case of a credit event and, hence, captures default risk in the purest sense (Callen et al., 2009).[3] We also employ the distance-to-default (*DTD*), which measures the distance between the default point and the expected value of a firm's assets. A higher DTD reflects lower credit risk. Together with the probability of default (*PD*), again over a one and five year time horizon, these measures are obtained from the Risk Management Institute at the National University of Singapore (CRI, 2021). We also use Standard & Poor's corporate *Credit rating* and convert the letter combination of credit ratings into an ordinal scale, where higher rating values represent lower default risk.

In contrast to earlier studies, we consider the scores of the individual environmental, social and governance pillars from the Thomson Reuters database in isolation as our main explanatory variables. As percentile rank scores, all environmental and social categories are benchmarked against Thomson Reuters Business Classifications Industry Group, while the governance categories are benchmarked against the respective Country Group (Refinitiv, 2020). Our choice of control variables includes *Leverage* (calculated as the ratio of total liabilities to total assets), *Size* (defined as the natural logarithm of

[2]We are aware of the fact that CSR ratings vary between different rating providers (Berg et al., 2020), so that reliance on only one such data source represents a potential weakness of our analysis. However, the ASSET4 database has been employed in various prior studies (e.g. Hawn and Ioannou, 2016; Flammer, 2021) as it is renowned for the length of its time series, its comprehensive reflection of firms' CSR activities and its rigorous selection rules that reduce the risk of sample selection bias.

[3]We use the "actuarial spread" which is constructed without upfront fee.

total assets), *Profitability* (approximated by operating income divided by total assets), *Sales growth* (proxied as the growth rate of total sales) and *Dividend yield* as indication of management's expectation of the level and volatility of future earnings. We winsorize all variables at 1% in order to limit the influence of outliers.

Table III.1 reports the descriptive statistics of our dataset. As can be seen, while U.S. firms show a higher credit risk with respect to long-term CDS spreads, probabilities of default and credit ratings compared to European firms, the DTD signals a slightly lower risk. More interestingly, however, we observe large and significant differences between the two subsamples with regard to CSR. Precisely, European companies show much better environmental and social scores than U.S. firms. Though the difference with respect to the governance pillar appears much smaller, it is still significant.

Table III.1: Descriptive statistics for the U.S. and EU sample.

	U.S.				EU				Difference EU-U.S.		
	N	Mean	Median	Std. dev.	N	Mean	Median	Std. dev.	Difference	t-Value	Std. err.
Panel A: Credit risk measures											
CDS1Y [bp]	11,124	10.5764	0.7037	30.3266	9,682	10.3433	4.4030	19.8934	-0.233	-0.645	0.361
CDS5Y [bp]	11,124	25.0872	12.2012	34.3520	9,682	16.4618	12.1426	17.8754	-8.6255***	-22.226	0.388
DTD	11,113	6.4345	6.0965	3.1883	9,583	5.7237	5.3537	2.9507	-0.7108***	-16.551	0.043
PD1Y [bp]	11,124	14.3960	0.7100	43.7245	9,682	15.3808	6.1200	30.2690	0.9848*	1.862	0.529
PD5Y [bp]	11,124	173.5095	86.4350	230.7762	9,682	120.4584	89.8200	124.2364	-53.0511***	-20.214	2.625
Credit rating	6,733	13.6017	14.0000	2.8684	3,553	14.4472	15.0000	2.6541	0.8456***	14.583	0.058
Panel B: ESG variables											
Environment	11,124	26.7594	17.2962	27.8904	9,682	44.9943	45.5810	28.0392	18.2349***	46.923	0.389
Social	11,124	43.3179	40.2823	20.8060	9,682	51.8724	52.1345	23.7112	8.5545***	27.718	0.309
Governance	11,124	49.2117	49.6889	22.4680	9,682	50.5842	51.1689	21.9605	1.3725***	4.441	0.309
Panel C: Control variables											
Leverage	11,124	0.6082	0.6063	0.2242	9,682	0.6209	0.6218	0.2067	0.0127***	4.229	0.003
Profitability	11,124	0.0741	0.0710	0.1164	9,682	0.0807	0.0698	0.0909	0.0066***	4.499	0.002
Size	11,124	22.5375	22.4396	1.5294	9,682	22.4853	22.3741	1.7820	-0.0523**	-2.277	0.023
Sales growth	11,124	0.1199	0.0666	0.3778	9,682	0.0866	0.0523	0.3387	-0.0332***	-6.642	0.005
Dividend yield	11,124	0.0192	0.0130	0.0238	9,682	0.0209	0.0145	0.0247	0.0018***	5.244	0.000

Remark: This table presents the descriptive statistics for the U.S. sample and the EU sample as well as a comparison of both samples. *Panel A* depicts the credit risk measures as dependent variables, *Panel B* the CSR pillar scores as main explanatory variables and *Panel C* the control variables. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

III.3 Methodology and results

In order to account for potential endogeneity effects in the CSR-risk relation, we employ a fixed-effects panel regression to depict our main results but run additional analyses as further robustness checks. The fixed-effects estimation approach allows to consider endogeneity effects caused by omitted variables that are fixed over time, such as industry effects, which might be particularly relevant in our case. However, to address the problem of time-invariant omitted variables or reverse causality effects, we also run a fixed-effects estimation where the lagged dependent variable is included among the regressors following Angrist and Pischke (2009) and furthermore employ a two-step system GMM estimation approach following Arellano and Bond (1991); Arellano and Bover (1995) and Blundell and Bond (1998). As these estimation approaches replicate our main results qualitatively, we report solely the findings from the simple fixed-effects panel estimation in the following and rather focus on analytical breadth via the employment of several credit risk proxies.[4] Given that credit ratings are measured on an ordinal scale, we estimate the corresponding regressions with an ordered probit model, but also employ simple OLS in an unreported robustness check that delivers identical results. It should be noted that standard errors are clustered at the firm level in all regressions.[5]

We intend to examine not only the relationship between the different facets of CSR and credit risk, but also to study the difference in these relations between firms in the U.S. and Europe. Therefore, we run the estimation on the full sample and employ a dummy variable to denote U.S. observations. European firms hence represent the base category in our regressions. The interaction terms of the individual CSR scores with the U.S. dummy then indicate the respective incremental credit risk relation of U.S. firms relative to European firms.[6]

[4]The results from these and further robustness checks, to be described below, are available upon request.

[5]Using standard errors that are robust to heteroscedasticity and autocorrelation does not change our results.

[6]Appendix II.A and Appendix II.B present the individual estimation results for the U.S. and EU

Table III.2 presents the corresponding estimation results. As can be seen, both the environmental and the social CSR facet show a significantly negative relation with market-based proxies of credit risk for European firms: We observe highly significant, negative coefficients of the environmental and social score in the regressions with both short- and long-term CDS spreads and PDs as dependent variables (models (1), (2), (4) and (5)) and a significantly positive coefficient in the regression with DTD as dependent variable (model (3)). Stronger environmental and social activities hence go along with lower market-based measures of credit risk for European firms. Surprisingly, the environmental and the social score show a significantly negative coefficient in the regression with the credit rating as dependent variable (model (6)). Stronger environmental and social activities thus appear to be associated with worse contemporaneous credit ratings for European firms. The governance score, in contrast, does not display significant coefficients in any regression model. For European firms there hence seems to be no significant relationship between stronger governance activity and credit risk.

Examining the interaction terms of the U.S. dummy with the individual CSR scores shows that for U.S. firms a similarly negative association between the environmental score and market-based credit risks holds: The insignificant coefficients of the interaction with the environmental score in regression models (1) and (4) indicate that there is no difference in this pillar's risk relation compared with European firms. The weakly significant negative coefficients in regression models (2) and (5) and the highly significant positive coefficient in model (3) even signal a stronger negative association between the environmental score and these market-based credit risk proxies for U.S. firms compared with European companies. With regard to the interaction term with the social score, in contrast, we observe consistently significant coefficients that show the opposite sign to that of the base category. Comparing the coefficient sizes indeed indicates a non-existent association of the social score with any type of credit risk for U.S. firms, as the interaction terms roughly offset the basic effects in all regressions. The interaction term with the governance score, finally, does not display a significant coefficient in any regression.

sample in isolation, to complement the results in Table III.2.

Table III.2: ESG effects on credit risk.

	(1)	(2)	(3)	(4)	(5)	(6)
	FE	FE	FE	FE	FE	Ordered Probit
	CDS1Y	CDS5Y	DTD	PD1Y	PD5Y	CreditRating
Environment	-0.0575***	-0.0391***	0.0040*	-0.0922***	-0.3120***	-0.0073**
	(0.0155)	(0.0140)	(0.0024)	(0.0239)	(0.0993)	(0.0034)
Social	-0.0462***	-0.0416***	0.0124***	-0.0743***	-0.3211***	-0.0107***
	(0.0173)	(0.0141)	(0.0027)	(0.0268)	(0.0995)	(0.0037)
Governance	-0.0165	-0.0131	0.0008	-0.0273	-0.0979	0.0039
	(0.0131)	(0.0110)	(0.0022)	(0.0203)	(0.0787)	(0.0024)
Leverage	17.0346***	19.0399***	-4.9871***	25.5742***	136.1211***	-3.0688***
	(3.6489)	(2.9824)	(0.4196)	(5.5361)	(20.3883)	(0.6118)
Profitability	-21.5450***	-22.7715***	3.0836***	-31.7072***	-155.9330***	6.8504***
	(5.7430)	(4.5421)	(0.5349)	(8.7385)	(30.7127)	(1.2604)
Size	3.8574***	2.1147***	0.0839	6.0968***	14.3726**	0.0196
	(0.9603)	(0.8166)	(0.1085)	(1.4720)	(5.6890)	(0.1769)
SalesGrowth	-0.1406	-0.2410	-0.0309	-0.1470	-1.2505	0.3587***
	(0.5275)	(0.4686)	(0.0772)	(0.7986)	(3.2370)	(0.0908)
DividendYield	19.5754	34.7805***	-10.9189***	26.0048	242.8334***	-3.7907
	(17.1107)	(13.4693)	(1.6686)	(25.9149)	(91.7573)	(2.5796)
U.S.*Environment	-0.0208	-0.0575*	0.0107***	-0.0257	-0.4170*	0.0048
	(0.0296)	(0.0320)	(0.0035)	(0.0437)	(0.2204)	(0.0040)
U.S.*Social	0.0653*	0.0645*	-0.0172***	0.1004*	0.4814*	0.0098**
	(0.0361)	(0.0381)	(0.0043)	(0.0532)	(0.2602)	(0.0047)
U.S.*Governance	0.0074	0.0131	0.0011	0.0110	0.0742	-0.0024
	(0.0264)	(0.0253)	(0.0030)	(0.0391)	(0.1731)	(0.0031)
U.S.*Leverage	-7.9836	-0.2469	2.6572***	-14.0543	-5.5245	0.2026
	(5.8206)	(5.3524)	(0.5432)	(8.6256)	(36.5074)	(0.6960)
U.S.*Profitability	-13.3547	-17.3625**	-0.5079	-18.8454	-109.1431**	-2.2910*
	(9.2487)	(7.7870)	(0.6832)	(13.7636)	(51.2207)	(1.3681)
U.S.*Size	-2.0758	-3.2312*	0.1927	-3.3741	-22.6752*	0.6287***
	(1.8223)	(1.7423)	(0.1479)	(2.6973)	(11.9430)	(0.2028)
U.S.*SalesGrowth	3.5748**	2.9866**	-0.1977**	5.2266**	18.9998**	-0.5277***
	(1.7269)	(1.4554)	(0.0986)	(2.5388)	(9.4546)	(0.1157)

Continued on next page

Table III.2 – continued from previous page

	(1) FE CDS1Y	(2) FE CDS5Y	(3) FE DTD	(4) FE PD1Y	(5) FE PD5Y	(6) Ordered Probit CreditRating
U.S.*DividendYield	156.0022***	183.1338***	-1.9967	226.2392***	1,207.8274***	2.3786
	(45.3355)	(39.7592)	(3.0463)	(67.5064)	(268.3182)	(3.3038)
Constant	-55.6160***	3.4762	3.5684**	-86.9698***	38.6424	
	(20.6246)	(19.8952)	(1.6301)	(30.4755)	(136.4238)	
Firm-year Obs.	20,806	20,806	20,699	20,806	20,806	10,998
Obs.	2,949	2,949	2,933	2,949	2,949	1353
(Pseudo) R^2	0.028	0.041	0.052	0.028	0.041	0.474

Remark: This table presents panel estimations of the effects of the three CSR facets *Environment*, *Social*, *Governance* on companies' credit risk of U.S and EU firms. Models (1) to (5) employ a fixed-effects panel estimation and model (6) a pooled ordered probit estimation with firm-fixed effects. The dependent variables are the natural logarithm of the one- and five-year *CDS Spread*, the *DTD*, the one- and five-year *Probability of Default (PD)* and the *Credit rating* by Standard & Poor's. The interaction terms with the *U.S.*-Dummy capture the different effects for all explanatory variables in the U.S. sample. Standard errors are clustered on firm level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

To counter concerns of collinearity between the individual CSR facets,[7] we also run the estimations with each CSR pillar score in isolation. This does not alter our main results regarding the environmental and social CSR score. We do find, however, a very weakly significant negative association of the governance score with the CDS spreads and PDs for European firms, though the effect sizes are only about a third of those of the environmental and social score. Finally, to consider the role that the distribution of CSR scores may play, we further split the observations along the median of the individual CSR pillars and run regressions on the subsamples. We find the results to be mainly unchanged, though there is a slightly stronger effect of the social pillar on credit risk for firms with a higher-than-median social score in the European sample.

[7] Correlations are 0.73 between environmental and social score, 0.40 between environmental and governance score and 0.39 between social and governance score.

Based on our main and auxiliary analyses, we hence conclude that stronger environmental activity goes along with lower market-based credit risk for both European and U.S. firms, and the association is even slightly stronger for U.S. companies. The social component of CSR, in contrast, only displays a negative association with market-based credit risk for European but not U.S. firms. These findings might be seen as a reflection of the fact that social issues have traditionally played a more important role for European firms and their investors, due to both governance and disclosure regulations (Verbeeten et al., 2016; Grewal et al., 2019).[8] Environmental issues, in contrast, have featured strongly in the public discussion both in the U.S. and Europe in recent years (Alok et al., 2020; Ilhan et al., 2020).

The deteriorating contemporaneous relationship between environmental and social activities and credit ratings for European firms remains counterintuitive, however. Though one might believe it to be the consequence of agency-based credit ratings that are sticky due to the discrete through-the-cycle rating approach (Löffler, 2004, 2005), further tests demonstrate that the association does not dissipate over time. Rather, as Appendix II.C shows, the negative relation remains intact for both CSR facets even under consideration of a one- and two-year time lag.

III.4 Conclusion

Our paper examines the relationship of the different facets of CSR with firms' credit risk. Supporting similar conclusions by Dorfleitner et al. (2020), we find that not all sustainability elements are equally relevant when comparing U.S. and European firms. Rather, we observe that while both samples show a negative association between market-based credit risk and environmental activity, only European firms display a similar relation with social activity. At the same time, we find that credit ratings do not reflect an equally aligned association with firms' CSR activity. To the best of our

[8]Examples might be the co-determination laws that give employees a strong position particularly in German firms, or the European non-financial disclosure regulation of 2014 (Directive 2014/95/EU) that puts strong emphasis on human rights, employee consideration, anti-corruption etc.

knowledge, this divergence between market- and agency-based measures of credit risk in relation with CSR activity has not been reported before.

We are aware that our findings may be subject to several weaknesses. First, they are based on only one set of CSR data, which might raise concerns regarding their reliability. While CSR scores of different providers have indeed been shown to diverge (Berg et al., 2020), the Thomson Reuters data appear to be relatively consistent with other data sources (Dorfleitner et al., 2015). It is moreover one of the longest, most comprehensive databases and renowned for its comparably low risk of selection bias (Desender and Epure, 2015). Second, most analyses of a relation between corporate activities and outcomes are prone to issues of endogeneity. Though reverse causality may be less of a problem when examining credit risk (rather than firm value), there could still be biases introduced via omitted variables. In order to alleviate these concerns, we run a host of different estimation models — fixed-effects, fixed-effects with lagged dependent variable, two-step system GMM — on the market-based proxies of credit risk and both pooled OLS and ordered probit estimation models on the agency-based credit ratings. As all models deliver the same qualitative main results, we report only one set of estimation outcomes in the paper. Though we are hence confident of having identified a robust CSR-credit risk relation, we nevertheless remain cautious with regard to statements of causality. Finally, as we focus on establishing a relation between CSR and credit risk in this article by considering various types of credit risk proxies and by examining individual CSR facets, we deliberately refrain from providing answers to ensuing questions such as regarding the underlying channels of the CSR-risk relation and leave this for future research.

Chapter IV

Corporate social responsibility and market efficiency: Evidence from ESG and misvaluation measures

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Corporate Social Responsibility and Market Efficiency: Evidence from ESG and Misvaluation Measures

Abstract

We study the impact of corporate social responsibility (CSR) on firm misvaluation in the US. Our results indicate that a firm's Environmental, Social and Governance (ESG) profile significantly affects valuation: an improvement of a firm's CSR leads to a higher ratio of actual to true firm value. Analyzing the relation between ESG and misvaluation separately, we find that ESG expands existing overvaluation whereas it reduces undervalued firms' deviation from the true value. We argue that both valuation effects are attributable to the worldwide trend of sustainable investing. Further analyses reveal a moderating role of market sentiment towards sustainability in the ESG-misvaluation relationship. Our findings suggest that firms' CSR is indeed perceived as valuable by shareholders and supports stakeholder theory's view in considering CSR as beneficial.

JEL Classification: G14; G32; M14; Q5

Keywords: Corporate social responsibility; ESG; misvaluation; sustainable investing; market efficiency; sentiment

IV.1 Introduction

"We believe that sustainability should be our new standard for investing" (BlackRock, 2020). In his 2020 annual letter to clients Larry Fink, Chairman of the largest asset management company in the world, announces "a significant reallocation of capital" according to sustainability criteria (BlackRock, 2020). The Global Sustainable Investment Review (GSIA, 2018) states that the rise of sustainable investing[1] is a worldwide trend. In the U.S., sustainable investing records a growth of 42% since 2018, with today more than one third of professionally managed assets invested in accordance with sustainability criteria — $17.1 trillion in aggregate (USSIF, 2020). While ESG is already a central topic for policymakers, institutional investors and corporates, it increasingly becomes part of the investment decisions for individual investors as well. For example, mutual funds with a higher assigned sustainability rating receive high net inflows whereas a low sustainability rating leads to outflows (Hartzmark and Sussman, 2019). Accompanied by regulatory initiatives[2], the worldwide movement in adopting ESG principles increases the demand for high ESG-rated companies. At the same time, the screening process in accordance with ESG principles reduces the amount of potential investment opportunities (e.g. Ghoul and Karoui, 2017; Hoepner, 2017). As a consequence, an increasing demand for sustainable companies in conjunction with a limited investment universe might affect market pricing efficiency of these firms.

In this study, we investigate the research question whether ESG leads to potential misvaluation of firms and thus affects market efficiency. While sustainable investing immediately raises questions about the resulting financial performance (e.g. Hong and Kacperczyk, 2009; Barber et al., 2021; Galema et al., 2008), we are particularly in-

[1]The investment approach that incorporates companies' Environmental, Social and Governance (ESG) profiles in portfolio selection and management is called 'sustainable investing'. The terms Corporate Social Responsibility (CSR), ESG and corporate sustainability are used as synonyms in this study.

[2]For example, changes in directives, such as the 2015 U.S. Department of Labor ruling on ESG in Employee Retirement Income Security Act plans (Eccles et al., 2017) or the EU's action plan on sustainable finance (European Commission, 2018).

terested in implications of sustainable investing for stock market valuation. In order to investigate value implications due to CSR engagement, we are to the best of our knowledge the first to empirically analyze the direct impact of corporate sustainability on firm-level misvaluation.

We find that ESG significantly affects misvaluation of U.S. firms. More specifically, an improved corporate sustainability increases a firm's market valuation relative to its true value. An investigation of over- and undervalued firms reveals that ESG leads to expanded overvaluation and reduces existing undervaluation. Moreover, we show that information asymmetry seems to not play a role in the relationship between ESG and misvaluation.

Furthermore, the ESG-misvaluation relationship strengthens in more recent years and seems to be moderated by the intensified relevance of CSR. This relevance is reflected in sentiment towards sustainability topics: the higher the ESG market sentiment, i.e. the societal and investors' awareness towards sustainability criteria, the stronger the impact of ESG on misvaluation measures.

Our empirical strategy to identify the impact of ESG on firms' valuation is straightforward: Our sample of 1,817 U.S. firms allows us to investigate the relationship between a company's sustainability profile (measured by ASSET4's ESG score) and its misvaluation. Therefore, we identify misvaluation of firms by predicting a company's intrinsic equity value, which we then relate to the actual observed value. We apply two different misvaluation measures, which are well-established in the corresponding literature (e.g. Dong et al., 2020; Fu et al., 2013). First, we employ a measure relying on I/B/E/S earnings forecasts of a company's future earnings per share that is based on the residual income model of Ohlson (1995). The second measure introduced by Rhodes-Kropf et al. (2005) is built on accounting-based figures. The application of two different approaches to capture misvaluation underlines the robustness of our findings, as both consider misvaluation from different perspectives. Furthermore, results from several two-stage least squares instrumental variable regressions as well as dynamic panel Generalized Method of Moments (GMM) estimations underline the relationship between ESG and misvaluation to be robust against potential endogeneity concerns. Moreover, the results are robust to an alternative approach of capturing ESG performance of firms independent of a numerical score: becoming a constituent of the MSCI KLD 400 Social sustainability index results in higher misvaluation ratios for the respective companies.

Our contribution to the literature is threefold: First, we show that ESG affects misvaluation in a comprehensive sample of U.S. firms by investigating the direct link between ESG and misvaluation. This extends the findings of Cao et al. (2021) who investigate investment decisions of socially responsible institutions based on the prevailing levels of CSR and (mis)valuation of the potential investment targets. However, their analyses do not establish any direct link between CSR and misvaluation but explicitly consider their combined impact on stock returns.

Second, our analysis digs deeper into the question in which way ESG drives prevailing over- and undervaluation. We find that regardless of the existing level of firm misvaluation, ESG efforts result in higher valuation compared to the firm's true value. We therefore complement a recent strand of research indicating that sustainable investing alters classic investment criteria and behavior (Riedl and Smeets, 2017; Gutsche and Ziegler, 2019). Socially responsible investors base investment decisions on their ESG preferences and attribute firm value to the CSR profile of higher ESG-rated firms which might be reflected in strong capital flows into more sustainable investment targets (Hartzmark and Sussman, 2019; Bialkowski and Starks, 2016). Moreover, these findings corroborate the argumentation of the stakeholder theory (Freeman, 1984) that CSR efforts do not diminish shareholder wealth but might have positive value implications (Deng et al., 2013). The shareholder value maximization view (Friedman, 1970) which argues that CSR investments are associated with costs without direct return (Cronqvist et al., 2009) and hence perceived as less favourable by shareholders can not be confirmed by our results.

In this context, another strand of literature already points out a positive impact of CSR on stock pricing efficiency due to higher information availability (Cui et al., 2018; Lopatta et al., 2015; Siew et al., 2016). However, since we do not find this moderating effect of information asymmetry in the ESG-misvaluation relationship we conclude that a strong CSR performance of a company leads (sustainable) investors to perceive these firms as attractive investment opportunities. This effect might induce capital flows which could lead overvalued companies to expand their overvaluation while undervalued firms converge to their true value.

Third, we contribute to a strand of the ESG literature focusing on the role of sentiment (e.g. Choi et al., 2020; Brøgger and Kronies, 2021). We show that sentiment is especially relevant in the context of misvaluation as stronger sentiment towards sustainability strengthens the effect of ESG on firms' misvaluation.

The remainder of this paper proceeds as follows: section IV.2 provides a review of related literature and derives hypotheses. Section IV.3 describes the data, variables and the empirical methodology. Results are presented in section IV.4. We provide additional analyses and robustness checks in section IV.5. Finally, section IV.6 concludes.

IV.2 Literature review and hypotheses development

Several strands of literature theoretically discuss the meaningfulness of firms' investments in and commitment to CSR. Two opposing views exist with regards to the effects of CSR on stakeholder and shareholder wealth. On the one hand, Friedman (1970) put forth agency theoretical considerations with the implication that the sole purpose of corporations is to maximize shareholder wealth. Since CSR efforts are voluntary investments of firm managers, shareholder fear increasing costs due to CSR investments without direct implications for financial profit and hence a reduction in profitability and firm value (Friedman, 1970; Lu and Taylor, 2015; Cronqvist et al., 2009; Deng et al., 2013).

On the other hand, Freeman (1984) postulates the stakeholder theory and argues that firms are responsible to care for the interest of all stakeholders. According to this theory, CSR efforts lead to indirect returns with value implications. First, the focus on stakeholder aspects triggers stakeholders to support firm operations and to provide resources to the firms (Deng et al., 2013). Moreover, these efforts result in a better reputation and alignment of stake- and shareholder interests (see e.g. Haley, 1991). In this view, the explicit consideration of stakeholder welfare does not come at the cost of shareholders but instead leads to higher firm reputation resulting in higher performance (see e.g. Brammer and Pavelin, 2006; Berman et al., 1999; Carmeli et al., 2007) and thus affecting firm value positively (see e.g. Jain et al., 2016).

Recent literature seeks to understand the implications of CSR activities for firm performance empirically (Bae et al., 2019; Ghoul et al., 2011; Deng et al., 2013). Moreover, in line with stakeholder theory, some studies argue that firms engaging in CSR create shareholder value in the long run (Ferrell et al., 2016; Nguyen et al., 2020; Byun and Oh, 2018) even though stock markets undervalue CSR in the short run (Gompers et al., 2003; Ioannou and Serafeim, 2014). Firms ignoring their social responsibility may destroy long-term shareholder value due to potential reputation losses or litigation costs (Renneboog et al., 2008). Although many of these studies suggest that CSR has a positive impact on firms' financial performance (e.g. the meta analyses of Friede et al., 2015; Whelan et al., 2021), there is no consensus on the direction of the causality and on whether CSR is priced in capital markets (Renneboog et al., 2008).

Furthermore, research on how sustainable investing or CSR engagement influences the efficiency of market prices is yet scarce. Prior literature indicates that ESG preferences may be associated with market inefficiencies: First, Cao et al. (2021) find that socially responsible institutions (SRIs) are less likely to buy underpriced stocks or sell overpriced stocks. Because of their ESG preference, SRIs tend to focus more on ESG performance and may thus react less to direct signals of firm value. Second, Starks et al. (2020) consider CSR in the context of investment behavior. They find that institutional investors with longer horizons prefer high ESG-rated firms. Such investors tend to behave more patiently towards these firms in their portfolios, e.g. they are less inclined to sell the stocks after poor stock performance or negative news. Starks et al. (2020) attribute this behavior to the investor's expectations of a long-term value creation offsetting the potential losses on a shorter time frame. Hence, short-term (negative) valuation signals of high ESG-rated companies are not inevitably taken into account by sustainable investors. Further studies report that socially responsible investors derive non-financial utility from investing in accordance with socially responsible criteria and, thus, are willing to accept lower financial performance (Gutsche and Ziegler, 2019; Riedl and Smeets, 2017; Ghoul and Karoui, 2017; Bollen, 2007).

These aspects could lead to a drift between the stock market valuation and the true value of firms regarding their ESG performance. Such misvaluation on the stock level, depending on the firms' CSR level, may lead to inefficiency on the market level. Thus, we hypothesize a relation between a firm's CSR engagement and misvaluation, which leads to our first testable prediction:

Hypothesis 1: *CSR engagement affects firms' misvaluation*

The existence of a valuation effect due to CSR engagement might be driven by different economic channels. Firm's economic benefits from CSR have been documented in its link to consumers' positive product and brand evaluations (e.g. Drumwright, 1994; Sen and Bhattacharya, 2001) beyond rational considerations such as product attributes. CSR is also reported to affect unrelated consumer judgements, for example the evaluation of new products (Klein and Dawar, 2004). Due to this so-called "halo effect"[3] of CSR, people use the fact that a firm cares about the environment for example to over-extrapolate that the firm itself is valuable and offers great products (Hong and Liskovich, 2015). Although CSR could indeed be valuable to consumers by signalling product quality, Hong and Liskovich (2015) show that the perceived value of CSR is most likely a result of the halo effect as it even exists among prosecutors. According to their findings, prosecutors are influenced by the halo effect and over-extrapolate from a firm's CSR to do less harm so that higher CSR firms receive lower fines. Transferring these findings to the stock level, this bias already affects consumers and also prosecutors and thus could even lead investors to over-extrapolate from a firm's CSR commitment to being particularly valuable and having great stocks.

Relating to capital markets, investors could attribute a higher value than the actual firm value due to CSR engagement. This potential valuation effect gains relevance by an increasing awareness of investors to ESG issues over the last decades, which is also reflected in a strong growth in socially responsible investing around the world

[3]The halo effect is a cognitive bias documented by psychological literature (e.g. Nisbett and Wilson, 1977; Thorndike, 1920) stating that one's judgement of a firm or person can be affected by the overall impression of the firm or person, in the absence of actual knowledge (Hong and Liskovich, 2015).

(Renneboog et al., 2008). Investing in accordance with sustainability criteria, thus, becomes crucial for a broader range of investors. Bialkowski and Starks (2016) examine U.S. equity mutual funds and find that inflows to funds labelled as ESG funds have been higher than to comparable funds without similar labels. Hartzmark and Sussman (2019) use the introduction of sustainability ratings by Morningstar and find that funds categorized as low sustainability funds experience net outflows, while being categorized as a high sustainability fund results in even higher net inflows. If retail and institutional investors value sustainability and avoid investments (i.e. firms and funds) with low ESG scores, asset managers will invest in accordance with their clients' preferences. These papers indicate that sustainable investing alters conventional investment criteria and behavior (Starks et al., 2020) leading to potential pricing inefficiencies.

While we already hypothesized an effect of ESG on misvaluation, such misvaluation could occur in both directions in either overvaluation (higher market value than true value) or undervaluation.[4] Thus, such effect has to be differentiated for both scenarios to analyze ESG's actual impact on valuation. Due to the growing relevance for sustainable investing, the amount of such investors increases channelling capital flows into high ESG-rated investment targets which might lead to higher misvaluation ratios regardless of prevailing levels of misvaluation. In particular, this would extend existing overvaluation of firms as the market valuation further diverges from the actual firm value. For undervalued stocks, we also expect the market valuation to increase relatively to the true value due to the additional attraction of capital accompanied with ESG engagement. Thereby, the deviation from the true value might decrease, which leads to a decreasing undervaluation. Thus, we hypothesize:

Hypothesis 2a: *CSR increases existing overvaluation*

Hypothesis 2b: *CSR decreases existing undervaluation*

Besides the described valuation effect, there is a further channel which might affect the ESG-misvaluation relationship: information asymmetry. It has been shown that the

[4]The consideration of the applied misvaluation measures in this study as described in section IV.3.1 does not allow a direct interpretation with regards to overvaluation or undervaluation due to the construction as a ratio.

disclosure of ESG information via annual reports and CSR reports increases the total information available to capital markets and thus a firm's transparency (Siew et al., 2016; Lopatta et al., 2015; Rossi and Harjoto, 2020). Moreover, prior evidence reports that ESG information mitigates information asymmetries (Cui et al., 2018). Higher CSR quality settles down in a decline in earnings forecasts biasedness and hence can lead to improved market efficiency (Becchetti et al., 2013). Taken together, this strand of literature indicates a positive impact of CSR engagement on market efficiency due to reduced information asymmetry. Thus, this would lead to a different effect (opposed to hypotheses 2a and 2b) where increasing CSR leads the market value to converge towards the true value. Consequently, we additionally test whether the CSR effect on valuation is affected by reduced information asymmetry. We would therefore expect that higher CSR engagement, if it is accompanied with diminished information asymmetry, reduces the misvaluation for both, over- and undervalued firms. Thus, we test the additional hypothesis:

Hypothesis 3: *Information asymmetry moderates the relationship between CSR and misvaluation*

Over the last years ESG considerations significantly increased in relevance for companies (e.g. United Nations, 2016) and investors (e.g. BlackRock, 2020). This is also reflected in prior studies (Cao et al., 2021; Hartzmark and Sussman, 2019) as well as institutional sustainability reports (USSIF, 2020; GSIA, 2018) that demonstrate the growing interest in sustainability. We therefore expect the effect of ESG on misvaluation to increase over time.

Moreover, investor views about the value of corporate sustainability might also be influenced by public awareness towards sustainability. This awareness is mirrored in public sentiment which in general has been shown to affect the pricing of securities (Baker and Wurgler, 2006; Stambaugh et al., 2012; Yu and Yuan, 2011). Furthermore, Serafeim (2020) provides evidence that public sentiment towards firms' sustainability activities affects their valuation. Serafeim (2020) also finds that the valuation premium paid for companies with strong sustainability performance has increased over time. Thus, we expect the ESG-misvaluation relationship to be moderated by increasing relevance of ESG, also reflected in sentiment. We therefore hypothesize:

Hypothesis 4: *Increasing relevance of CSR positively moderates the ESG-misvaluation relationship*

IV.3 Sample description and methodological approach

IV.3.1 Data and variables description

Main explanatory variable — ESG score

We study a sample of 1,817 U.S. firms from 2004 to 2017 given that prior research shows that potential inefficiencies arise due to growth in sustainable investing after 2003 (Cao et al., 2021). We obtain time series company *ESG scores* from the ASSET4 database provided by Refinitiv (formerly Thomson Reuters). The ASSET4 data on ESG are well-established in the literature (Flammer, 2021; Hawn and Ioannou, 2016; Cheng et al., 2013; Ioannou and Serafeim, 2012).

The score measures a company's ESG performance based on reported data and ranges from 0 to 100, where 100 represents the best *ESG score* achievable. ASSET4 pursues precise inclusion rules for the assignment of ESG scores to companies and hence is shown to exhibit minimal selection bias (Desender and Epure, 2015). The score consists of three main components called 'pillars' (environmental, social and governance pillar). Each pillar includes several categories (e.g. emissions, environmental product innovation, human rights, CSR strategy) reflecting a company's performance in the specific field of CSR.

With regards to the environmental and social pillar scores, Thomson Reuters Business Classification (TRBC) industry groups are used to benchmark the companies against their peers. However, best practices in the field of governance tend to be more consistent within countries; thus, for the governance pillar peer companies in the same country are considered as benchmark.

The aggregate score captures over 450 company-level ESG measures that are translated into 178 indicators and incorporates the most indicators among rating providers (e.g. MSCI KLD uses about 70 indicators).[5] In order to obtain scores for each category, a percentile rank scoring methodology is applied. The indicators are then weighted according to their respective materiality in a company's industry in the aggregation procedure of the ASSET4 score. In addition, ESG ratings in general seem to be quite sticky over time, however, this weakness is reduced for the ASSET4 score as it shows the most variation among established ESG ratings in both investment industry and academic research (Dorfleitner et al., 2015).

Most important for our research setting, all indicator values per company are benchmarked against all other companies in the same industry (or for governance issues in the same country). Since the misvaluation measure of Rhodes-Kropf et al. (2005) (see subsection *Dependent variables — misvaluation measures* in section IV.3) in particular relies on the industry-relative identification of firm misvaluation (i.e. benchmarking), the ASSET4 score ideally fits our research question.

Our sample includes all publicly listed companies in the U.S. that receive an ASSET4 ESG rating. Table IV.1 reports the number of firms and its evolution over time with an assigned *ESG score* in Panel A as well as the distribution across industries in Panel B. The number of rated firms increases over the investigation period due to the soaring coverage by the ASSET4 database. The information content of ESG scores in the respective year reflects the information available to investors at this specific point in time since Refinitiv does not backfill the ratings. The consideration of the industry composition outlined in Table IV.1 in Panel B reveals that our sample firms are distributed over a wide range of industries.

[5] Appendix III.B shows the weights and counts of these indicators per category and pillar.

Table IV.1: Firm-year observations with ESG score per year and by industry.

Panel A: Year descriptives			*Panel B: Industry descriptives*		
Year	Firm-year obs.	%	Industry	Firm-year obs.	%
2004	375	3.37%	Basic materials	758	6.81%
2005	422	3.79%	Consumer cyclicals	1,897	17.03%
2006	436	3.91%	Consumer non-cyclicals	692	6.21%
2007	475	4.27%	Energy	762	6.84%
2008	596	5.35%	Financials	2,195	19.71%
2009	663	5.95%	Healthcare	1,109	9.96%
2010	693	6.22%	Industrials	1,643	14.75%
2011	712	6.39%	Technology	1,425	12.79%
2012	719	6.46%	Telecommunications services	128	1.15%
2013	727	6.53%	Utilities	526	4.72%
2014	759	6.82%	Other	3	0.03%
2015	1,244	11.17%			
2016	1,646	14.78%			
2017	1,670	15.00%			

Remark: This table presents the soaring coverage of the *ESG score* for our sample over time (Panel A) as well as the industry compositions (Panel B). Industry classifications are based on TRBC Economic sector codes.

Dependent variables — misvaluation measures

To approximate the misvaluation of firms, we employ two distinct measures that are well-established in the corresponding literature. First, we employ a measure relying on the *residual income model* which was defined by Ohlson (1995). This model uses discounted earnings forecasts as a measure of the true value of equity of a company. Finally, to estimate the misvaluation derived from the residual income model in line with Dong et al. (2006) and Dong et al. (2020) the imputed 'true' value is compared to the actual observed value, i.e. market capitalization applied in the following formula:

$$RES_i^{MSV}(t) = \frac{P_i(t)}{V_i(t)}. \tag{IV.1}$$

The price value $P_i(t)$ is the market capitalization, i.e. the market value of equity of company i at time t. The true value approximated by the residual income model is denoted as V. Hence, our 'misvaluation' measure of interest is a yearly time series of the RES^{MSV}.

Relating the market to the true value does not necessarily imply a company is fairly valued only when reaching a ratio of 1 for the RES^{MSV} (see e.g. Dong et al., 2020). This is due to two reasons: First, by definition the calculation of the true value incorporates a firm's book value. Book values do not reflect growth opportunities and therefore the model is too conservative in approximating true values. Second, the residual income model on average imputes true values that are found to be too low (see e.g. Dong et al., 2020). This even implies that comparatively undervalued firms could experience a misvaluation ratio higher than 1 in some years.

The aforementioned residual income model discounts earnings forecasts to derive a firm's true value and thus takes a forward-looking perspective of misvaluation. However, this approach is amongst other restrictive assumptions limited to companies that are covered by analysts' earnings forecasts. Hence, we apply another misvaluation measure that approximates a company's true value in a backward-looking approach. Here, the true value is computed as a linear function of accounting measures benchmarked against industries and allowed to vary over time (Fu et al., 2013).

Based on the theoretical approach of Rhodes-Kropf and Viswanathan (2004), Rhodes-Kropf et al. (2005) developed a method that identifies misvaluation of companies in an M&A context and estimates this 'true' value as a function of a company's *Book value of equity*, *Net income* and *Leverage*. The resulting measure of misvaluation in our study is then comparable to the *residual income model*.[6] The market value of equity M is divided by the imputed 'true' value V for company i at time t resulting in a time series

[6] We are aware of the fact that Rhodes-Kropf et al. (2005) compute the *Market-to-value* ratio as its natural logarithm. For the sake of comparability, we use the ratio in standard units since our first misvaluation variable of interest (RES^{MSV}) is also computed in standard units.

of misvaluation (RRV^{MSV}), as shown in equation (IV.2):

$$RRV_i^{MSV}(t) = \frac{M_i(t)}{V_i(t)}. \tag{IV.2}$$

Hence, a high value of $RRV_i^{MSV}(t)$ denotes an overvaluation and a low value reflects an undervaluation of company i in year t, respectively.

Both applied measures capture different angles of misvaluation in assessing a firm's true value by different approaches. The computation of misvaluation from different perspectives allows to further enhance the reliability and robustness of our analyses by not only focusing on one specific measure. For further information regarding the misvaluation measures, their underlying assumptions and detailed computation please refer to Appendix III.A.

Information asymmetry variables

Besides the direct relationship between ESG and misvaluation, we further aim to investigate the role of *Information asymmetry* in this context. First, we follow Fu et al. (2012) and apply bid-ask spreads and illiquidity as proxies for information asymmetry. Second, in line with Krishnaswami and Subramaniam (1999) we use the standard deviation of I/B/E/S analysts' earnings forecasts (*Forecast* σ) and the forecast error of these earnings forecasts.

The *Bid-ask spread* represents the yearly average of daily bid-ask spreads calculated as $(Ask - Bid)/((Ask + Bid)/2)$ following Silber (2005).[7] The stronger the information asymmetry the wider the bid-ask spread in the underlying stock. Larger bid-ask spreads imply diverging information endowments of shareholders.

The *Illiquidity* measure captures the average in daily absolute returns divided by the dollar trading volume on that respective day in each year (Amihud, 2002).[8] *Illiquidity* expresses an investor's ability to trade a stock without impacting its price. Higher values of illiquidity point towards larger information asymmetry.

[7]Due to limited data availability our *Bid-ask spread* variable is not observable prior to 2006.

[8]The illiquidity measure is multiplied by 10^5 reflecting the percentage-return per \$100,000 trading volume.

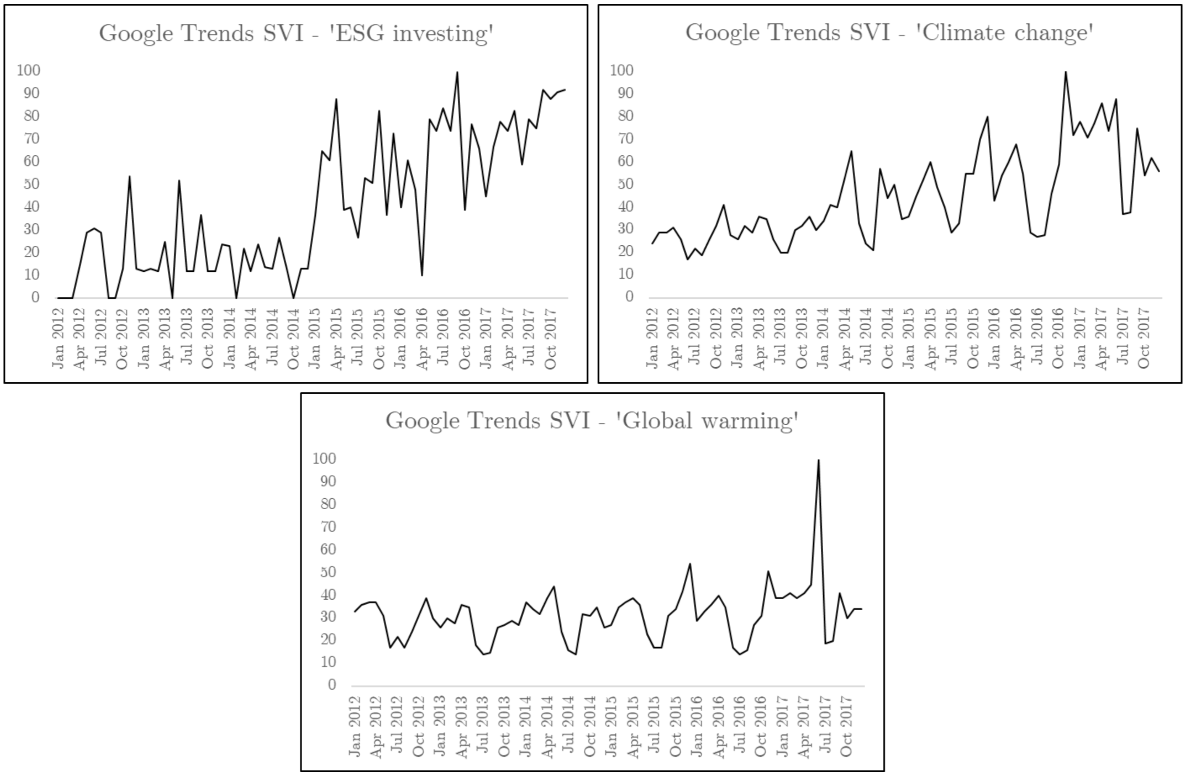
The *Forecast* σ is measured as the standard deviation of all I/B/E/S analysts' earnings forecasts available at the last month of the fiscal year end (Krishnaswami and Subramaniam, 1999). It represents the deviation of a consensus estimate between the analysts. Stronger disagreement between analysts implies higher information asymmetry as there seems to be a lack of information. The *Forecast error* measures the percentage deviation of the mean of all analysts earnings forecasts from the actual reported earnings per share in the respective fiscal year (Krishnaswami and Subramaniam, 1999). Without any information asymmetry in place earnings forecasts should be precise. Thus, higher forecast errors reflect higher information asymmetry.

Google search volume index

As we are interested in effects of market sentiment in the context of ESG and misvaluation, we apply Google Trends search volumes as a proxy. Google Trends provides data on the amount of searches in specific regions at a specific point in time with regards to every possible search term. Additionally, the database offers time series data on the occurrence of the predefined search terms in its search volume index (SVI). These data have been used in several studies investigating asset prices in a more general context (e.g. Da et al., 2014; Preis et al., 2013) and the impact of sustainability in a corporate finance and asset management setting (e.g. Choi et al., 2020; Brøgger and Kronies, 2021). We therefore collect the proxy variables for *Sentiment* towards sustainability (employed in the analysis in section IV.4.4) from Google Trends' SVI. With increasing relevance of sustainable investing from 2012 on (e.g. USSIF, 2020), we download the monthly data from Google Trends' SVI search topic for the time span of 2012 to 2017 to cover the more recent sample period and build yearly averages, restricting the search region to the U.S.

Consequently, we include the query for the search term 'ESG investing' covering the holistic area of ESG and sustainability in the investment context. Additionally, we perform the same analysis for the search terms 'Climate change' and 'Global warming' as investigated by Choi et al. (2020). Figure IV.1 illustrates the development of the Google search terms 'ESG investing', 'Climate change' and 'Global warming' over time for the period 2012 to 2017.

Figure IV.1: Developments of the Google Trends SVI for the keywords ‘ESG investing’, ‘Climate change’ and ‘Global warming’.



Remark: This figure illustrates the monthly Google Trends SVI for the keywords ‘ESG investing’ on the top left-hand side, ‘Climate change’ on the top right-hand side and ‘Global warming’ at the bottom over the period 2012 to 2017 in the U.S. The y-axis denotes the search volume and the x-axis shows the respective date. The search volume index is assessed relative to the maximum search frequency in the investigated time period.

As can be seen in Figure IV.1, the search terms increase in importance over the sample period from 2012 to 2017. Especially, ‘ESG investing’ and ‘Climate change’ seem to become more and more important to the society reflected in increased search volume.

Control variables

A variety of control variables, identified as relevant in the context of misvaluation, is included in the analyses: The *Leverage* ratio, defined as the book value of total liabilities over the value of total assets (e.g. Dong et al., 2006) and a firm's *Analyst coverage* (e.g. Becchetti et al., 2013). We furthermore include $Profitability$ calculated as operating income divided by total assets. $Profitability$ is related to valuation since it contains information about future returns and hence market valuation (Hoepner et al., 2021) and significantly affects the return distribution in a misvaluation context (Eisdorfer et al., 2019).

Furthermore, Rhodes-Kropf et al. (2005) disentangle the $Market$-*to-book* ratio into a market-to-value (misvaluation) and a value-to-book (growth) component. In order to control for the growth component in a firm's valuation, we include a firm's $Market$-*to-book* ratio (e.g. Doukas et al., 2010). In addition, capital expenditures ($CapEx$) are a significant determinant of misvaluation as shown by Hertzel and Li (2010) and thus included as control variable. Moreover, the equity return volatility of stocks (σ) has an impact on valuation since higher volatility accelerates market value adjustment processes (e.g. Hwang and Lee, 2013). σ is the volatility of a firm's daily stock returns in the respective year. The firm-level data for the calculation of the misvaluation measures (detailed derivations in Appendix III.A), the information asymmetry proxies as well as control variables are collected from Refinitiv.

IV.3.2 Empirical methodology

The panel data structure allows to apply a fixed effects regression model in order to examine the relationship between ESG and misvaluation. However, potential endogeneity concerns may arise from measurement errors in the explanatory variable, omitted variables or reverse causality (e.g. Roberts and Whited, 2013; Li, 2016). We try to solve the issue of omitted variables by carefully including control variables found to be relevant in the context of misvalation in the empirical literature as described in Chapter IV.3.1. In order to further alleviate endogeneity concerns — particularly reverse causality —

that might arise in the ESG-misvaluation relationship, we include the one year lagged value of the dependent variable as additional regressor into the regression model. Reverse causality, in this context, describes the fact that misvaluation might drive firms' CSR engagement which is in contrast to the relationship we intend to measure. Overvalued companies for example might have more financing resources to engage stronger in CSR. Including the value of misvaluation in the preceding period (lagged dependent variable) as additional regressor accounts for the fact that misvaluation might depend on past outcomes. Furthermore, Avramov et al. (2020) show a persistence of misvaluation which justifies the inclusion of the lagged dependent variable in the regressions. Therefore, we estimate the following fixed-effects model with lagged dependent variable:

$$y_{i,t} = \beta_1 y_{i,t-1} + \beta_2 ESG_{i,t-1} + \gamma' \mathbf{x}_{i,t} + \upsilon_i + \epsilon_{i,t} \ . \tag{IV.3}$$

y_{it} denotes the dependent variable representing our misvaluation measures, $y_{i,t-1}$ contains the lagged dependent variable and $ESG_{i,t-1}$ captures the lagged ESG rating, so that β_2 shows the impact of lagged corporate sustainability on misvaluation. The vector $\mathbf{x}_{i,t}$ captures the control variables delineated in section IV.3.1. υ_i is a firm-fixed effect and $\epsilon_{i,t}$ denotes the error-term in the regression. By first differencing or within-transforming equation (IV.3), we get rid of the time-invariant part υ_i. The equation after first differencing looks as follows:

$$\Delta y_{i,t} = \beta_1 \Delta y_{i,t-1} + \beta_2 \Delta ESG_{i,t-1} + \gamma' \Delta \mathbf{x}_{i,t} + \Delta \epsilon_{i,t} \ . \tag{IV.4}$$

The inclusion of past outcomes of the dependent variable, however, comes at the cost of introducing a correlation between the differenced error term $\Delta\epsilon_{i,t}$ and the lagged dependent variable $\Delta y_{i,t-1}$ since both are a function of $\epsilon_{i,t}$.[9] We address this issue by presenting dynamic GMM estimations in the endogeneity section (IV.5.1). To account for heterogeneous effects between the different firms in the sample, we apply standard errors clustered on firm level.

[9]Due to concerns about biases arising from the inclusion of the lagged dependent variable, we have additionally performed our analyses without lagged dependent variable. Nevertheless, we can replicate our findings. Results are available upon request from the authors.

As shown in equation (IV.3), we use the lagged *ESG score* as explanatory variable to take the time structure of CSR into account. ESG ratings of data providers approximate the corporate sustainability of a company based on its information available on corporate actions in the field of ESG issues. Most of this information is published in annual reports of the companies. Hence, investors are informed about the actions of a company mostly in the aftermath of the company's fiscal year. This is supported by findings of Khan et al. (2016) who report lagged capital market reactions to the publication of ESG ratings, owing to the fact that sustainable investors decide to adjust their portfolios after the publication of new ESG information.

IV.3.3 Summary statistics

The final dataset consists of 11,137 *ESG score* firm-year observations. Table IV.2 presents the descriptive statistics of the included variables. Misvaluation measures, information asymmetry proxies and control variables are winsorized at the 1st and 99th percentile in order to limit the influence of outliers. As Panel A in Table IV.2 reveals, the mean of RES^{MSV} indicates an on average 2.6 times higher market value compared to fundamental value of firms. By construction, the value of RRV^{MSV} is closer to 1 as it benchmarks a firm's imputed true value by analyzing the observed market values of companies in the respective industry.[10]

Moreover, the mean value of the *ESG score* as shown in Panel B in our sample is 49.7. ESG pillar scores show a mean value of 46.8 for the *Environmental* pillar, 51.2 for the *Social* pillar and 51 for the *Governance* pillar. With regards to our control variables delineated in Panel C, firms in our sample have on average a $Profitability$ of 7.4%. *CapEx* are scaled by total assets and hence reveal that on average 4.6 percent of total assets are invested in CapEx. Furthermore, the average firm in the sample is covered by 15 analysts and its annual equity return volatility σ is 2.1%. The *Leverage* ratio shows a mean value of 60.2% and the *Market-to-book* ratio signals a 3.8 times higher

[10]Pairwise correlations between the two investigated misvaluation measures reveal a positive correlation of 0.2 in our sample. This is supportive for the fact that both misvaluation measures co-vary although both consider misvaluation with respect to different temporal perspectives.

market value than book value of the firms' equity. Panel D delineates the information asymmetry variables. First, the *Bid-ask spread* has a mean value of 0.125%. Second, the *Illiquidity* measure shows an average value of 19.5% return per $100,000 trading volume per day. On average, the volatility of earnings forecasts is 0.176 and the *Forecast error* is 10.82%.

Table IV.2: Descriptive statistics of dependent and explanatory variables.

	Firm-year obs.	Mean	Median	Std. Dev.	Min.	Max.
Panel A: Misvaluation measures						
RES^{MSV}	9,014	2.625	1.759	3.156	0.123	20.907
RRV^{MSV}	10,614	1.368	1.080	1.041	0.249	7.060
Panel B: Sustainability variables						
ESG score	11,137	49.651	46.629	17.747	9.646	97.891
ESG pillars						
Environmental	11,137	46.836	41.816	22.673	2.794	98.704
Social	11,137	51.164	48.955	19.823	4.150	98.944
Governance	11,137	51.028	50.980	21.634	3.181	99.058
Panel C: Control variables						
Profitability	10,312	0.074	0.074	0.120	-0.797	0.391
CapEx	10,845	-0.046	-0.031	0.053	-0.373	0.000
Analyst coverage	11,082	14.933	14	8.731	0	35
σ	10,825	2.099	1.792	1.096	0.820	7.748
Leverage	11,137	0.602	0.611	0.212	0.074	1.000
Market-to-book	11,137	3.788	2.447	4.457	0.067	29.405
Panel D: Information asymmetry variables						
Bid-ask spread	9,597	0.125	0.072	0.218	0.000	3.549
Illiquidity	10,332	19.543	2.926	231.226	0.012	12.252
Forecast σ	10,722	0.176	0.048	0.463	0.000	3.985
Forecast error	10,835	10.818	2.089	39.579	0.000	387.805

IV.4 Results

IV.4.1 ESG and firm misvaluation relationship

As postulated in hypothesis 1 we expect corporate sustainability to affect misvaluation. We therefore investigate the direct impact of companies' ESG activities on their respective misvaluation. Table IV.3 shows that the lagged *ESG score*, our variable of interest, significantly increases the misvaluation measures on the firm level in the subsequent period.

Table IV.3: Company misvaluation regressed on ESG score.

	(1) RES^{MSV}	(2) RES^{MSV}	(3) RES^{MSV}	(4) RRV^{MSV}	(5) RRV^{MSV}	(6) RRV^{MSV}
L.dep. var.		0.0587***	0.0221		0.268***	0.0478
		(0.0199)	(0.0205)		(0.0316)	(0.0314)
L.ESG score	0.0404***	0.0416***	0.0323***	0.00782***	0.00709***	0.00277***
	(0.00334)	(0.00327)	(0.00361)	(0.00121)	(0.000989)	(0.000928)
Profitability			-4.228***			-0.623***
			(0.908)			(0.229)
CapEx			14.09***			0.486
			(2.064)			(0.443)
Analyst coverage			0.0166			-0.00308
			(0.0119)			(0.00233)
σ			-0.386***			-0.0291*
			(0.0514)			(0.0164)
Leverage			-4.196***			0.863***
			(0.632)			(0.157)
Market-to-book			0.0932***			0.164***
			(0.0160)			(0.00660)
Constant	0.701***	0.377**	4.556***	0.983***	0.654***	0.216*
	(0.171)	(0.170)	(0.499)	(0.0604)	(0.0679)	(0.125)
Firm-year obs.	7,917	7,080	6,243	9,056	8,978	7,949

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Table IV.3 – continued from previous page

	(1) RES^{MSV}	(2) RES^{MSV}	(3) RES^{MSV}	(4) RRV^{MSV}	(5) RRV^{MSV}	(6) RRV^{MSV}
R^2	0.021	0.027	0.084	0.009	0.070	0.426
Obs.	1,439	1,318	1,093	1,582	1,574	1,333

Remark: This table presents the fixed-effects estimations of the effects of a company's lagged *ESG score* on its respective misvaluation. The dependent variables are the residual income misvaluation measure RES^{MSV} according to Ohlson (1995) in models (1), (2) and (3) as well as the Rhodes-Kropf et al. (2005) misvaluation measure RRV^{MSV} in models (4), (5) and (6). Standard errors are clustered at firm-level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The analysis of the residual income model misvaluation measure (RES^{MSV}) reveals a significantly positive effect of the lagged *ESG score* in the base model (1). This effect remains significant when including the lagged dependent variable in model (2) and additionally control variables in model (3). Thus, an increase in the *ESG score* by one unit leads to an increase in the misvaluation ratio by 0.0323 when measured by the RES^{MSV} measure in model (3). In other words, an improvement of the *ESG score* leads to an increase in the ratio of actual to true value. The observed effect is also economically significant: under the assumption of holding the true value constant at $10 billion, an increase of the ESG score by one unit results in a $323 million higher market value.

Considering RRV^{MSV} in models (4), (5) and (6), an increase in ESG is also accompanied by statistically significant higher misvaluation ratios. In the main model of interest (6), improved ESG performance by one unit leads to a 0.00277 higher misvaluation ratio.[11] Besides the fact that the RRV^{MSV} has a comparatively smaller mean value, the smaller effect in magnitude compared to the RES^{MSV} measure can be ex-

[11] First, we are aware of the fact that our misvaluation measures and one of our control variables (*Market-to-book*) have the *Market capitalization* of the respective companies as the nominator, causing potential endogeneity concerns. However, not controlling for *Market-to-book* does not alter the results. Second, since the misvaluation measure RRV^{MSV} is among others computed based on the *Leverage* ratio it also can cause potential endogeneity issues. Excluding the *Leverage* ratio from the regression model(s) does not influence the observed effects either.

plained in the following way: The market value in both ratios is — by definition — exactly the same, however, both measures capture the true values of companies from different temporal perspectives. The forward-looking approach of the residual income model is found to estimate more conservative values, hence underestimates the true value (e.g. Dong et al., 2020). Since market value is divided by an underestimated true value in the residual income model, this could result in higher effect sizes for the respective misvaluation measure. In contrast, the backward-looking RRV model estimates less conservative (higher) true values, resulting in potentially smaller effect sizes.

Overall, results from Table IV.3 indicate that CSR engagement of companies significantly affects misvaluation and thus stock pricing efficiency. Therefore we can accept hypothesis 1 that CSR engagement of companies significantly affects their misvaluation.

IV.4.2 ESG-misvaluation relation of over- and undervalued firms

Corporate sustainability indeed affects the misvaluation on firm-level as shown in the previous section. However, the overall effect does not allow an interpretation with regards to overvaluation or undervaluation. This is due to the construction of the misvaluation measures as a ratio, where comparatively higher values indicate an overvaluation and lower figures point out an undervaluation. Hence, a positive effect of ESG on these measures could affect the degree of over- and undervaluation in opposing ways. In other words, the positive effect of corporate sustainability on misvaluation measures can on the one hand be driven by a diminishing undervaluation or on the other hand by amplified overvaluation or both.

For this reason, we analyze the most over- and undervalued companies within the sample based on the degree of misvaluation in the preceding period to trace out effects for over- and undervaluation separately. The group of overvalued companies comprises the 20% of companies with the highest misvaluation ratio according to the respective measure. The mean misvaluation ratio for the group of overvalued firms is 5.868 (RES^{MSV}) and 2.666 (RRV^{MSV}). Correspondingly, the companies with the lowest misvaluation ratio belong to the group of undervalued companies. These are the 20% of companies that are most undervalued with means of 1.059 (RES^{MSV}) and 0.563 (RRV^{MSV}), respectively.[12] This subdivision allows to interpret the effects of ESG with regards to the respective existing misvaluation.

Table IV.4 displays the effects of the lagged *ESG score* on the misvaluation measures in the respective group. For both groups the coefficients are significantly positive with two different implications. Overvalued companies (investigated in Panel A) that increase their corporate sustainability profile experience an expansion of their overvaluation. In contrast, if a company is undervalued (investigated in Panel B) and improves its sustainability profile it does not widen its undervaluation but instead reduces its existing misvaluation.

Disentangling the overall effect into the misvaluation extremes consequently underlines the overall positive effect of corporate sustainability on misvaluation ratios and provides further insights into the valuation processes of companies.[13] These results confirm hypotheses 2a and 2b: ESG engagement leads to higher ratios of actual to true value helping undervalued companies in reducing their misvaluation whereas overvalued firms become even more overvalued.

Our results can be interpreted such that a higher degree of sustainability is perceived as a signal of a firm to be more valuable and thereby might attract capital flows (Hartzmark and Sussman, 2019; Starks et al., 2020) irrespective of its true value. This effect could consequently drive market valuation of companies regardless of their existing level of misvaluation.

[12]As described in section IV.3 the RES^{MSV} model's fair valuation ratio is not necessarily equal to 1. Misvaluation according to this measure must always be assessed relatively at a specific point in time (e.g. Dong et al., 2020). It could even be that comparatively undervalued firms experience a RES^{MSV} ratio larger than 1 (Dong et al., 2020).

[13]Results are qualitatively unchanged when we analyze the 25% of most under- and overvalued firms instead of 20% most under- and overvalued firms.

Table IV.4: Company misvaluation regressed on ESG score: most over- (highest 20%) and undervalued (lowest 20%) firms.

	Panel A: L.overvalued quintile						*Panel B: L.undervalued quintile*					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	RES^{MSV}	RES^{MSV}	RES^{MSV}	RRV^{MSV}	RRV^{MSV}	RRV^{MSV}	RES^{MSV}	RES^{MSV}	RES^{MSV}	RRV^{MSV}	RRV^{MSV}	RRV^{MSV}
L.dep. var.		0.0228	-0.00464		0.244***	0.0741		0.0147	-0.0571		0.422**	0.224
		(0.0406)	(0.0391)		(0.0460)	(0.0450)		(0.0334)	(0.0367)		(0.191)	(0.186)
L.ESG score	0.0959***	0.0957***	0.0684***	0.0134***	0.0113***	0.00438*	0.0214***	0.0213***	0.0187***	0.00611**	0.00517**	0.00469*
	(0.0167)	(0.0166)	(0.0182)	(0.00392)	(0.00320)	(0.00252)	(0.00548)	(0.00545)	(0.00548)	(0.00237)	(0.00251)	(0.00244)
Profitability			-6.066**			-0.916			-3.071*			0.308
			(2.751)			(0.824)			(1.843)			(0.209)
CapEx			18.22***			-0.199			6.937**			2.342***
			(5.508)			(1.432)			(2.954)			(0.748)
Analyst coverage			-0.0339			-0.00680			0.0218			-0.0113**
			(0.0444)			(0.00622)			(0.0157)			(0.00523)
σ			-1.066***			-0.0575			-0.170**			-0.0243
			(0.210)			(0.0402)			(0.0727)			(0.0217)
Leverage			-7.125***			0.611			-2.062			0.819***
			(2.430)			(0.374)			(1.410)			(0.238)
Market-to-book			0.124**			0.165***			0.0292			0.148***
			(0.0590)			(0.00870)			(0.0233)			(0.0261)
Constant	0.569	0.474	9.386***	1.577***	1.072***	0.544*	0.407	0.400	2.375**	0.520***	0.330***	0.0714
	(0.753)	(0.783)	(1.761)	(0.199)	(0.218)	(0.323)	(0.304)	(0.307)	(1.156)	(0.105)	(0.121)	(0.171)
Firm-year obs.	1,155	1,155	1,072	2,143	2,143	2,021	1,495	1,495	1,319	1,312	1,312	1,178
R^2	0.033	0.033	0.119	0.011	0.062	0.484	0.020	0.020	0.057	0.011	0.022	0.222
Obs.	540	540	495	660	660	609	556	556	485	529	529	475

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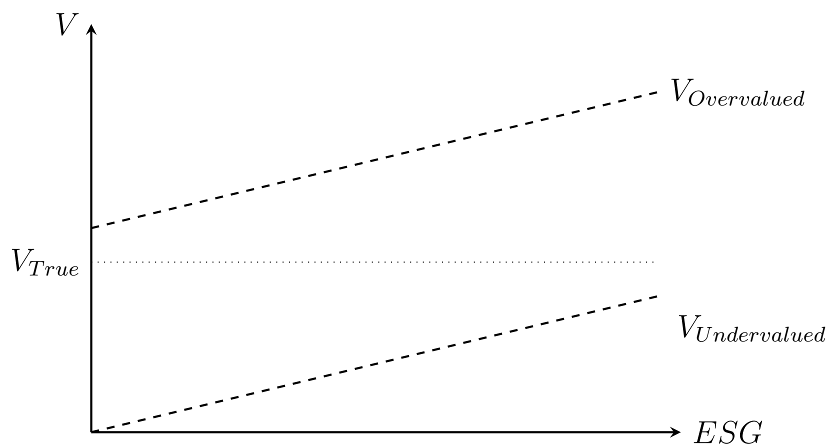
Table IV.4 – continued from previous page

Remark: This table presents the fixed-effects estimations of the effects of a company's lagged *ESG score* on its respective misvaluation for over- and undervalued firms with regards to misvaluation in the previous period. Models (1) to (6) in Panel A represent the analyses for the companies with the highest overvaluation in the preceding periods measured according to the respective misvaluation measure (highest 20%), models (7) to (12) in Panel B show the results for the analyses for the most undervalued companies (lowest 20%). The dependent variables are the residual income misvaluation measure RES^{MSV} according to Ohlson (1995) in models (1), (2), (3), (7), (8) and (9) as well as the Rhodes-Kropf et al. (2005) misvaluation measure RRV^{MSV} in models (4), (5), (6), (10), (11) and (12). Standard errors are clustered at firm-level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Figure IV.2 provides a schematic illustration of this relationship.[14] The graph reflects the valuation development of over- and undervalued companies in the subsequent period in response to an increased *ESG score*. Consequently, the x-axis denotes the firm's deviation from its (within-transformed) mean *ESG* value while the y-axis shows the resulting effect on the firm's valuation. For both lines ($V_{Overvalued}$ and $V_{Undervalued}$), an increasing *ESG score* leads to a higher degree of relative valuation. As stated above, this development for an increasing *ESG score* reflects the higher degree of overvaluation for already overvalued companies whereas undervalued companies can lower the distance to the true value (V_{True}).

Figure IV.2: Relation of ESG and (mis)valuation for over- and undervalued firms.



Remark: This figure illustrates the relationship between ESG and (mis)valuation schematically for over- and undervalued companies. The ordinate represents the firm's value, whereas the horizontal axis shows a change in the firm's *ESG score*. *ESG* reflects a company specific within transformed value ($ESG = ESG_{i,t} - \overline{ESG}_i$). V_{True} is the true value of the firm.

IV.4.3 Information asymmetry

The analyses in section IV.4.2 reveal that corporate ESG engagement affects existing firm misvaluation. As postulated in hypothesis 3, this effect can be accompanied by

[14]Please note that this figure only serves as a schematic illustration and does not account for the following aspects: different slopes in both groups (over- and undervalued firms) as indicated by different ESG score coefficient sizes in Panel A and Panel B in Table IV.4 as well as further findings indicating that the effects are not linear for different ESG levels (see section IV.5.3).

the impact of information asymmetry since prior literature shows that CSR engagement affects the information asymmetry of firms.

To test the hypothesis, we analyze the effect of CSR engagement on misvaluation in conjunction with several proxies for information asymmetry as described in section IV.3.1.[15] In order to investigate the moderating effect of information asymmetry in the ESG-misvaluation relationship, we include an interaction term between the information asymmetry proxies and the lagged ESG score. The respective interaction term captures the effect of ESG that is directly attributable to the impact of information asymmetry. We again investigate the most over- and undervalued companies separately to trace out potential effects for these groups. For these firms, information asymmetry could affect the relationship in opposing directions offsetting each other. In other words: a decline in information asymmetry might positively affect the misvaluation of undervalued firms and negatively overvalued firms.

Table IV.5 presents regression results for the inclusion of the information asymmetry variables.[16] Panel A comprises the analyses for the moderating effect of information asymmetry for the 20% most overvalued companies. Panel B shows these regression results for the 20% most undervalued companies. In general we do not find a significant effect of the respective interaction terms between the lagged ESG score and the information asymmetry proxies. However, the positive effect of the ESG score on the misvaluation measures remains statistically significant despite the inclusion of the proxies for information asymmetry. Hence, the results imply that information asymmetry does not moderate the relationship between companies' ESG engagement and their respective misvaluation; neither for over- nor for undervalued companies.

[15] We are aware of the fact that two of our *Information asymmetry* proxies (Earnings forecast σ and Earnings Forecast error) as well as the misvaluation measure RES^{MSV} rely on I/B/E/S earnings forecast data. This fact raises concerns about potential endogeneity issues. However, these issues are mitigated since we apply two further proxies for information asymmetry and additionally our second misvaluation ratio (RRV^{MSV}) is not affected by these concerns. Regression results for both misvaluation measures report the same findings with respect to the information asymmetry.

[16] Regression models include all control variables as in prior analyses but are not reported for the sake of brevity.

In addition, we investigate the impact of information asymmetry in the ESG-misvaluation relationship in the full sample. As can be seen in Appendix III.C, the vast majority of information asymmetry proxies seems not to affect the relationship significantly. Consequently, we do not observe a significant impact of information asymmetry as postulated in hypothesis 3 and therefore reject this hypothesis.

Table IV.5: Moderating role of information asymmetry in the ESG-misvaluation relationship.

	Panel A: L.overvalued quintile							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	RES^{MSV}	RES^{MSV}	RES^{MSV}	RES^{MSV}	RRV^{MSV}	RRV^{MSV}	RRV^{MSV}	RRV^{MSV}
L.dep. var.	-0.0171	-0.00461	-0.00449	-0.00428	0.0554	0.0644	0.0709	0.0824*
	(0.0379)	(0.0405)	(0.0374)	(0.0399)	(0.0470)	(0.0460)	(0.0455)	(0.0465)
L.ESG score	0.0921***	0.0617***	0.0492**	0.0665***	0.00754**	0.00544**	0.00511*	0.00462*
	(0.0220)	(0.0193)	(0.0217)	(0.0188)	(0.00303)	(0.00265)	(0.00277)	(0.00254)
Bid-ask-spread	13.61**				1.469			
	(5.625)				(1.008)			
L.ESG*Bid-ask	-0.179				-0.0236			
	(0.114)				(0.0181)			
Illiquidity		-0.0924				0.0176		
		(0.0763)				(0.0147)		
L.ESG*Illiquidity		0.00244				-0.000345		
		(0.00204)				(0.000413)		
Forecast σ			-3.021				0.254	
			(2.909)				(0.317)	
L.ESG*Forecast σ			0.0599				-0.00340	
			(0.0458)				(0.00574)	
Forecast error				0.00331				0.00464
				(0.0189)				(0.00319)
L.ESG*Forecast error				-7.21e-06				-2.64e-05
				(0.000332)				(6.86e-05)
Constant	8.501***	9.576***	9.662***	8.907***	0.655	0.682*	0.439	0.469
	(1.782)	(1.698)	(1.845)	(1.723)	(0.399)	(0.353)	(0.348)	(0.337)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-year obs.	989	1,023	1,064	1,064	1,844	1,931	1,983	1,995
R^2	0.169	0.115	0.122	0.115	0.487	0.495	0.486	0.494
Obs.	463	471	491	492	577	581	598	603

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Table IV.5 – continued from previous page

	Panel B: L.undervalued quintile							
	(1) RES^{MSV}	(2) RES^{MSV}	(3) RES^{MSV}	(4) RES^{MSV}	(5) RRV^{MSV}	(6) RRV^{MSV}	(7) RRV^{MSV}	(8) RRV^{MSV}
L.dep. var.	-0.147***	-0.0753**	-0.0723*	-0.0675*	0.162	0.232	0.242	0.244
	(0.0398)	(0.0372)	(0.0380)	(0.0363)	(0.185)	(0.198)	(0.202)	(0.244)
L.ESG score	0.0142**	0.0181***	0.0215***	0.0205***	0.00547**	0.00549**	0.00406	0.00432*
	(0.00665)	(0.00566)	(0.00490)	(0.00584)	(0.00268)	(0.00247)	(0.00256)	(0.00247)
Bid-ask-spread	0.389				0.0888			
	(0.647)				(0.247)			
L.ESG*Bid-ask	0.00390				-0.00108			
	(0.0125)				(0.00531)			
Illiquidity		0.000157				0.00120		
		(0.000478)				(0.00127)		
L.ESG*Illiquidity		-5.48e-06				-6.56e-05**		
		(1.31e-05)				(2.82e-05)		
Forecast σ			1.385				-0.120	
			(0.936)				(0.0856)	
L.ESG*Forecast σ			-0.0171				0.00216	
			(0.0117)				(0.00135)	
Forecast error				0.0124				0.000653
				(0.0152)				(0.000953)
L.ESG*Forecast error				-0.000198				9.11e-06
				(0.000208)				(1.62e-05)
Constant	2.967**	2.520**	2.134*	2.038*	0.0315	0.0506	0.129	0.0936
	(1.287)	(1.246)	(1.101)	(1.212)	(0.182)	(0.174)	(0.192)	(0.184)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-year obs.	1,225	1,267	1,313	1,315	1,081	1,119	1,120	1,144
R^2	0.063	0.057	0.068	0.063	0.229	0.237	0.224	0.234
Obs.	457	459	481	483	443	448	452	461

Remark: This table presents the fixed-effects estimations of the effects of a company's lagged *ESG score* on its respective misvaluation for over- and undervalued firms including information asymmetry proxies. Panel A represents the analyses for the companies with the highest overvaluation in the preceding periods (highest 20%), Panel B shows the results for the most undervalued companies (lowest 20%). The dependent variables are the residual income misvaluation measure RES^{MSV} according to Ohlson (1995) in models (1) to (4) as well as the Rhodes-Kropf et al. (2005) misvaluation measure RRV^{MSV} in models (5) to (8). The information asymmetry proxies are the *Bid-ask spread* in models (1) and (5), the *Illiquidity* in models (2) and (6), the *Forecast* σ in models (3) and (7) as well as the *Forecast error* in models (4) and (8). Standard errors are clustered at firm-level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

IV.4.4 The increasing relevance of CSR

In recent years the implementation of ESG criteria into corporate business models gains in importance for companies (e.g. United Nations, 2016) while also investors raise their awareness for sustainability and hence intensify their investment scope towards ESG criteria (e.g. BlackRock, 2020; GSIA, 2018). Our previous results show an impact of ESG on misvaluation measures that we attribute to increased interest in sustainable investing. This interest in sustainable investing might also increase over our sample period resulting in temporal differences in the intensity of ESG's impact on misvaluation measures.

The year 2012 marks a considerable turning point in the relevance of sustainable investing: In this year GSIA initiates its report on global sustainable investments and USSIF (2020) reports strong growth rates for assets under management according to sustainability criteria from 2012 on (e.g. an increase of 76% from 2012 to 2014).

As postulated in hypothesis 4 we expect the increasing importance of ESG to play a role in the ESG-misvaluation relationship. To account for the strong development in ESG investing recently, we investigate whether we discover differences in this relationship in the periods before and after the introduction of the GSIA reports in 2012 as well as the sharpe growth in assets under management with respect to sustainability criteria. To investigate the moderating role of temporal effects we introduce a dummy variable equalling 1 for the more recent period (2012 - 2017) and 0 for the earlier period in our sample (2004 - 2011). Additionally, we include an interaction term between our time period dummy variable and the lagged ESG score to trace out different effects of ESG on misvaluation in the respective periods.

Table IV.6 presents the results of the temporal effects in the relationship between ESG and misvaluation. First of all, we again discover a positive baseline effect regarding both misvaluation measures (RES^{MSV} in model (1) to (3) and RRV^{MSV} in model (6)) of the lagged ESG score. In addition, the table reveals a significantly positive interaction term of the lagged *ESG score* and the *Recent period* dummy variable in most models. Taking the baseline ESG effect together with the interaction term, these results indicate that the overall positive ESG effect on misvaluation seems to become even stronger in the more recent period.

Table IV.6: Temporal differences in the ESG-misvaluation relationship.

	(1) RES^{MSV}	(2) RES^{MSV}	(3) RES^{MSV}	(4) RRV^{MSV}	(5) RRV^{MSV}	(6) RRV^{MSV}
L.dep. var.		-0.0307	-0.0517**		0.256***	0.109***
		(0.0223)	(0.0237)		(0.0309)	(0.0323)
L.ESG score	0.00994**	0.0197***	0.0176***	0.000172	0.000416	0.00221**
	(0.00414)	(0.00371)	(0.00398)	(0.00132)	(0.00108)	(0.000988)
Recent period	0.166	0.656***	0.274	0.0456	0.0552	0.127**
	(0.201)	(0.205)	(0.220)	(0.0759)	(0.0620)	(0.0634)
L.ESG*Recent per.	0.00929***	0.00440	0.00744**	0.00392***	0.00326***	0.000647
	(0.00329)	(0.00321)	(0.00340)	(0.00137)	(0.00111)	(0.00100)
Profitability			-3.725***			-0.859***
			(0.889)			(0.276)
CapEx			14.07***			0.441
			(2.047)			(0.386)
Analyst coverage			0.000421			-0.0125***
			(0.0116)			(0.00247)
Stock vola			-0.254***			-0.0396**
			(0.0576)			(0.0160)
Leverage			-5.082***			-0.0564
			(0.653)			(0.0793)
Market-to-book			0.0902***			0.140***
			(0.0161)			(0.00737)
Constant	-0.515**	-1.579***	-1.336***	1.219***	0.871***	0.984***
	(0.209)	(0.185)	(0.203)	(0.0652)	(0.0695)	(0.0693)
Firm-year Obs.	7,917	7,080	6,243	9,056	8,978	7,949
R^2	0.023	0.055	0.100	0.033	0.090	0.355
Obs.	1,439	1,318	1,093	1,582	1,574	1,333

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Table IV.6 – continued from previous page

Remark: This table presents the fixed-effects estimations of the effects of a company's lagged *ESG score* on its respective misvaluation and the additional impact of the dummy variable *Recent period*. This dummy variable equals 1 in the time span 2012 - 2017 and 0 in the earlier years (2004 - 2011). The dependent variables are the residual income misvaluation measure RES^{MSV} according to Ohlson (1995) in models (1), (2) and (3) as well as the Rhodes-Kropf et al. (2005) misvaluation measure RRV^{MSV} in models (4), (5) and (6). Standard errors are clustered at firm-level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

This finding indicates that the main result of an impact of ESG on misvaluation could be attributed to the increasing relevance of sustainable investing in the more recent years. Hence, these results serve as a first indicator that the increasing relevance of CSR positively moderates the ESG misvaluation relationship as postulated in hypothesis 4.

Although Table IV.6 already indicates a time dependency of our main effect, no societal topic remains steadily on the same level of importance since media coverage and societal debate play an important role in the perceived relevance (Benesch et al., 2019). Investors' awareness towards climate risk, for example, changes in relevance over time (Engle et al., 2020). As a consequence, societal awareness for sustainability might influence investors' investment decisions. To investigate the possible impact of societal awareness on the misvaluation of companies induced by their ESG engagement, we further try to proxy the time varying level of 'awareness' in our next analyses.

Several studies investigated the impact of *Sentiment* in the research field of finance in general (e.g. Baker and Wurgler, 2006) and more particularly in the field of CSR (e.g. Choi et al., 2020; Brøgger and Kronies, 2021). In our study we are specifically interested in the *Sentiment* towards sustainability to capture investors' awareness for sustainable topics. To explicitly proxy the stance towards the investment focus on ESG, we use several Google search terms for the time span from 2012 to 2017 as a proxy for the overall *Sentiment* towards sustainability.

Accordingly, we include the *Sentiment* variables in the analyses investigating the ESG-misvaluation relationship to analyze the potential moderating role of societal sustainability awareness. As revealed by our previous analysis in Table IV.6, the ESG-misvaluation relationship seemingly strengthens from 2012 on which is why we investigate this specific time period. Table IV.7 reports the regression results regarding *Sentiment* as well as the interaction term *L.ESG*Sentiment* to investigate the moderating effect of sentiment in the ESG-misvaluation relationship.

This interaction term as our main variable of interest reveals a significantly positive effect on the misvaluation measures for almost all regression models. The interaction term is not only significant for the more general investment focused search term 'ESG investing' in Panel A but also from an environmental perspective such as 'Climate change' (Panel B) and 'Global warming' (Panel C).[17] This implicates that a higher *Sentiment* towards sustainability raises the misvaluation ratios induced by ESG. Hence, we can confirm that the overall *Sentiment* towards sustainability affects, i.e. moderates, the relationship between ESG and misvaluation. As a consequence, these results additionally support the argument of a moderating role of the increasing relevance towards sustainability topics in the ESG-misvaluation relationship as postulated in hypothesis 4. In conclusion, by taking together the results from Tables IV.6 and IV.7 we can confirm hypothesis 4.

[17] Please note, that the base effect of the lagged ESG coefficient is significantly negative in models (3), (7), (8), (11), (12) in Table IV.7. The sentiment variables range from values of 0 to 100. Hence, under the assumption of an average sentiment value of 50, the positive effect of the interaction term is able to outweigh the negative base effect of the lagged ESG score in all models (except for model (8)) resulting in an overall positive effect on misvaluation. For example, considering model (3) the base lagged ESG coefficient is -0.00427. With an interaction term coefficient of 0.000121 multiplied by a value of 50 for the sentiment the effect reaches a value of 0.00605 resulting in an overall effect of 0.00178 on the RRV^{MSV} measure.

Table IV.7: Company misvaluation regressed on ESG: the moderating role of sustainability sentiment.

	Panel A: Google search 'ESG investing'				*Panel B: Google search 'Climate change'*				*Panel C: Google search 'Global warming'*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	RES^{MSV}	RES^{MSV}	RRV^{MSV}	RRV^{MSV}	RES^{MSV}	RES^{MSV}	RRV^{MSV}	RRV^{MSV}	RES^{MSV}	RES^{MSV}	RRV^{MSV}	RRV^{MSV}
L.dep. var.	0.140***	0.0754**	0.0683	-0.0728*	0.152***	0.0867***	0.0570	-0.0769**	0.131***	0.0721***	0.0762*	-0.0700*
	(0.0259)	(0.0292)	(0.0452)	(0.0374)	(0.0227)	(0.0253)	(0.0454)	(0.0374)	(0.0218)	(0.0245)	(0.0452)	(0.0373)
L.ESG score	0.0498***	0.0416***	-0.00427*	-0.00231	0.0447***	0.0311***	-0.0119***	-0.00588**	0.0241	0.00829	-0.0234***	-0.0150***
	(0.00861)	(0.00876)	(0.00252)	(0.00207)	(0.0109)	(0.0115)	(0.00342)	(0.00287)	(0.0176)	(0.0196)	(0.00564)	(0.00485)
Sentiment	-0.0108*	-0.0174**	-0.00206	-9.92e-07	-0.0527***	-0.0648***	-0.00322	-0.00112	-0.0258	-0.0600*	-0.0259***	-0.0162**
	(0.00642)	(0.00692)	(0.00193)	(0.00162)	(0.0117)	(0.0129)	(0.00354)	(0.00298)	(0.0306)	(0.0348)	(0.00901)	(0.00790)
L.ESG*Sentiment	0.000230**	0.000358***	0.000121***	4.55e-05	0.000732***	0.000949***	0.000241***	0.000113**	0.000932*	0.00144***	0.000834***	0.000499***
	(9.07e-05)	(9.79e-05)	(3.35e-05)	(2.89e-05)	(0.000176)	(0.000194)	(6.17e-05)	(5.32e-05)	(0.000485)	(0.000553)	(0.000166)	(0.000146)
Profitability		-2.370*		-0.626**		-2.650**		-0.613**		-2.215*		-0.636**
		(1.220)		(0.310)		(1.249)		(0.311)		(1.235)		(0.312)
CapEx		14.42***		0.380		15.65***		0.309		14.29***		0.441
		(3.065)		(0.507)		(3.115)		(0.508)		(3.036)		(0.514)
Analyst coverage		0.0233		-0.00403		0.0222		-0.00320		0.0252		-0.00239
		(0.0218)		(0.00463)		(0.0220)		(0.00464)		(0.0221)		(0.00474)
σ		-1.025***		-0.0567*		-1.047***		-0.0436		-0.984***		-0.0348
		(0.157)		(0.0342)		(0.158)		(0.0348)		(0.158)		(0.0363)
Leverage		-5.913***		1.130***		-5.445***		1.107***		-5.850***		1.155***
		(1.165)		(0.223)		(1.200)		(0.222)		(1.130)		(0.224)
Market-to-book		0.0642***		0.171***		0.0711***		0.170***		0.0655***		0.171***
		(0.0241)		(0.00814)		(0.0246)		(0.00817)		(0.0242)		(0.00816)
Constant	0.290	6.295***	1.405***	0.444**	1.285**	7.422***	1.563***	0.494**	0.958	7.446***	2.028***	0.820***
	(0.435)	(0.963)	(0.131)	(0.192)	(0.611)	(0.988)	(0.178)	(0.223)	(1.036)	(1.295)	(0.296)	(0.309)
Firm-year obs.	4,543	3,966	5,458	4,799	4,543	3,966	5,458	4,799	4,543	3,966	5,458	4,799
R^2	0.046	0.107	0.040	0.395	0.052	0.113	0.050	0.397	0.047	0.106	0.038	0.396

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Table IV.7 – continued from previous page

	Panel A: Google search 'ESG investing'				*Panel B: Google search 'Climate change'*				*Panel C: Google search 'Global warming'*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	RES^{MSV}	RES^{MSV}	RRV^{MSV}	RRV^{MSV}	RES^{MSV}	RES^{MSV}	RRV^{MSV}	RRV^{MSV}	RES^{MSV}	RES^{MSV}	RRV^{MSV}	RRV^{MSV}
Obs.	1,292	1,066	1,567	1,325	1,292	1,066	1,567	1,325	1,292	1,066	1,567	1,325

Remark: This table presents the fixed-effects estimations of the effects of a company's lagged *ESG score* on its respective misvaluation for the sub sample period from 2012 to 2017. The regression includes the moderating effect of sustainability *Sentiment* proxied by the Google search keywords 'ESG investing', 'Climate change' and 'Global warming' on the respective misvaluation. The dependent variables are the residual income misvaluation measure RES^{MSV} according to Ohlson (1995) in models (1), (2), (5), (6), (9) and (10) as well as the Rhodes-Kropf et al. (2005) misvaluation measure RRV^{MSV} in models (3), (4), (7), (8), (11) and (12). Standard errors are clustered at firm-level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

IV.5 Additional analyses

IV.5.1 Endogeneity

Prior analyses in this study reveal a significant relation between CSR engagement of companies and their respective misvaluation. However, this relationship might be plagued by endogeneity concerns leading to false inference. One potential concern regards simultaneity or reverse causality issues in the ESG-misvaluation relationship. In our main regression we already tried to address these issues by including the lagged ESG score to ensure a time gap between ESG score and the subsequent effects in the misvaluation measures. Additionally, the inclusion of the lagged dependent variable reduces a potential reverse causality bias. A second concern regards the omitted variable bias which arises if rather unobservable factors — despite carefully adding the relevant control variables identified in the literature — are related to both the explanatory as well as the dependent variable.

In order to further alleviate these endogeneity concerns we apply two distinct and well-established econometric approaches relying on instrumental variables. First, we perform two-stage least squares (2SLS) instrumental variables (IV) regressions with industry means of the ESG score serving as instrument for the company ESG score following Ghoul et al. (2011) and Kim et al. (2014). We expect the industry means to be uncorrelated with the firm specific error terms and a company's misvaluation but correlated with the ESG scores of the company. However, since these industry means might be subject to potential industry peer pressure (Cao et al., 2019), these instruments might not be completely exogenous. Thus, we follow Deng et al. (2013) and additionally apply a dummy variable that covers the political affiliation of citizens in the U.S. federal state in which a company is headquartered as instrument. This *Blue state* dummy equals 1 if a state voted the democratic presidential candidate in the last and subsequent presidential election in a respective year and zero otherwise.[18] Prior

[18]Information on the results of presidential elections in the federal states is obtained from: https://www.270towin.com/states/.

literature has shown that democratic voters seem to be more interested in CSR efforts which implies a higher pressure on the respective firms to engage more heavily with regards to ESG (Gromet et al., 2013; Costa and Kahn, 2013; Giuli and Kostovetsky, 2014; Albuquerque et al., 2019). Consequently, we expect the *Blue state* dummy to be correlated with the ESG score of the firms; however, the political orientation in the states should not directly affect (mis)valuation. The explicit consideration of the political affiliation hence serves as an exogenous and valid instrument. This 2SLS IV procedure with two different instruments helps to rule out issues with omitted variable bias and strengthens the robustness of our results.

Table IV.8 Panel A shows 2SLS analyses of the direct effect of ESG on misvaluation in model (1) and (2) with industry means serving as instrument and complementing the results in Table IV.3 (section IV.4.1). As can be seen from the table our variable of interest — the predicted ESG score — shows a significantly positive effect on our misvaluation measures RES^{MSV} and RRV^{MSV} respectively and hence underlines our prior finding. The consideration of the Kleibergen & Paap test as well as the F-statistics reveal that the instrument is relevant.

Panel B in Table IV.8 illustrates the results of the 2SLS procedure with the *Blue state* dummy as instrument.[19] As can be seen from models (3) and (4) the predicted ESG score reveals a significantly positive effect on our misvaluation measures and hence corroborates our main result. Again, the Kleibergen & Paap test as well as the F-statistics show the *Blue state* dummy to be a relevant instrument for the ESG score.

Second, we apply a dynamic panel GMM model following Arellano and Bond (1991) and Arellano and Bover (1995) that has recently been used in the field of CSR and finance to mitigate endogeneity issues of fixed-effects methods (Kim et al., 2014; Ghoul et al., 2011). This methodological approach instruments all explanatory variables with their past lags. In addition, dynamic panel estimations account for the Nickell (1981)

[19] Due to a lack of variation over time in the dummy variable *Blue state* and in line with Deng et al. (2013) we estimate an OLS IV regression. Moreover, in line with Deng et al. (2013) we do not include the lagged dependent variable in our reported regression. However, an additional check reveals that the results point qualitatively in the same direction, but are statistically less significant when including the lagged dependent variable.

bias stemming from the correlation between differenced lagged regressor and error term as described in section IV.3.2. Regarding the estimation procedure, we follow Roodman (2009), Wintoki et al. (2012) and Eugster (2020).[20]

Regression results from dynamic GMM estimations are presented in Table IV.8 in Panel C. In the regression models (5) and (6) we find a significantly positive effect of the lagged ESG score on the RES^{MSV} misvaluation measure. Moreover, we check for the validity of the models by considering the AR(2) test of serial-correlation in the first-differenced residuals as well as the Hansen test of overidentifying restrictions. According to AR(2) test, we can reject serial-correlation for both misvaluation measures. Regarding the RES^{MSV} we can further confirm that the model is not overidentified, which unfortunately does not hold for the RRV^{MSV}.

In conclusion, 2SLS estimations with two different instruments as well as dynamic GMM estimations to rule out endogeneity concerns do not contradict our findings but support these. Hence, we can confirm that there is a significant relationship between ESG and misvaluation.

[20]Dynamic GMM regressions are estimated using the Stata-command xtabond2 with the following options: twostep, robust, small, orthogonal and collapse. The lag length to determine the instruments is (2 3).

Table IV.8: Regression analysis to address potential endogeneity concerns.

	Panel A: 2SLS - Industry mean		*Panel B: 2SLS - Blue state*		*Panel C: Diff. GMM*	
	(1)	(2)	(3)	(4)	(5)	(6)
	RES^{MSV}	RRV^{MSV}	RES^{MSV}	RRV^{MSV}	RES^{MSV}	RRV^{MSV}
L.dep. var.	0.125**	0.0392			0.0243	0.103
	(0.0553)	(0.0314)			(0.0708)	(0.0734)
L2.dep. var.					-0.385***	0.00184
					(0.112)	(0.0373)
L.Predicted ESG score	0.894***	0.0568***	0.0719**	0.0137*		
	(0.250)	(0.0209)	(0.0341)	(0.00797)		
L.ESG score					0.0870***	0.00444
					(0.0294)	(0.00476)
Profitability	-3.139	-0.483*	-7.823***	-0.413***	42.67**	1.820
	(2.051)	(0.261)	(0.729)	(0.122)	(21.00)	(2.375)
CapEx	-8.901	-0.983	-2.144**	-0.876**	174.5**	11.97
	(8.877)	(0.862)	(1.064)	(0.345)	(82.07)	(9.010)
L.CapEx					-85.94*	-7.037
					(46.18)	(4.911)
Analyst coverage	-0.372***	-0.0268***	-0.0769**	-0.00431	0.381**	0.00892
	(0.127)	(0.00974)	(0.0307)	(0.00716)	(0.187)	(0.0161)
σ	1.104**	0.0635	-4.913***	0.464***	0.809*	-0.0428
	(0.467)	(0.0410)	(0.735)	(0.160)	(0.427)	(0.0414)

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Table IV.8 – continued from previous page

	Panel A: 2SLS - Industry mean		Panel B: 2SLS - Blue state		Panel C: Diff. GMM	
	(1)	(2)	(3)	(4)	(5)	(6)
	RES^{MSV}	RRV^{MSV}	RES^{MSV}	RRV^{MSV}	RES^{MSV}	RRV^{MSV}
Leverage	-21.80***	-0.237	0.169***	0.164***	7.119	0.572
	(5.643)	(0.460)	(0.0191)	(0.00433)	(5.598)	(0.558)
Market-to-book	0.0998	0.168***	0.814***	0.105***	-0.125	0.188***
	(0.0674)	(0.00729)	(0.177)	(0.0392)	(0.229)	(0.0510)
Constant			0.151	-0.395	-13.05**	-0.0379
			(1.154)	(0.276)	(6.453)	(0.543)
Firm-year obs.	6,050	7,673	6,976	7,998	5,387	7,481
Obs.	900	1,057	1,200	1,338	975	1,318
Kleibergen & Paap Und. (p)	0.001	0.001	0.000	0.000		
F statistic	33.22	30.93	24.922	39.478	22.86	28.81
Hansen J Overid (p)					0.314	0.000
AR(2) (p)					0.621	0.821
Number of Instruments					17	17
Lag Specification					(2 3)	(2 3)

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Table IV.8 – continued from previous page

Remark: This table presents 2SLS IV regressions and Dynamic Panel GMM regression results of a company's lagged ESG score on its respective misvaluation. The lagged ESG score is instrumented with the respective industry mean in models (1) and (2) in Panel A and with the Blue state constituency dummy variable in models (3) and (4) in Panel B. The Kleibergen & Paap Underidentification test as well as the F-statistics reveal the validity of models (1) to (4). In Panel C models (5) and (6) present dynamic GMM estimations. We use AR(2) to test for second order serial correlation in the first-differenced residuals. Under the null hypothesis there is no serial correlation. To test for the validity of the instruments, we consider Hansen tests for overidentification. Under the null hypothesis the instruments are valid. The dependent variables are the residual income misvaluation measure RES^{MSV} according to Ohlson (1995) in models (1), (3) and (5) as well as the Rhodes-Kropf et al. (2005) misvaluation measure RRV^{MSV} in models (2), (4) and (6). Standard errors are robust to heteroscedasticity and clustered at firm-level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

IV.5.2 Sustainability index changes: MSCI KLD 400 Social index

Another endogeneity concern could arise from a potential measurement error, which we seek to address in this section. We have shown that companies' engagement in CSR leads to a higher ratio in the misvaluation measures. The level of corporate sustainability was measured by employing the ASSET4 ESG rating by Refinitiv. However, according to Dorfleitner et al. (2015), ESG ratings significantly vary between data providers making inference based on one provider vulnerable. In order to check the robustness of our results, we consider sustainability index changes in our next analysis. Accordingly, we employ the further analytical ESG background from another data provider (MSCI) and extend our analysis to being independent from a numerical ESG rating.

Sustainability indices reflect the 'label' of a company assigned by the respective underlying data provider to be sustainable. This simplifies investment decisions for individual investors since the data provider declared the company to belong to the respective 'sustainable investment grade'. Additionally, as the relevance of sustainability indices has grown in recent years, being a sustainability index constituent significantly increases the visibility of a company for investors with ESG preferences. Accordingly, becoming a sustainability index constituent is a result of a significant improvement in a company's CSR profile. In line with the findings in our main analysis we expect that new members of a sustainability index experience increased ratios of misvaluation by attracting sustainable investments.

Following several prior studies (e.g. Kim et al., 2014; McWilliams and Siegel, 2000) we analyze the index changes in the MSCI KLD 400 Social index as alternative measure for CSR performance. In order to analyze the constituents of this index, we employ the holdings data of an exchange traded fund on the MSCI KLD 400 Social index as a proxy for its index constituents (e.g. Avramov et al., 2020; Jiang and Zheng, 2018). Since the holdings data are retrievable from 2006 on, our sustainability index analysis is executed with a sample starting in 2006.

In this analysis, our variable of interest is a dummy variable indicating whether the firm is an index constituent or not, which we employ to explain misvaluation. The dummy variable equals 1 if a company is a constituent of the sustainability index at year-end and a value of 0 is assigned to all other companies.[21] In the same logic as for the analyses of *ESG score*'s impact on misvaluation, we use the lagged constituency dummy as explanatory variable (*L.Sustainability index*).[22]

As can be referred from Table IV.9, the impact of a firm's addition to the sustainability index on misvaluation is statistically significant. Becoming a constituent of the MSCI KLD 400 Social index significantly increases a firm's misvaluation ratio for the RES^{MSV} in models (1) to (3). Model (3) reveals that becoming an index constituent implies an increase of 0.219 in the misvaluation ratio. With regards to the RRV^{MSV} measure, the positive coefficients are not significant in models (4) and (6) and only on the 10% significance level in model (5).

These findings first show that the effects are robust at least for the RES^{MSV} to alterations in the underlying ESG rating methodology. Second, index additions to the sustainability index measured with a dummy variable are independent of employing numerical ESG ratings in the regression equation but implicitly measure a company's sustainability profile, too. Overall, considering index constituents of the MSCI KLD 400 Social supports our hypothesis 1 that ESG affects misvaluation. As shown in the literature (Hartzmark and Sussman, 2019; Bialkowski and Starks, 2016), the 'label' of sustainability could attract investors relying their portfolio choices on sustainability criteria.

[21] The index composition of the MSCI KLD 400 Social index is rebalanced quarterly. However, in line with the analytical approach for the ESG score which is updated yearly, we only obtain yearly values for the index constituencies. Hence, companies that were part of the index during the year but not at year-end obtain a value of 0. Otherwise, if a company was only part of the index at year-end its dummy variable value equals 1.

[22] In the fixed-effects regressions, the dummy variable captures information on companies that were added to or deleted from the index, only. This implies that the effects can be traced back to a reduced number of observations limiting the explanatory power. Appendix III.D illustrates the index additions and deletions for the MSCI KLD 400 Social index considered in the analyses of the respective misvaluation measures.

Table IV.9: Misvaluation regressed on CSR proxied by sustainability index membership.

	MSCI KLD 400 Social index					
	(1)	(2)	(3)	(4)	(5)	(6)
	RES^{MSV}	RES^{MSV}	RES^{MSV}	RRV^{MSV}	RRV^{MSV}	RRV^{MSV}
L.dep. var.		0.0128	-0.0257		0.243***	0.0606***
		(0.0148)	(0.0179)		(0.0224)	(0.0193)
L.Sustainability index	0.333***	0.296***	0.218**	0.0770	0.0751*	0.0186
	(0.0898)	(0.0965)	(0.106)	(0.0479)	(0.0405)	(0.0316)
Profitability			-3.479***			-0.0375
			(0.772)			(0.126)
CapEx			13.57***			0.913***
			(1.740)			(0.315)
Analyst coverage			0.0156			0.00711***
			(0.0115)			(0.00212)
σ			-0.593***			-0.00718
			(0.0468)			(0.0107)
Leverage			-3.340***			0.746***
			(0.576)			(0.116)
Market-to-book			0.0957***			0.160***
			(0.0164)			(0.00502)
Constant	2.755***	2.623***	6.318***	1.243***	0.924***	0.178**
	(0.0200)	(0.0444)	(0.406)	(0.00866)	(0.0282)	(0.0775)
Firm-year obs.	11,430	9,534	7,825	15,733	15,208	12,689
R^2	0.001	0.001	0.067	0.000	0.056	0.375
Obs.	1,715	1,511	1,260	1,642	1,635	1,381

Remark: This table presents the fixed-effects estimations of the effects of a dummy that reflects a company's membership in a sustainability index on its respective misvaluation. The dummy variable equals 1 if a company belongs to the MSCI KLD 400 Social in a specific year and equals 0 otherwise. The dependent variables are the residual income misvaluation measure RES^{MSV} according to Ohlson (1995) in models (1), (2) and (3) as well as the Rhodes-Kropf et al. (2005) misvaluation measure RRV^{MSV} in models (4), (5) and (6). Standard errors are clustered at firm-level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Hence, our results indicate that the addition to the MSCI KLD 400 Social index assigns companies this 'label' of being part of the 'sustainable investment grade' resulting in an effect on the valuation of such firms. These index additions can be compared to highest ASSET4 ESG-rated firms which we investigate in the following section (IV.5.3) since these companies are 'labeled' as the most sustainable firms as well.

IV.5.3 ESG-misvaluation relation of high and low ESG firms

In our main analyses (in section IV.4) we discover a relation between a firm's valuation efficiency and corporate sustainability. However, the main result does not allow to draw inference on the effect with regards to existing levels of corporate sustainability. The observed effect can be driven in two ways: On the one hand, non sustainable or socially irresponsible companies could experience a higher ratio of misvaluation by engaging in CSR. This could be due to an increased attention of investors who rely their portfolio decisions on sustainability criteria and previously avoided the investment in the respective company due to e.g. negative screening. On the other hand, companies that are sustainable and further engage in CSR become even more attractive for sustainable investors that e.g. utilize a best-in-class investment approach resulting in a higher value of misvaluation.

In order to investigate whether the main result is driven by the most or least sustainable firms, we analyze the respective ESG-misvaluation relationship separately. Therefore, we consider firms' lagged *ESG scores* in each year and compare the groups of highest and lowest *ESG scores*. Companies with the 20% highest lagged *ESG scores* are assigned into the group of sustainable firms and have a mean ESG value of 75.729. The 20% of companies with the lagged lowest *ESG scores* belong to the group of least sustainable firms with a mean ESG value of 30.432.

As can be referred from Table IV.10, the positive relationship between ESG and misvaluation remains statistically significant for the highest ESG-rated firms in models (1) to (6) in Panel A and its effect is higher in magnitude compared to the full sample. For lowest ESG-rated firms (models (7) to (12) in Panel B), however, there is no relation between misvaluation and ESG considering the base effect as well as after including control variables.

Table IV.10: Company misvaluation regressed on ESG score: most (highest 20%) and least sustainable (lowest 20%) firms.

	Panel A: L.most sust. firms						*Panel B: L.least sust. firms*					
	(1) RES^{MSV}	(2) RES^{MSV}	(3) RES^{MSV}	(4) RRV^{MSV}	(5) RRV^{MSV}	(6) RRV^{MSV}	(7) RES^{MSV}	(8) RES^{MSV}	(9) RES^{MSV}	(10) RRV^{MSV}	(11) RRV^{MSV}	(12) RRV^{MSV}
L.dep. var.		0.0639	0.0199		0.493***	0.152**		0.00809	-0.0395		0.226***	0.0197
		(0.0481)	(0.0449)		(0.0646)	(0.0727)		(0.0386)	(0.0400)		(0.0574)	(0.0429)
L.ESG score	0.0487***	0.0442***	0.0324***	0.0170***	0.0169***	0.00658**	-0.0524	-0.0366	-0.0364	0.00446	0.00516	-0.00188
	(0.00919)	(0.0100)	(0.00946)	(0.00483)	(0.00373)	(0.00277)	(0.0362)	(0.0391)	(0.0451)	(0.00695)	(0.00589)	(0.00516)
Profitability			-5.723***			-2.208***			-3.761			-0.379
			(1.577)			(0.531)			(2.365)			(0.418)
CapEx			12.17**			1.597**			7.983*			1.209
			(5.084)			(0.789)			(4.838)			(1.119)
Analyst coverage			0.0356*			-0.00702*			-0.0577			-0.00452
			(0.0190)			(0.00424)			(0.0520)			(0.00784)
σ			-0.357***			-0.0698**			-0.565***			-0.0216
			(0.0812)			(0.0308)			(0.147)			(0.0388)
Leverage			-3.393***			0.610**			-4.901*			0.987***
			(0.872)			(0.278)			(2.534)			(0.308)
Market-to-book			0.0965***			0.162***			0.0997*			0.191***
			(0.0254)			(0.0139)			(0.0511)			(0.0157)
Constant	-1.545**	-1.344*	2.288**	0.131	-0.530	0.217	4.493***	3.994***	9.292***	1.186***	0.872***	0.310
	(0.701)	(0.725)	(1.086)	(0.368)	(0.323)	(0.268)	(0.996)	(1.077)	(2.356)	(0.191)	(0.184)	(0.280)
Firm-year obs.	1,845	1,750	1,606	1,930	1,921	1,768	1,432	1,217	1,004	1,787	1,769	1,482
R^2	0.020	0.022	0.099	0.014	0.164	0.510	0.003	0.002	0.040	0.000	0.044	0.497
Obs.	363	348	321	359	359	332	593	512	404	690	686	568

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Table IV.10 – continued from previous page

Remark: This table presents the fixed-effects estimations of the effects of a company's lagged *ESG score* on its respective misvaluation for the most sustainable and least sustainable firms with regards to the *ESG score*. Models (1) to (6) in Panel A represent the analyses for the companies with the highest *ESG scores* (highest 20%) in the preceding period, models (7) to (12) in Panel B show the results for the analyses for companies with the lowest *ESG scores* (lowest 20%). The dependent variables are the residual income misvaluation measure RES^{MSV} according to Ohlson (1995) in models (1), (2), (3), (7), (8) and (9) as well as the Rhodes-Kropf et al. (2005) misvaluation measure RRV^{MSV} in models (4), (5), (6), (10), (11) and (12). Standard errors are clustered at firm-level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

We interpret these findings as follows: The market trend towards sustainability leads to a high demand for the most sustainable firms (e.g. GSIA, 2018; Hartzmark and Sussman, 2019). Companies in the highest sustainability bracket are assigned a 'label' of belonging to the 'sustainable investment grade'. Thus, an increase in the *ESG score* makes a firm an even more attractive investment target, which might result in a significant impact on misvaluation. The results from index additions (section IV.5.2) support these findings and hence indicate a robust positive impact of corporate sustainability on misvaluation, specifically for companies belonging to the 'sustainable investment grade'. On the other hand, the least sustainable firms are avoided by the increasing number of sustainable investors. A small increase in ESG might not be sufficient to increase the ratio of actual observed to true firm value.[23]

IV.5.4 ESG pillar analysis

Our results suggest a positive relation between a firm's ESG score and misvaluation. The ESG score is an aggregate score comprising three components: the *Environmental*, *Social* and *Governance* pillar. Several studies investigating these pillars separately find that one specific pillar predominantly drives their specific relationship (e.g. Sassen et al., 2016; Dimson et al., 2015). For example, Bajic and Yurtoglu (2018) provide evidence that the relation between ESG and firm value comes solely from the social dimension of the ESG measure which captures firm-level practices related to treatment of employees and stakeholder relations. Thus, we reexamine our main finding from section IV.4 with regards to each pillar separately in Table IV.11.

Models (1) and (2) document the effect of the *Environmental* pillar score on misvaluation, whereas models (3) to (6) report the results for the *Social* and *Governance* pillar score, respectively. As can be seen, the relation between each of the three pillars and the misvaluation measures remains highly statistically significant. Also in terms of the coefficients' magnitude, the results are comparable for each of the three pillars. Thus, our finding is not attributable to one specific component of the ESG score.

[23]Results remain qualitatively unchanged when we investigate the 25% of most and least sustainable firms instead of 20% most and least sustainable firms.

Table IV.11: ESG pillar analysis on misvaluation measures.

	Panel A: Environmental		*Panel B: Social*		*Panel C: Governance*	
	(1)	(2)	(3)	(4)	(5)	(6)
	RES^{MSV}	RRV^{MSV}	RES^{MSV}	RRV^{MSV}	RES^{MSV}	RRV^{MSV}
L.dep. var.	0.0194	0.0480	0.0187	0.0477	0.0234	0.0483
	(0.0204)	(0.0315)	(0.0204)	(0.0314)	(0.0206)	(0.0315)
L.Environmental	0.0134***	0.00201***				
	(0.00283)	(0.000754)				
L.Social			0.0186***	0.00156**		
			(0.00277)	(0.000749)		
L.Governance					0.0194***	0.000920*
					(0.00227)	(0.000552)
Profitability	-4.242***	-0.624***	-4.297***	-0.630***	-4.199***	-0.625***
	(0.905)	(0.229)	(0.908)	(0.229)	(0.904)	(0.229)
CapEx	14.46***	0.492	14.68***	0.544	14.39***	0.527
	(2.092)	(0.444)	(2.070)	(0.440)	(2.079)	(0.441)
Analyst coverage	0.0247**	-0.00282	0.0231*	-0.00257	0.0227*	-0.00221
	(0.0119)	(0.00234)	(0.0118)	(0.00231)	(0.0121)	(0.00229)
σ	-0.411***	-0.0291*	-0.429***	-0.0326**	-0.400***	-0.0318*
	(0.0512)	(0.0163)	(0.0515)	(0.0162)	(0.0526)	(0.0165)
Leverage	-3.852***	0.869***	-3.835***	0.896***	-3.960***	0.899***
	(0.632)	(0.156)	(0.634)	(0.156)	(0.641)	(0.157)
Market-to-book	0.0936***	0.164***	0.0919***	0.164***	0.0938***	0.164***
	(0.0163)	(0.00662)	(0.0162)	(0.00659)	(0.0161)	(0.00662)
Constant	5.307***	0.251**	5.049***	0.258**	5.022***	0.281**
	(0.495)	(0.123)	(0.491)	(0.123)	(0.482)	(0.123)
Firm-year obs.	6,243	7,949	6,243	7,949	6,243	7,949
R^2	0.075	0.426	0.077	0.425	0.082	0.425
Obs.	1,093	1,333	1,093	1,333	1,093	1,333

Continued on next page

Table IV.11 – continued from previous page

Remark: This table presents the fixed-effects estimations of the effects of a company's lagged *ESG score* divided in the three pillars *Environmental* in Panel A, *Social* in Panel B and *Governance* in Panel C on its respective misvaluation. The dependent variables are the residual income misvaluation measure RES^{MSV} according to Ohlson (1995) in models (1), (3) and (5) and the Rhodes-Kropf et al. (2005) misvaluation measure RRV^{MSV} in models (2), (4) and (6). Standard errors are clustered at firm-level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

IV.6 Conclusion

This study investigates the relationship between corporate sustainability and misvaluation in the U.S. We show that a firm's ESG engagement affects its misvaluation as it increases a firm's market valuation relative to its true value. This effect is robust to various alterations in the methodological setting (e.g. several 2SLS IV regressions and dynamic GMM estimations). Whereas corporate sustainability expands misvaluation for already overvalued firms, such efforts move undervalued firms towards the true value. In this context, we rule out a moderating role of information asymmetry in the ESG-misvaluation relation. Thus, we argue that this valuation effect might be attributable to the investment behavior of sustainable investors (e.g. Cao et al., 2021; Starks et al., 2020) in conjunction with a strong sustainability trend channeling ESG-rating based capital flows (e.g. Hartzmark and Sussman, 2019; Starks et al., 2020). The observed valuation effect that even exceeds the true value corroborates the implications of the stakeholder theory (Freeman, 1984) which postulates that CSR engagement of firms goes beyond pure cost considerations of the shareholder value theory (Friedman, 1970) and is perceived as valuable.

Besides, the reported effect of ESG on misvaluation intensifies over time due to increasing relevance of CSR topics as well as sentiment towards sustainability: higher attention towards CSR topics intensifies the ESG-induced effect on misvaluation. Hence, the attention of media and society can shape investors' views towards sustainability topics and ultimately drive (mis)valuation of companies.

On the one hand, our results may suggest sustainable investors behaving rather irrational due to the attribution of comparatively higher values mainly on the improved sustainability profile instead of financial figures. On the other hand, sustainable investors could also derive non-financial utility through their financial investments (Gutsche and Ziegler, 2019). Furthermore, prior literature shows that sustainable efforts result in a risk-decreasing effect (e.g. risk of business models, conflicts with stakeholders or regulators (Godfrey et al., 2009; Hong and Liskovich, 2015)), which does not inevitably affect firm-value in the short-term but in the long-run. The applied misvaluation measures however rely on quantitative financial numbers that might neglect non-financial benefits. As we are interested in quantitative valuation effects on capital markets, these measures fit our research question. Further research could dig deeper into rationality implications on valuation effects in the sustainability context. It might even consider the inclusion of non-financial preferences (in terms of investors' CSR appetite) into misvaluation measures.

Moreover, emerging alteration of investment criteria due to e.g. sustainability preferences in conjunction with value-driven misvaluation effects might point towards the fact that CSR as a whole serves as a friction for market efficiency. However, the investors' underlying heuristics to invest sustainable might also be based on a discounted (far) future value that already includes sustainability benefits which are not captured by the more short-term oriented misvaluation measures applied in this paper. This suggests another future research question regarding the materiality of implied CSR values of firms.

Taken together, our research also bears implications for investors and the top management of firms. First, all investors should take ESG criteria into consideration irrespective of their own investment preferences as it is highly relevant for the valuation of firms. Second, from a firm's perspective, companies considering an improvement in their CSR profile can expect to benefit from higher valuations. However, the firm's actual level of sustainability plays an important role since the most sustainable companies experience this specific benefit in increasing valuation as revealed in section IV.5.3. Furthermore, companies in general should engage in CSR to profit from the trend of sustainable investing and attract additional capital flows as investors shift their investment preferences towards sustainability (BlackRock, 2020).

Chapter V

The sustainability trap: Active fund managers between ESG investing and fund overpricing

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The sustainability trap: Active fund managers between ESG investing and fund overpricing

Abstract

This study examines the relation between a fund's environmental, social and governance (ESG) rating and active fund investment skill. We find that higher ESG ratings are associated not only with higher overpricing in the fund. Rather, higher sustainability of the fund also leads to higher overpricing in the fund even relative to its benchmark. Pursuing higher fund sustainability hence leads to active fund overpricing which is typically interpreted as low investment skill.

JEL Classification: G11, G23, M14, Q56

Keywords: ESG, Sustainability, Mutual funds, Mispricing, Active fund overpricing, Fund investment skill

V.1 Introduction

Active fund management seeks to create value for investors by picking stocks that are expected to outperform. Despite relentless competition from passive investment vehicles (c.f. French, 2008; Greenwood and Scharfstein, 2013) the strong market share of active mutual funds demonstrates that investors still rely heavily on fund managers' skills to select underpriced securities (Investment Company Institute, 2019). However, the global trend towards sustainable investments seems to have added an additional layer of complexity to active fund managers' task. This is not only because funds with low sustainability ratings suffer from net outflows whereas funds with high ratings receive net inflows (Hartzmark and Sussman, 2019), thus requiring fund managers to consider investors' environmental, social and governance (ESG) preferences for their portfolio selection. Current research indicates that strong ESG preferences also go along with an underreaction to negative earnings surprises (Starks et al., 2020), other mispricing signals (Cao et al., 2021) and a general willingness to accept lower financial performance in exchange for stronger sustainable performance (Riedl and Smeets, 2017). In addition, Hong and Liskovich (2015) argue that the so-called "halo-effect"[1] leads people to ascribe value to companies that care about the environment and thus overestimate overall firm and product value. Taken together, this might lead to mis- or overvaluation for stocks with high sustainability ratings (Bofinger et al., 2021).

If sustainability preferences of investors lead active fund managers to select potentially overpriced sustainable stocks to raise the sustainability profile of their funds, this may create a severe tradeoff for managers: The consideration of sustainability issues to avoid net fund outflows might be related with an overpricing in the fund's portfolio at the same time. Furthermore, if the fund's benchmark does not reflect the same degree of mispricing due to sustainability, accepted proxies of fund investment skill such as the Active Fund Overpricing (AFO) measure by Avramov et al. (2020) will indicate inferior

[1]The absence of actual knowledge about a firm or person leads people to extrapolate based on an overall impression. This effect is called 'halo effect' and extensively described in the psychological literature (see Nisbett and Wilson, 1977).

relative fund investment skill. Our paper therefore sets out to examine the association between the sustainability of a fund and its overpricing, both on a stand-alone basis and relative to its benchmark portfolio. In doing so, we cast light on the relation between active fund investment skill assessment and sustainability issues by analyzing whether preferences for ESG investing, as reflected in a fund's sustainability rating, are related with the way active fund managers deviate from their benchmark portfolio.

Our results indeed indicate the existence of a sustainability trap for active fund managers: We find that funds with higher ESG ratings are associated with significantly higher overpricing and that fund sustainability is also positively related with the fund's overpricing relative to its benchmark. We conclude that the attempt to increase a fund portfolio's sustainability level leads fund managers to actively deviate from their benchmark which might be labelled as inferior fund investment skill according to an established skill proxy (Avramov et al., 2020). This reflects the dilemma that investors' sustainability preferences confront active fund managers with.

V.2 Data and methodology

Our panel dataset consists of all actively managed U.S. equity mutual funds domiciled in the USA and covers the time period from 2006 to 2016. The sample of 1,559 funds is retrieved from the Morningstar Direct database.[2] We collect annual data on the portfolio stock holdings for each fund from Refinitiv (formerly Thomson Reuters). We also import various stock-specific information from Refinitiv, most importantly the ASSET4 ESG ratings. These ratings are comprehensive scores of companies' environmental, social and governance activities and range between 0 and 100. Together with the portfolio weights, they allow us to calculate the funds' aggregate sustainability ratings (*Fund ESG*) as follows[3]:

[2]The data are free of survivorship bias as they include both active and defunct funds.

[3]We include only those fund-year observations with an ASSET4 ESG score portfolio coverage of at least 67% following Wimmer (2013).

$$Fund\, ESG_{f,y} = \sum_i w_{i,f,y} * ESG_{i,y}, \tag{V.1}$$

$Fund\, ESG_{f,y}$ is the aggregated sustainability rating of fund f in year y, calculated as the weighted average of the ESG ratings of the stocks in the fund in year y, where each stock i's $ESG_{i,y}$ rating is weighted with the stock's portfolio weight $w_{i,f,y}$ in the fund in that year.

To capture the degree of overpricing in a fund, we rely on a mispricing dataset compiled by Stambaugh et al. (2015) which is available at the stock level.[4] For each stock i, the mispricing measure $MISP_i$ captures the exposure of this stock to a comprehensive list of 11 market anomalies that are associated with mispricing (Stambaugh et al., 2012), among them asset growth (Cooper et al., 2008), momentum (Jegadeesh and Titman, 1993) or net stock issuance (Loughran and Ritter, 1995). This mispricing variable is measured on a scale from 0 to 100, where higher values indicate higher overpricing.[5] To calculate the degree of fund mispricing (*Fund MISP*), we analogously aggregate the individual stocks' mispricing values in the fund portfolio as a weighted average:

$$Fund\, MISP_{f,y} = \sum_i w_{i,f,y} * MISP_{i,y}. \tag{V.2}$$

While an analysis of the association between a fund's sustainability rating and its degree of overpricing is highly interesting in its own right, we go one step further and consider also the relation between the fund's sustainability and its benchmark-corrected degree of overpricing. To do so, we follow Avramov et al. (2020) and calculate the *Active Fund Overpricing (AFO)* measure which adjusts the *Fund MISP* for the degree of mispricing contained in the fund's respective benchmark.[6] AFO hence captures the mispricing induced by fund managers' active deviation from their benchmark. Equation

[4] We download the *MISP* measure at stock level from the website of Robert Stambaugh which is available for the years from 1965 to 2016.

[5] $MISP_i$ is the arithmetic average of the stock's percentile ranking for each of the 11 anomalies.

[6] The benchmark for each fund in our dataset is the respective Russell index as retrieved from Morningstar.

V.3 illustrates this calculation:

$$AFO_{f,y} = \sum_{i}(w_{i,f,y} - w^{b}_{i,f,y}) * MISP_{i,y}. \tag{V.3}$$

Here, $AFO_{f,y}$ is the active overpricing of fund f in year y and $w^{b}_{i,f,y}$ is the weight of stock i in fund f's benchmark b in year y. Positive *AFO* values hence indicate a more overpriced fund relative to its benchmark, i.e. inferior active fund investment skill, and vice versa. As the AFO is a benchmark-adjusted measure, we also employ a benchmark-adjusted ESG fund rating when examining the relation between sustainability and active fund investment skill. This *Excess Fund ESG* rating is derived as the difference between the *Fund ESG* rating and its *Benchmark ESG* rating.[7]

Our choice of control variables follows Avramov et al. (2020) and includes standard fund characteristics such as expense ratio, total net assets (TNA), fund age, manager tenure, return or flow data which are collected from the Morningstar Direct database. Moreover, we calculate further mispricing-specific control variables for the fund level from stock level data such as the leverage ratio (Dong et al., 2006), analyst coverage (Becchetti et al., 2013), profitability (Hoepner et al., 2021), market-to-book ratio (Doukas et al., 2010), capital expenditures (Hertzel and Li, 2010) and equity return volatility (Hwang and Lee, 2013).

Table V.1 reports the descriptive statistics of our dataset.[8] As can be seen, the average *Fund MISP* and *Benchmark MISP* are quite similar at values around 42.[9] This leads to a mean *AFO* value that is only slightly above zero and indicates that the average fund in our dataset is only slightly more overpriced than its respective benchmark. However, the comparably large standard deviation (3.13) of this measure indicates its heterogeneity in the cross section of our dataset and underlines the importance of analyzing it. The average *Fund ESG* rating in our sample at 66.2 is a bit lower than the *Benchmark ESG* rating at 67.8. The benchmark-adjusted *Excess Fund ESG* rating

[7]The latter is likewise calculated as the weighted average of the benchmark constituents' ESG ratings.

[8]In order to deal with outliers, the respective variables have been winsorized at the 1 percent level.

[9]This compares with relatively similar values in Avramov et al. (2020), who consider a slightly smaller set of U.S. mutual equity funds over the period 1981 to 2010.

correspondingly takes on a small negative average value.

Table V.1: Descriptive statistics of the mutual fund sample.

	N	Mean	Median	Std. dev.	Min.	Max.
Panel A: Mispricing measures						
Fund MISP	7,970	41.927	41.667	3.758	34.231	56.230
Benchmark MISP	7,836	41.636	40.921	3.395	35.904	52.508
AFO	7,836	0.289	0.179	3.13	-12.819	16.988
Panel B: ESG variables						
Fund ESG	7,970	66.216	67.551	7.179	33.625	86.992
Benchmark ESG	7,837	67.778	69.296	5.769	31.775	75.282
Excess ESG	7,837	-1.582	-1.155	4.897	-28.416	31.478
Panel C: Control variables						
Raw return	7,678	4.739	6.602	19.434	-47.005	56.19
Fund flow (in bn.)	7,829	-0.096	-0.009	0.92	-33.069	8.462
ln(TNA)	7,557	19.759	19.869	2.018	13.603	25.81
ln(Age)	7,847	2.558	2.658	0.842	-0.863	4.512
ln(Manager tenure)	7,561	1.558	1.639	0.872	-5.9	4.397
ln(Liquidity)	6,681	10.431	10.569	0.685	6.041	12.059
Turn over ratio	7,633	63.886	50	53.429	0	325
Expense ratio	7,585	0.985	0.96	0.349	0	2.27
Active share	7,970	73.838	74.865	16.942	0	100
ICI	6,672	14.2	12.783	8.397	0.374	103
Fund profitability	7,970	0.115	0.117	0.03	-0.109	0.184
Fund cap ex	7,970	-0.045	-0.044	0.009	-0.234	0
Fund analyst coverage	7,970	1.635	1.268	1.259	0	16.435
Fund leverage	7,970	0.611	0.621	0.071	0.254	1
Fund MTB	7,970	5.203	3.771	5.413	0.01	79.36
Fund sigma	7,969	1.206	1.061	0.479	0.35	2.852

We analyze the association between sustainability and fund overpricing using fixed-effects panel estimations. This allows to mitigate potential endogeneity effects stemming from time-constant variables on fund investment skills. As Avramov et al. (2020)

furthermore reports persistence of fund overpricing over time, we include the respective lagged dependent variable (*L.dep. var.*) as an additional regressor in the regression model:

$$y_{i,t} = \beta_1 y_{i,t-1} + \beta_2 ESG_{i,t-1} + \gamma' \mathbf{x}_{i,t} + \upsilon_i + \epsilon_{i,t} \; . \tag{V.4}$$

Here, y_{it} denotes the *Fund MISP* or *AFO* measure, respectively. $ESG_{i,t-1}$ represents the lagged *Fund ESG* or *Excess Fund ESG* rating, respectively. We use lagged ratings to account for the fact that ESG ratings are regularly announced with a certain time lag.[10] $\mathbf{x}_{i,t}$ captures a vector of control variables. υ_i are fund-fixed effects, $\epsilon_{i,t}$ denotes the error-term. Standard errors are clustered at the fund level and robust to heteroscedasticity and autocorrelation.

V.3 Results

Table V.2, Panel A, reports regression results from the analysis of an association between a fund's ESG rating and fund mispricing. Model (1) includes mispricing-specific controls, model (2) considers well-established fund-specific controls and model (3) combines both sets of controls.

The regression results indicate a significant, positive relation between a fund's sustainability rating and its degree of mispricing: Higher sustainability levels go along with stronger fund overpricing in all regression models. The effect remains significant under consideration of an extensive set of mispricing and fund-specific control variables. Our findings on the fund level hence extend previous research that reports an impact of ESG preferences on mispricing and returns of stocks (Bofinger et al., 2021; Cao et al., 2021).

In order to examine the relation between a fund's sustainability rating and the fund investment skill, approximated by the mispricing in the fund relative to the fund's benchmark, the regressions in Panel B consider the AFO as dependent variable. As can be seen from the highly significant coefficient of the *Excess Fund ESG* rating in all

[10] The ESG rating for year t would, for instance, be announced not prior to spring of year $t + 1$.

regression models, higher sustainability of the fund's portfolio is associated also with higher overpricing of the fund relative to its benchmark.

Table V.2: Fund sustainability and mispricing.

	Panel A: Fund MISP			*Panel B: AFO*		
	(1)	(2)	(3)	(4)	(5)	(6)
L.dep. var.	0.251***	0.215***	0.255***	0.0585***	0.109***	0.0673***
	(0.0127)	(0.0120)	(0.0125)	(0.0138)	(0.0176)	(0.0166)
L.Fund ESG	0.0936***	0.107***	0.105***			
	(0.0135)	(0.0130)	(0.0124)			
L.Excess Fund ESG				0.0213***	0.0333***	0.0256***
				(0.00554)	(0.00785)	(0.00755)
Constant	37.65***	61.60***	64.69***	0.150	7.664***	11.95***
	(1.433)	(2.529)	(3.029)	(0.840)	(2.223)	(2.568)
Mispricing controls	Yes	No	Yes	Yes	No	Yes
Fund characteristics	No	Yes	Yes	No	Yes	Yes
Fund-year obs.	7,969	5,940	5,939	7,835	5,939	5,938
No. of Funds	1,559	1,238	1,238	1,532	1,238	1,238
R^2	0.164	0.464	0.494	0.129	0.072	0.173

Remark: This table presents the results of the following annual panel regressions with fund fixed effects: $y_{i,t} = \beta_1 y_{i,t-1} + \beta_2 ESG_{i,t-1} + \gamma' \mathbf{x}_{i,t} + \upsilon_i + \epsilon_{i,t}$. Here, $y_{i,t}$ denotes the *Fund MISP* (Panel A) or *AFO* (Panel B). $y_{i,t-1}$ refers to the respective lagged dependent variable (*L.dep.var.*). $ESG_{i,t-1}$ represents the lagged *Fund ESG* (models (1)-(3)) or *Excess Fund ESG* rating (models (4)-(6)). $\mathbf{x}_{i,t}$ captures a vector of control variables. Standard errors are clustered at the fund level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

It should also be noted that the highly significant coefficient of the lagged AFO variable (L.dep. var. in Panel B) confirms the finding by Avramov et al. (2020) regarding the persistency of AFO over time. To account for potential Nickell (1981) bias which may arise with panel data characterized by a large number of observations and short time-series, we also re-estimate the regressions with dynamic GMM according to Arellano and Bond (1991). The results remain qualitatively the same.[11]

[11] Results are available upon request from the authors.

V.4 Conclusion

Our analysis investigates the link between fund sustainability and fund mispricing. We find that mutual funds with a higher sustainability rating show a higher degree of mispricing. Moreover, a more sustainable investment portfolio in comparison to the fund's benchmark is even associated with higher active fund overpricing (AFO) Avramov et al. (2020). According to Avramov et al. (2020), this is evaluated as low active fund investment skill. Investors' sustainability preferences hence pose a trap for active fund managers that seems inherently difficult to avoid: The implementation of investors' sustainability preferences into the portfolio selection process to avoid fund outflows comes at the cost of an evaluation of low fund investment skill.

In the light of the recent strong growth in sustainable investments, these results bear implications for the application of the AFO measure to evaluate fund investment skill: Managers who hold a more sustainable fund portfolio would be evaluated to be less skilled, solely due to a focus on more sustainable investment targets. Hence, in these cases the AFO measure might unintentionally misjudge fund investment skill by disregarding the implementation of investors' sustainability preferences into the fund's portfolio. Our results hence emphasize the need of taking a more holistic approach when evaluating fund investment skill by combining the AFO measure with the respective investors' sustainability endeavors. Future research should therefore investigate the triangular relation between fund mispricing, fund sustainability and fund returns in more detail. Such analyses should particularly carve out the skill of fund managers to understand and implement the preferences of their customers.

Chapter VI

Zooming in on CSR: Which aspects of CSR are relevant for companies' equity risk?

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Corporate Finance, (VHB-JOURQUAL3: D).

Zooming in on CSR: Which aspects of CSR are relevant for companies' equity risk?

Abstract

This paper investigates a sample of 776 European firms and studies the individual impact of different Corporate Social Responsibility (CSR) categories on firms' equity risk. The results indicate that environmental innovation, consideration of human rights, community relations as well as the implementation of a CSR strategy are particularly relevant for reducing equity risk. Other aspects of CSR, however, seem not to be related with equity risk.

JEL Classification: G32; G34; O16; Q56

Keywords: Corporate social responsibility; ESG; sustainability; ESG Pillars; Downside risk; Equity risk

VI.1 Introduction

In modern societies the role of corporations goes beyond the doctrine of Friedman (1970) to maximize firm profits and shareholder wealth. Instead firms are expected to engage in non-financial activities as well, i.e. social and sustainable behavior also known as CSR. This expectation comprises a great variety of different issues, from questions regarding resource use and emissions over human rights issues and governance-related topics. Rating providers that aim to evaluate firms with regards to these aspects aggregate climate-related measures into an environmental pillar, social aspects into the social pillar and aspects with regards to good corporate governance into the governance pillar. The overall evaluation of firm CSR efforts finally combines these three pillars in CSR ratings and thus delivers an aggregate sustainability level of firms.

Research in the field of corporate finance applies these ratings to analyze a variety of CSR-related topics. Most research focuses on investigating the impact of these ratings on firm-related outcomes such as firm performance. In the early years of analyzing this particular relationship research heavily discusses whether this effect is positive or negative (Margolis et al., 2009). Meta-analytical approaches[1] conducted in recent years, however, reveal a weakly positive connection between firm performance and CSR ratings (Friede et al., 2015; Whelan et al., 2021). Firm CSR engagements hence tend to positively impact firm operations and profitability.

Another recent strand of literature focuses on the relationship between firm equity risk and CSR ratings. The overwhelming majority of academic research shows that aggregated CSR ratings are negatively associated with firm risk (see e.g. Oikonomou et al., 2014; Jo and Na, 2012). Investors thus attribute lower equity risk towards CSR engaging firms when making their risk assessments. What is more, while Monti et al. (2018) show in general that country-specific legal and financial disclosure requirements might influence the ESG-risk relationship, Bannier et al. (2021) explicitly investigate

[1]Meta-analyses condense the results and findings of a multitude of individual studies that investigated a specific relationship based on empirical data (for further information on the meta-analytical approach see Borenstein et al., 2009).

region specific differences between the U.S. and Europe. The authors find that the risk-reducing effect is more pronounced for firms in the disclosure regime of the European Union which especially targets firm CSR reporting.

Moreover, Bannier et al. (2021) investigate the CSR-effect also in a more granular way and consider the three individual Environment, Social and Governance (ESG) pillars in their sample. Their results indicate, that for European firms the risk-reducing effect is mainly ascribable to the social and governance pillar, whereas no effect of these individual components can be found for U.S. firms. Among the few other studies to analyze the risk-effect of the CSR pillars, Sassen et al. (2016) investigate a sample of European firms in the period from 2002 to 2014. The authors can show that the environmental and social pillar are the main forces of the negative relationship, whereas governance does not seem to be relevant for the risk-reducing effect.

However, as of today, there is still only scarce evidence regarding the question which individual categories of the ESG pillars are particularly relevant for firm risk. Among the small number of studies investigating CSR categories and firm risk, Bouslah et al. (2013) find the aggregated dimensions regarding strengths and concerns[2] of employee relations, human rights and community to be negatively related to firm risk in a U.S. sample. The risk-reducing effect concerning the environmental and governance dimension depends on a firm's constituency in the S&P500. Firms belonging to the S&P500 experience reduced equity risks through their governance efforts, whereas Non-S&P500 firms' efforts do so via environmental engagement.

Putting the focus on strengths in the investigated CSR categories only, Bouslah et al. (2013) report mixed results on equity risks. While improved community relations are associated with less risk, better diversity and governance tend to increase risk. Oikonomou et al. (2012) also investigate the individual strengths of U.S. firms in CSR categories but, however, do not find any significant effects.

[2]The MSCI ESG KLD STATS rating differentiates between strengths and concerns of firms in specific CSR categories. For example, with regards to climate change and emission proactive investments in technologies to reduce emissions are assessed as a strength while greenhouse gas-related legal cases are evaluated as a concern (MSCI, 2015).

However, recent academic evidence with regards to equity risk effects of CSR categories is yet limited to samples focusing on U.S. firms. Moreover, these studies do not reflect a clear consensus on which specific categories are of utmost interest for investors in their risk-evaluation. Our study aims to extend this stream of research by investigating which CSR (sub-) categories are particularly relevant for firm equity risk in Europe. This is especially relevant as Monti et al. (2018) and Bannier et al. (2021) hint to the fact that risk effects of CSR differ between geographical regions and specifically between Europe and the U.S. With a precise knowledge of the main drivers of the risk effects, companies have the opportunity to invest in a more targeted manner and to improve their sustainability strategies.

We find that specific categories of the three CSR pillars are relevant with respect to equity risks in Europe. First, environmental innovation as part of the environment pillar significantly reduces equity risk. I.e. stronger environmental innovation decreases equity risk, while less environmental innovation increases it. Second, with regards to the social pillar, human rights and the community category are drivers of the risk-reducing effect. Again, stronger considerations of human rights and higher involvement in the firm's community decreases equity risk, while less engagement in these two activities increases it. Third, the implementation of a CSR strategy as part of governance aspects is also negatively associated with the perceived firm risk on capital markets. Firms which do not implement a CSR strategy hence show significantly higher equity risk.

The remainder of this paper is structured as follows. Section VI.2 presents the data and variables. Section VI.3 outlines the econometric methodology and presents the empirical results. Section VI.4 concludes.

VI.2 Data

Our sample consists of 776 publicly listed companies in the European Union that have received CSR ratings from Refinitiv (formerly ASSET4) over the time period 2003 to 2018. CSR ratings measure the sustainability profile of firms with respect to the three pillars: the environmental, the social and the governance pillar. As we are particularly interested in the individual categories making up the pillars, we collect data on this more granular level. The environmental pillar comprises the categories resource use, environmental innovation and emissions. The social pillar includes workforce, human rights, community and product responsibility. At last, the governance pillar consists of management, shareholder and CSR strategy. Table VI.1 presents a detailed description of each individual pillar category.[3]

Table VI.1: Description of ESG pillar categories as defined by Refinitiv (2020).

Pillar	Category	Description
Environmental	Resource Use Score	Reflects a company's performance and capacity to reduce the use of materials, energy or water, and to find more eco-efficient solutions by improving supply chain management.
	Emissions Score	Measures a company's commitment and effectiveness towards reducing environmental emission in the production and operational processes.
	Environmental Innovation Score	Reflects a company's capacity to reduce the environmental costs and burdens for its customers, and thereby creating new market opportunities through new environmental technologies and processes or eco-designed products.
Social	Workforce Score	Measures a company's effectiveness towards job satisfaction, healthy and safe workplace, maintaining diversity and equal opportunities, and development opportunities for its workforce.
	Human Rights Score	Measures a company's effectiveness towards respecting the fundamental human rights conventions.
	Community Score	Measures the company's commitment towards being a good citizen, protecting public health and respecting business ethics.

Continued on next page

[3]Refinitiv constructs the CSR ratings to range from 0 to 100 with higher scores displaying better performance in the respective area. We divide the respective scores by 100 for better interpretability.

Table VI.1 – continued from previous page

Pillar	Category	Description
	Product Responsibility Score	Reflects a company's capacity to produce quality goods and services integrating the customer's health and safety, integrity and data privacy.
Governance	Management Score	Measures a company's commitment and effectiveness towards following best practice corporate governance principles.
	Shareholders Score	Measures a company's effectiveness towards equal treatment of shareholders and the use of anti-takeover devices.
	CSR Strategy Score	Reflects a company's practices to communicate that it integrates the economic (financial), social and environmental dimensions into its day-to-day decision-making processes.

In order to investigate the impact of CSR pillar categories on equity risk, we employ a variety of equity risk measures: we consider standard risk variables, i.e. the stock volatility σ as well as the idiosyncratic risk σ_ϵ. Annual stock volatility is calculated as the standard deviation of daily stock returns. To calculate the idiosyncratic risk we use the capital asset pricing model to estimate yearly firm betas. Consequently, the idiosyncratic risk contains the proportion of firms' stock return volatility (σ) that is not attributable to a firm's beta. In addition to these two standard equity risk measures, our analysis aims to recognize that CSR-related risks may be extreme in nature (Monti et al., 2018; Hoepner et al., 2021). We also capture these extreme risks in the form of value at risk (VaR) and expected shortfall or conditional value at risk (CVaR). The VaR measures the predicted maximum loss of a firm over a given horizon within a specific confidence interval (Jorion, 2007). We follow Monti et al. (2018) and calculate it as the 0.05-quantile of the empirical distribution of daily stock returns in the specific year. The CVaR corresponds to the mean value of returns below the VaR-threshold. In the same vein as Hoepner et al. (2021) we also capture downside risks via lower partial moments (LPMs) of the second and third order (LPM(0,2) and LPM(0,3)). In order to be able to compare our results metrically, we calculate the square root of the LPM(0,2) and the cube root of LPM(0,3). We include a set of control variables found to be relevant in the investigated context (Sharfman and Fernando, 2008; Ghoul et al., 2011; Hoepner et al., 2021; Bannier et al., 2021).

Table VI.2 outlines the descriptive statistics for our equity risk measures in Panel A, CSR pillar category variables in Panel B and firm-specific control variables in Panel C. In order to limit the influence of outliers, we winsorize our dependent variables as well as control variables on the one-percent level. With regards to the environmental categories, the innovation category lacks behind resource use and emissions with an average of 0.27 compared to 0.52 each. Concerning averages of the social categories the workforce score reveals a quite positive evaluation with a rating of 0.69, whilst the human rights category is assessed noticeably weaker (0.34 on average). The community score displays a value of 0.5 and the product responsibility score a value of 0.44. Finally, since governance categories are benchmarked against firms in the same country, these ratings are quite close to 0.5. The CSR Strategy, however, shows a slightly weaker mean value (0.41) than the other two categories.

The average firm in our sample has a *Leverage* ratio — calculated as the ratio of total liablities to total assets — of 63% and a *Profitability* of 8.4%. Revenues of firms in the sample grow on average by 6.9% per year and the mean *Dividend Yield* is 2 %. The *Size* variable is calculated as natural logarithm of a firm's total assets. Consequently, the mean ratio refers to a firm size of $6.3 billion and implies that our sample consists of comparatively large firms.

Table VI.2: Descriptive statistics.

	N	Mean	Median	Std. dev.	Min.	Max.
Panel A: Risk measures						
σ	7,711	2.120	1.869	0.918	0.982	5.838
σ_ϵ	7,711	1.714	1.504	0.759	0.803	4.961
VaR	7,711	3.374	2.954	1.519	1.49	9.132
CVaR	7,711	4.697	4.145	2.072	2.063	12.886
LPM(0,2)	7,711	2.077	1.841	0.885	0.955	5.458
LPM(0,3)	7,711	2.669	2.330	1.216	1.162	7.39
Panel B: ESG pillar category variables						
Environmental Categories						
Resource Use	7,711	0.523	0.570	0.331	0	0.998
Innovation	7,711	0.267	0.029	0.321	0	0.997
Emission	7,711	0.522	0.570	0.330	0	0.998
Social Categories						
Workforce	7,711	0.690	0.748	0.245	0.004	0.998
Human Rights	7,711	0.340	0.213	0.359	0	0.995
Community	7,711	0.502	0.495	0.292	0	0.998
Product Responsibility	7,711	0.441	0.444	0.351	0	0.998
Governance Categories						
Management	7,711	0.517	0.521	0.279	0.001	0.999
Shareholder	7,711	0.528	0.540	0.286	0.002	0.999
CSR Strategy	7,711	0.412	0.400	0.325	0	0.994
Panel C: Control variables						
Leverage	7,711	0.631	0.633	0.195	0.149	1.177
Profitability	7,711	0.084	0.070	0.083	-0.14	0.418
Size	7,711	22.570	22.475	1.745	19.02	26.778
Sales Growth	7,711	0.069	0.049	0.224	-0.558	1.261

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Table VI.2 – continued from previous page

	N	Mean	Median	Std. dev.	Min.	Max.
Dividend Yield	7,711	2.080	1.449	2.423	0	10.972

Remark: This table presents the descriptive statistics for our sample. *Panel A* provides descriptive statistics for the equity risk measures, *Panel B* for the ESG pillar category variables and *Panel C* for the control variables.

VI.3 Methodology and results

In order to analyze the impact of ESG pillar categories on equity risks, we employ fixed-effects panel estimations in our main regressions.[4] As explanatory variables we include the CSR category scores. These CSR category ratings are mainly collected based on reporting information of the investigated companies. As this information is published through annual reports and CSR reports, the CSR ratings are computed in the aftermath of firms' fiscal years. Consider an example as illustration: company A had its fiscal year end on the 31st of December 2015 and publishes its annual report (and CSR information) in March 2016. Refinitiv assigns the CSR ratings based on this information in May 2016 for the year 2015. As we argue that investors react on the published ratings, the respective rating for the year 2015 was not present before mid 2016 which is why we include the CSR ratings with a one year time lag into our analyses following Khan et al. (2016).

Table VI.3 shows the estimation results of our panel fixed-effects regressions. With regards to the environmental pillar categories we observe a significant risk-reducing effect of equity risks stemming from environmental *Innovation*. Particularly companies that focus their business model on sustainable innovation (e.g. new environmental technologies) benefit from a risk-reducing effect which is especially interesting since the *Innovation* category is evaluated comparatively low for firms in our sample. This effect is economically significant as an increase of the innovation score by one standard

[4]To account for autocorrelation and heteroscedasticity we employ robust standard errors in the analyses.

deviation (0.321) decreases the *Conditional Value at Risk* by 0.14% which refers to 3% of the average *CVaR* value in our sample.

The *Human Rights* category as well as the *Community* category are apparently the most relevant categories with regards to the social pillar. Both show a significant risk-reducing effect on all analyzed equity risk measures for European companies. Thus, companies' efforts to comply with human rights conventions and the appeals of the companies of good corporate citizenship and business ethics are rewarded with lowered equity risks.

When observing the effects for the governance pillar categories we find that, in particular, the *CSR Strategy* category has a significantly negative impact on equity risk measures for EU companies. It measures the conjointly integration of economic (financial), social and environmental dimensions into daily business. Finally the *Management* category seems partially to be able to reduce firm risk.

Interestingly, two categories reveal a slightly significant positive effect on equity risks for σ, σ_ϵ and *VaR* as well as *CVaR* and *LPM(0,3)*. Firm engagement in the categories *Resource Use* and *Product Responsibility* thus seems to be judged as risk-increasing.

However, the relationship between ESG pillar categories and equity risks might be subject to reverse causality issues, i.e. the relationship of CSR categories and equity risk might exist in both directions with CSR categories affecting equity risk or equity risk affecting firms' CSR. On the one hand, firms' CSR engagement in different categories might be perceived as risk-reducing. On the other hand, less risky firms could potentially experience favourable financing conditions allowing these companies to invest more heavily in a variety of CSR measures. In order to account for this reverse causality, we add past values of our risk variables as additional explanatory variables and re-run our regressions (Angrist and Pischke, 2009). Results are reported in Appendix IV.A. Overall, these results support our main findings. However, the slightly negative effect of the *Management* category almost completely disappears when including the lagged dependent variable into the regression. Moreover, the additional consideration of the lagged dependent variable also vanishes the significance of the risk-increasing effects of the *Resource Use* and *Product Responsibility* categories. Consequently, we do not expect these three effects to be robust in our sample.

Table VI.3: Fixed-effects estimation of pillar categories effects on equity risk.

	(1)	(2)	(3)	(4)	(5)	(6)
	σ	σ_ϵ	VaR	CVaR	LPM(0,2)	LPM(0,3)
Environmental Categories						
Resource Use	0.177**	0.135**	0.314**	0.313	0.132	0.126
	(0.088)	(0.069)	(0.146)	(0.193)	(0.082)	(0.108)
Innovation	-0.105*	-0.100**	-0.218**	-0.260*	-0.097	-0.090
	(0.063)	(0.046)	(0.110)	(0.138)	(0.060)	(0.077)
Emission	0.098	0.001	0.218	0.244	0.127	0.138
	(0.085)	(0.064)	(0.142)	(0.188)	(0.081)	(0.106)
Social Categories						
Workforce	-0.043	-0.013	-0.131	-0.099	-0.032	0.019
	(0.094)	(0.072)	(0.160)	(0.208)	(0.090)	(0.116)
Human Rights	-0.209***	-0.100**	-0.388***	-0.378***	-0.177***	-0.157**
	(0.057)	(0.043)	(0.100)	(0.131)	(0.057)	(0.077)
Community	-0.370***	-0.238***	-0.614***	-0.791***	-0.348***	-0.424***
	(0.066)	(0.050)	(0.114)	(0.146)	(0.063)	(0.082)
Product Responsibility	0.055	0.044	0.079	0.253*	0.096	0.165**
	(0.061)	(0.045)	(0.107)	(0.137)	(0.059)	(0.076)
Governance Categories						
Management	-0.109*	-0.084*	-0.228**	-0.212	-0.090	-0.070
	(0.061)	(0.046)	(0.104)	(0.137)	(0.059)	(0.078)
Shareholder	0.050	0.027	0.067	0.110	0.048	0.082
	(0.058)	(0.044)	(0.100)	(0.131)	(0.057)	(0.075)
CSR Strategy	-0.223***	-0.173***	-0.402***	-0.417**	-0.189***	-0.181**
	(0.074)	(0.054)	(0.130)	(0.164)	(0.071)	(0.091)
Controls						
Leverage	1.176***	1.065***	1.772***	2.083***	0.922***	1.001***
	(0.160)	(0.131)	(0.267)	(0.349)	(0.154)	(0.227)

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Table VI.3 – continued from previous page

	(1)	(2)	(3)	(4)	(5)	(6)
	σ	σ_ϵ	VaR	CVaR	LPM(0,2)	LPM(0,3)
Profitability	-0.283	-0.894***	0.246	0.503	0.199	0.340
	(0.239)	(0.191)	(0.386)	(0.513)	(0.222)	(0.292)
Size	0.007	-0.021	0.033	0.205**	0.078**	0.178***
	(0.040)	(0.033)	(0.067)	(0.091)	(0.039)	(0.053)
Sales Growth	0.124**	0.046	0.255***	0.268**	0.130**	0.121
	(0.056)	(0.041)	(0.094)	(0.127)	(0.055)	(0.074)
Dividend Yield	0.036***	0.026***	0.052***	0.044***	0.027***	0.024***
	(0.007)	(0.006)	(0.011)	(0.016)	(0.007)	(0.009)
Constant	1.431	1.733**	1.888	-0.916	-0.139	-1.939
	(0.918)	(0.746)	(1.521)	(2.083)	(0.897)	(1.214)
Firm-year Obs.	7,711	7,711	7,711	7,711	7,711	7,711
Obs.	776	776	776	776	776	776
R^2	0.038	0.047	0.037	0.024	0.027	0.018

Remark: This table presents the fixed-effects estimation of the effects of the *ESG pillar categories* on companies' equity risk in the EU. The dependent variables are the stock volatility σ in model (1), idiosyncratic risk σ_ϵ in model (2), *VaR* in model (3), *CVaR* in model (4) as well as the second and third order lower partial moments *LPM(0,2)* in model (5) and *LPM(0,3)* in model (6). Standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

VI.4 Conclusion

Digging deeper into the underlying effects of individual CSR pillar categories allows us to draw conclusions regarding the individual drivers of the risk-reducing effect in the regulatory framework of the European Union. We can show that environmental innovation becomes relevant for the risk-reducing effect concerning the environmental pillar. The consideration of the social pillar reveals that human rights and the community category are the main driver for the negative effect on equity risk. Finally, with respect to the governance pillar, the aspects CSR strategy in corporate governance are especially relevant.

Hence, our results indicate that investors set special emphasis when evaluating CSR efforts of companies. Only the statistically significant pillar categories are judged as particularly relevant and therefore equity risk-reducing for the respective companies. When a company, for example, especially puts efforts in its relation to the respective community the investors grant this engagement with a lower equity risk assessment.

Moreover, our findings point towards implications for managers as well as investors. If managers are aware of the special focus of investors, they can concentrate on the most relevant aspects of CSR and thereby facilitate the risk-reducing effects. Consequently, if, for example, a firm's investors especially reward efforts regarding environmental innovation, the firm's managers can put special emphasis on these aspects in the firm's CSR strategy. Future research might investigate which specific CSR categories are particularly relevant in certain industries.

From a(n) (responsible) investor's perspective, the opportunity arises to explicitly screen the investment universe in order to identify firms with strengths in the aforementioned categories to optimize her portfolio choice and hence actively reduce equity (downside) risks. Investors can additionally engage in the role of active stock owners and guide firms to improve these risk-reducing aspects of CSR.

Finally, the findings point to the fact that researchers and capital market participants who apply CSR information need to take CSR data on a more granular level (categories) into account. The investigation of aggregated CSR scores allows to get first insights into specific research areas but does not enable to draw conclusions on what individual aspects are explicitly relevant for the respective relationship of interest.

Chapter VII

The glass cliff myth? - Evidence from Germany and the U.K.

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The glass cliff myth? – Evidence from Germany and the U.K.

Abstract

This study analyzes the "glass cliff" phenomenon using performance data from 233 large listed firms in Germany and the United Kingdom collected from 2005 to 2015. We examine these firms' accounting and stock market performance trends prior to the appointments of new board members and the short-term stock market reaction to these appointments. To address endogeneity concerns that may have affected previous glass cliff field research, we apply various matching procedures, perform different panel data analyses and do instrumental variable analyses. We find no support for the idea of the glass cliff: Before the appointment of female executives, the performance trend in German or British companies is no more negative than in companies that select male managers.

Keywords: Glass cliff; Leadership; Corporate boards; Gender; Matching procedures

VII.1 Introduction

Do women's chances of promotion rise in times of firm performance downturns? Since the early 2000s, a body of research has accumulated suggesting that women are more likely than men to be promoted to top positions in precarious situations. To describe the phenomenon, Ryan and Haslam (2005) coined the term "glass cliff". In reaction to a lead article in the The London Times which suggested that an increase in the number of female board members in U.K. companies resulted in worse firm performance (Judge, 2003), the authors posited a reversed association according to which weak firm performance causes the appointment of female board members. Indeed, they concluded from their analysis that "women are particularly likely to be placed in positions of leadership in circumstances of general financial downturn and downturn in company performance" (Ryan and Haslam, 2005, p.87).

Subsequent research on the glass cliff has yielded a complex pattern of results and a number of moderators which seem to qualify the robustness of the phenomenon (for overviews see Kulich and Ryan, 2017; Ryan et al., 2016; Velte, 2018), ranging from the institutional context (Bruckmüller and Branscombe, 2010; Jalalzai, 2008; Ryan et al., 2010) to the kind of position that needs to be filled (Adams et al., 2009; Lee and James, 2007), the nature of the performance downturn (Furst and Reeves, 2008; Kulich et al., 2015) and the question of whether adverse situations are best defined by means of market-based corporate performance measures or accounting-based proxies (Haslam et al., 2009). Accordingly, the glass cliff seems to have established itself in the literature as a validated phenomenon. We argue, however, that previous field research on the glass cliff — like a large proportion of leadership research in general (Antonakis et al., 2010) — failed to elucidate the causal chain of effects. Do women ascend to (top) management positions because firm performance is declining? Or do some unobserved third variables account for previously found associations between women's promotions and firm performance? Correlational, observational or retrospective self-report data are not sufficient to address these endogeneity concerns. Therefore, to answer this question, we apply a variety of methods to company data from two countries, which taken as a whole allow more valid conclusions to be drawn than previous research.

Although the glass cliff has not been conceptualized as a theory to be confirmed or refuted, but rather as a phenomenon to be or not to be observed (Ryan et al., 2016), it defines relationships among variables and concepts in much the same way as a theory does. To analyze the validity of these relationships, research thus needs to illuminate the "set of boundary assumptions and constraints" affecting these relationships across time and space (Bacharach, 1989, p. 496). Culture might be one of these constraints (e.g. Aguilera and Jackson, 2003). Culture shapes organizational structures, which in turn affect the composition of corporate boards (Adams, 2017; Kirsch, 2018). For example, in cultural contexts where women in leadership positions are still extremely rare, it is unlikely that women face a glass cliff, simply because leadership positions are not within their reach or because women do not consider themselves apt to contribute to the boards' culture-specific role (Bruckmüller et al., 2014; Fernandez-Mateo and Fernandez, 2016). National cultures also differ in terms of how strongly they value and enforce gender equality (Adams, 2017). In this sense, they shape people's expectations of effective leaders and make women appear more or less suitable candidates for leadership positions (Lord et al., 2001). Furthermore, culture may lead to legislative structures that affect the appointment of women to boards in more indirect ways. For instance, national cultures impose different forms of shareholder protection rights (La Porta et al., 1998; Post and Byron, 2015). In countries that grant weaker rights to shareholders, directors cannot easily be held liable for mismanagement and fraud, lowering the pressure on boards to optimize their decision-making procedures and leverage the knowledge and skills of all of their members, including women (Adams, 2017; Post and Byron, 2015).

Due to these cultural differences, it cannot be assumed that the glass cliff is an internationally generalized phenomenon. A closer look at field studies on the glass cliff phenomenon shows that almost all of them used archival data from the U.K. or the U.S. (e.g. Adams et al., 2009; Brady et al., 2011; Cook and Glass, 2013a,b; Glass and Cook, 2016; Haslam et al., 2009; Lee and James, 2007; Ryan and Haslam, 2005).[1] Insights

[1]For exceptions see Santen and Donker (2009), who analyzed the phenomenon in a sample of Dutch

from different cultural contexts are therefore needed (Velte, 2018).

In contrast to previous research, this study examines the validity of the glass cliff phenomenon outside the U.S. or the U.K. and chooses Germany, the largest economy in the European Union and the fourthlargest economic power worldwide (World Bank, 2018). In order to corroborate the robustness of our findings and address questions of causality (Antonakis et al., 2010), we first match firms to eliminate potential biases in selecting firms that appoint women to their boards. We test three different matching procedures to ensure that the results are not due to the specificities of each method. We then apply different panel estimation methods on each of these matched datasets to test for differences in firm performance trends prior to the appointments of new board members. We additionally employ an instrumental variables estimation approach because matching procedures align firms on those characteristics that were part of the matching but do not achieve balance between firms with regard to unobserved third variables. Finally, in order to analyze generalizability of our results and define potential cultural boundaries of our findings, we repeat all analyses using data from the U.K.

Before elaborating on the methodological approach taken by our study, we review previous findings from archival studies on the glass cliff phenomenon on corporate boards.

VII.2 Background and hypotheses

Women are still a rarity in senior management positions around the world. Women held no > 15% of board seats on average in 2016, ranging from 7.2% in Latin & South America, 7.8% in Asia, 11.3% in the Middle East, 14.5% in the United States, 18.8% in Africa, 20.8% in Australia/New Zealand, and 22.6% in Europe (Deloitte, 2017). To explain women's and men's unequal career progression to leadership positions, the idea of a so-called glass ceiling has dominated the discussion since the 1980s. Although the

firms, and Sun et al. (2014), who performed a similar study in China. Whereas Santen and Donker (2009) concluded there was no evidence for the glass cliff, Sun et al. (2014) found in a sample of Chinese firms that female board member appointments were indeed more likely in times of economic downturns.

term is said to have first appeared in an Adweek interview with journalist Gay Bryant in 1984, it was popularized by Wall Street Journal reporters Carol Hymowitz and Timothy Schelhardt in 1986, when they highlighted the invisible barriers women face on their way up to senior management positions (Boyd, 2008; Krismann, 2005). However, in 2003 The London Times took the opposite perspective by suggesting that women were scarce on boards because they lacked the necessary skills for top management. The article proposed that a higher number of women on managerial boards actually resulted in worse corporate performance (Judge, 2003). Although it was criticized for being a "correlation-does-not-equal-causation classic" (Hill, 2016), the article can nevertheless be credited with launching renewed discussion of the phenomenon now known as the glass cliff (Haslam et al., 2009; Ryan and Haslam, 2005). In a nutshell, the metaphor suggests that any apparent progress towards gender equality in top management positions is in reality a "perverse sign of progress" (Hill, 2016), implying that compared to men, women are often promoted to precarious positions with a high risk of failure. In other words, when firms' performance is poor, women are more likely to ascend to top management positions. This idea has drawn considerable attention not only in academia but also in the popular press, as reflected in views on both female managers' and female politicians' rise to top positions. Thus, Marissa Mayer, former CEO of Yahoo (Hass, 2012), Theresa May, leader of the Conservative Party and current British prime minister (McGregor, 2016), and Andrea Nahles, leader of the Social Democrats in the German Federal Parliament (Waechter, 2017) — just to mention a handful — have all been seen as prominent examples of the glass cliff (for further anecdotal examples see Kulich and Ryan, 2017).

VII.2.1 Evidence for the glass cliff

Besides anecdotal evidence, Ryan and Haslam (2005) were the first to present empirical evidence for the glass cliff from an archival study performed in the U.K. They compared the stock prices of 15 firms listed on the FTSE 100 which appointed female board members in 2003 to those of firms which appointed male board members in the same year. Based on a correlational analysis they showed that "companies that appointed a woman experienced consistently poor performance in the months preceding the appointment" (Ryan and Haslam, 2005, p.86). They concluded that women's chances of being promoted to top level positions increase in precarious circumstances. Mulcahy and Linehan (2013) focused on U.K. firms that were experiencing an accounting loss in any one year between 2004 and 2006. In a difference-in-differences analysis based on a matched dataset they found that greater losses lead to a higher proportion of women on corporate boards.

Brady et al. (2011) studied U.S. firms listed among the Fortune 500. Examining their board composition over the period from 2001 to 2005 with a logistic regression, they observed a positive association between the likelihood of female board members being present and declining accounting performance or organizational scandals in the year of the appointment. Cook and Glass (2013a) analyzed transitions of Chief Executive Officers (CEOs) in Fortune 500 companies between 1996 and 2010. They concluded that occupational minorities' (i.e., white women and both men and women of color) likelihood of being promoted to CEO positions increased when accounting performance had declined during the predecessors' terms of office. In a follow-up study, Glass and Cook (2016) selected all 52 women who ever served as CEOs in Fortune 500 companies up to 2014 and compared them to male CEOs in firms of similar size in similar industries. They concluded from a univariate comparison that women were more likely than men to ascend to higher risk CEO positions with less formal authority to accomplish strategic goals. Likewise, Elsaid and Ursel (2017) found evidence for women's higher chances for promotion to more precarious CEO positions in their analysis of CEO transitions in a broad set of North-American firms between 1992 and 2014. In a matched-sample approach, they showed that female CEOs assumed their position in firms of lower accounting-based profitability and higher stock price volatility than firms where male CEOs were appointed.

VII.2.2 Evidence against the glass cliff

Not all archival studies support the idea of a glass cliff, however. Adams et al. (2009) examined firms' market-based firm performance (measured by both raw and adjusted stock market returns) during the 120 trading days leading up to CEO appointments in U.S. firms between 1992 and 2004. Based on a t-test analysis, they found that female appointments were preceded by higher (instead of lower) stock returns than male appointments and, thus, refuted the glass cliff notion. Similarly, Cook and Glass (2013b) analyzed CEO transitions in Fortune 500 firms between 1990 and 2011 and found no correlation between both market- or accounting-based firm performance and the appointment of female CEOs. Haslam et al. (2009) studied the presence of women on the boards of FTSE 100 firms from 2001 to 2005. Although they derived supportive evidence for the glass cliff in simple correlational analyses when using a market-based measure of firm performance, there was no association between accounting-based measures of firm performance and female board member representation. Haslam et al. (2009) further considered the time-lagged relation between market-based measures of performance and female participation in corporate boards. Based on a Granger (1969) causality analysis, they derived the existence of a bilateral causality where the impact of female board representation on subsequent firm performance was slightly stronger than the effect of preceding performance on board composition. They took this finding as a sign that "investors 'over-interpret' the signals associated with women's presence on company boards — seeing this (incorrectly) as a sign of decline and as a harbinger of ruin" (Haslam et al., 2009, p. 493). In a related vein, Brinkhuis and Scholtens (2018) examined the short-term stock market reaction to the appointment of female CEOs and Chief Financial Officers (CFOs). They matched a sample of 100 female appointments at international firms between 2004 and 2014 to a comparable set of firms appointing male CEOs and CFOs. They did not find statistically significant market reactions to female (relative to male) appointments, even when controlling for country-specific gender inequality, though they reported a substantial international heterogeneity in market reactions.

VII.2.3 Hypotheses development for German firms

Taken together, evidence from the field is mixed and mostly limited to the U.K. and U.S. Therefore, there is a need for more evidence from cultural contexts outside these two countries. Although culture may affect organizational gender promotion policies in numerous ways (Adams, 2017), our arguments focus on three issues that differentiate listed firms in Germany from those in the U.K. and U.S.: board structures, legislation governing shareholders' rights, and the societal value placed on diversity management — including gender equality — in the past.

Board structures in European countries are diverse, including unitary (one-tier) systems and two-tier systems. In contrast to the one-tier system that U.K. and U.S. firms use, listed firms in Germany are legally bound to apply a two-tier system consisting of two separate senior management bodies with clearly defined and separated responsibilities: the management board and the supervisory board. The management board deals with day-to-day operations, i.e. runs the firm; the supervisory board monitors the actions of executives on the management board (also referred to as "executive directors"). Compared to supervisory board members, the prototypical behavior profile of directors on management boards is therefore more action-oriented or agentic: Successful executives are described as decisive, inspirational, courageous, proactive and strategic (Eagly and Karau, 2002; Martell et al., 1998) — so-called agentic qualities that people associate with men more strongly than with women, and for which women get less credit when they do demonstrate them (role congruity theory, Eagly and Karau, 1991, 2002; Schein, 1973, 2001). Though the congruence between the stereotypical associations of "male" and "leader" holds at all leadership levels, it is particularly strong in the case of top executives on management boards (Eagly and Karau, 2002). The congruence can be assumed to be less strong for supervisory directors, instead, who tend to stay in the background, give advice to management board members and monitor their decisions. As directors in two-tier systems are members of either the management or the supervisory board, ensuring there is no role overlap between the two bodies, the two-tier system can be argued to intensify the agentic profile of executive directors in comparison with unitary board systems, where the division of responsibilities between executive and non-executive directors is less pronounced (European Confederation of Directors' Associations, 2014). This is important for our analysis, as — in line with the earlier literature that predominantly studied the appointment to the chief executive position — we consider appointments to executive directorships, i.e. to management board positions, and do not examine any supervisory board appointments in our sample of German firms.

Arguing on the basis of role congruity theory, one could hence conclude that two-tier systems aggravate women's alleged misfit in top executive positions (Eagly and Karau, 2002). Nevertheless, the glass cliff metaphor implies that women's opportunities to ascend to these top executive positions should rise in times of declining firm performance. But decreasing returns pose a threat to firms' competitive strength in the marketplace, and intergroup competitive contexts increase shareholders' desire for "warrior" qualities in top management, which again are more strongly associated with men than with women (see Van Vugt and Spisak, 2008). So logically, declining returns that deteriorate a company's position vis-à-vis its competitors should elicit a preference for male leaders who, due to their allegedly more pronounced agentic profile, are perceived as more effective (Eagly and Karau, 1991, 2002; Heilman, 2001; Ryan et al., 2011). In contrast to the glass cliff metaphor, declining returns would hence be assumed to strengthen the preference for male rather than female executives in a dual board system such as in Germany.[2]

Besides board structures, shareholder protection legislation in Germany is different from that in the U.K. or U.S. because German shareholders have fewer protective rights (La Porta et al., 1999; Post and Byron, 2015). One major aspect of shareholder protection is the ease with which shareholders can sue for director misconduct. Strong protective rights therefore motivate firms to promote the most qualified candidates to their boards in order to avoid lawsuits and the corresponding legal costs (La Porta et al., 2000). Since nowadays women's educational attainments in Western countries are at least on a par with men's (Organization for Economic Cooperation and Development, 2017),[3] firms subject to strict shareholder protection legislation should

[2]The argument would also hold for executive directors in unitary board systems like in the U.S. or U.K. The fact that previous field studies on the glass cliff did not consistently differentiate between executive directors and non-executive directors on unitary boards may therefore have confounded the earlier findings.

[3]In 2016, 10.0% of men and 11.9% of women in the United States had a Master's degree, 2.0% of

reasonably adjust the number of female board members accordingly to achieve maximal board quality. The comparably weak shareholder protection legislation in Germany may hence put German firms under less pressure to change decision-making procedures in times of performance declines, implying that they may be less motivated to promote women to their management boards.

Finally, in contrast to the U.S., where diversity management has been part of corporate governance since the 1960s (Anand and Winters, 2008), the topic did not attract much public interest in Germany before the early 2000s. It was not until 2006 that a nationwide corporate initiative, the Charta der Vielfalt (English: diversity charter), was launched to promote diversity in companies and institutions. In a 2006 survey among 78 firms, only 44% of German firms (as opposed to $> 90\%$ of firms operating in the U.K. and U.S.) stated that they had some kind of diversity management policy in place (Köppel et al., 2007). In a more recent survey of 215 German firms of various sizes in different industries, more than half of them (55%) likewise indicated that diversity management had not played a significant role in their internal processes over the past two years (PageGroup, 2014). Until today, there is no compulsory female quota for management boards in German companies; in 2016 a female quota for supervisory boards came into effect but it is binding only for the largest publicly-listed firms. Even before this legislation, the percentage of women on management boards in Germany has been considerably smaller than on supervisory boards (5% vs. 18%) in the 200 largest German firms according to Holst and Kirsch (2015). Given the brief history of diversity management in Germany, we hence assume that companies are less alert to gender discrimination in staffing procedures than firms in the U.K. or U.S., implying more conservative promotion patterns that favor men (Cook and Glass, 2013b; Schein, 1973, 2001), particularly with respect to executive positions.

To recap, we argue that two-tier board systems of the kind found in Germany emphasize the agentic profile of executive directors. Taking into account two-tier board characteristics, together with each country's shareholder protection laws and history of

men and 1.6% of women had a PhD. In the 22 European member states of the OECD, 12.4% of men and 14.9% of women had a Master's degree, 1.1% of men and 0.8% of women had a PhD.

diversity management policies, we assert that it is more difficult for female managers to ascend to executive directorship positions in Germany than it is in the U.K. or U.S. Performance downturns are likely to exacerbate women's difficulties further, as under threat conditions, firms are more likely to revert to traditional and well-learned agentic behaviors (Staw et al., 1981). Thus we do not expect firms' preference for promoting men to change in times of performance downturn: When corporate performance declines, German firms are more likely to promote male candidates to their executive boards.

Hypothesis 1: *Prior to management board appointments, the performance trend of German firms that promote men is more negative than the performance trend of German firms promoting women.*

Although we argue that women are less likely to ascend to management boards in times of performance downturns, there is some evidence that shareholders nevertheless approve of women's appointments to boards: Huang and Kisgen (2013) showed that the market reaction to acquisitions and debt issuances is more positive when these are conducted by female executives as compared to male executives. Levi et al. (2014) reported a similar effect with regard to acquisitions of S&P 1500 firms between 1997 and 2009. They showed that a higher proportion of women on firms' boards leads to fewer acquisition bids and lower bid premia. It seems that the market anticipates less overconfidence and greater risk aversion in female CEOs or CFOs, thus triggering a more positive reaction to major corporate finance decisions. In a large study on both publicly-listed and private firms in Europe, Faccio et al. (2016) reported that female CEOs indeed display higher risk-avoidance behavior than male CEOs. Similar reasons might explain investors' preferences for female managers when corporate crises result from male predecessors' mismanagement, so that female appointments allow to signal gender-stereotypic change (Kulich et al., 2018, 2015). A meta-analytic approach showed that a positive performance effect of female representation on corporate boards runs primarily via their involvement in monitoring functions, as women appear to be more careful and effective monitors of corporate actions (Post and Byron, 2015). Taking endogeneity aspects explicitly into account, Adams and Ferreira (2009) found that a higher female representation on boards is performance-increasing only for firms with weak corporate governance, more precisely: for firms with weak shareholder protection rights. Correspondingly, Adams et al. (2012) observed a particularly positive market response to the appointments of female board members in firms with strong monitoring needs.

For the German context it is not quite clear from the outset whether a more or less positive market reaction to the appointment of women (relative to men) to management boards might be expected. On the one hand, the weaker shareholder rights in Germany should induce a more positive investor reaction; on the other hand, the stronger monitoring activity that is necessary for performance improvement is not the responsibility of the management board but of the supervisory board. Nevertheless, if a decline in corporate performance is strongly attributed to the incumbent management (which tends to be predominantly male for our sample of German firms), the appointment of a female board member may signal a change in management approach above all else. This might trigger a positive reaction by investors. We therefore assert:

Hypothesis 2a: *When corporate performance is declining, German firms evoke more positive reactions from shareholders if they promote women rather than men to their boards.*

Shareholders' preference for women is likely to be less pronounced or even disappear when external factors explain a firm's negative performance, as, for example, in times of macroeconomic instability when corporate crises are uncontrollable and shareholders no longer associate declining performance with (men's) internal mismanagement (Kulich et al., 2015; Lassiter et al., 2002). Again referring to the threat-rigidity hypothesis (Staw et al., 1981), we assert that macroeconomic instability strengthens firms' preference for well-tried promotion patterns, leading to the recurring appointment of male board members. Because macroeconomic instability poses a threat to firms' competitive strength and increases pressure on firms, companies likely become more rigid in their decision-making and they rely on traditional strategies preferring the agentic qualities of male executives. So we assert that macroeconomic instability moderates the market reaction to board member appointments, leading to a more negative response to female board member appointments than to male board members.

Hypothesis 2b: *Macroeconomic instability mitigates shareholders' reaction to women's promotions to the management boards of German firms. Shareholders' reaction to women's promotions is less positive than to the appointment of male board members in times of economic instability.*

VII.3 Method

VII.3.1 Sample

Our sample consists of all women and men who were appointed to the management boards of the largest German corporations between January 1, 2005 and January 1, 2015. Companies are selected based on their stock listings on the most important German stock indices: DAX30, MDAX, SDAX and TecDAX. As the indices' compositions change irregularly throughout the years (Deutsche Börse, 2018), the set of firms contained in our dataset is not constant but had to be adapted dynamically. In order to be included in the dataset, companies have to be listed in the indices over a minimum time span of four years (+/- 2 full business years before/after appointment of a new board member). We impose this criterion in order to obtain reliable information on companies' performance. Although we do not evaluate the two-year period after board members' appointment, we employ this information to remove companies from the sample which, due to e.g. mergers or insolvencies, move between indices or lose their stock listing. Given the rather extreme nature of these types of corporate transactions, the composition of their boards may be affected by different dynamics than those with which this paper is concerned. We collect the appointment dates of new board members using the ESG section of Thomson Reuters EIKON database and manually check them by cross-comparison with the companies' annual reports. In total, 557 board member appointments enter our dataset. Due to missing or faulty data regarding stock performance and other financial information (taken from S&P's Capital IQ and the Thomson

Reuters EIKON database in combination with firms' annual reports), 28 appointments are excluded, leaving a final dataset of 128 firms with 529 appointments of executive directors, of whom 42 (7.9%) are female.

Figure VII.1 shows the development of management board appointments over time. The number of male directors appointed each year varies between 37 and 58, whereas fewer than five women per year were appointed to management board positions prior to 2010. In 2012, the number of female appointments peaks at 13, falling back to six appointments in 2013 and 2014 respectively.

Figure VII.1: Number of directors appointed to management boards of firms listed in the DAX, MDAX, SDAX or TecDAX from January 1, 2005 to January 1, 2015.

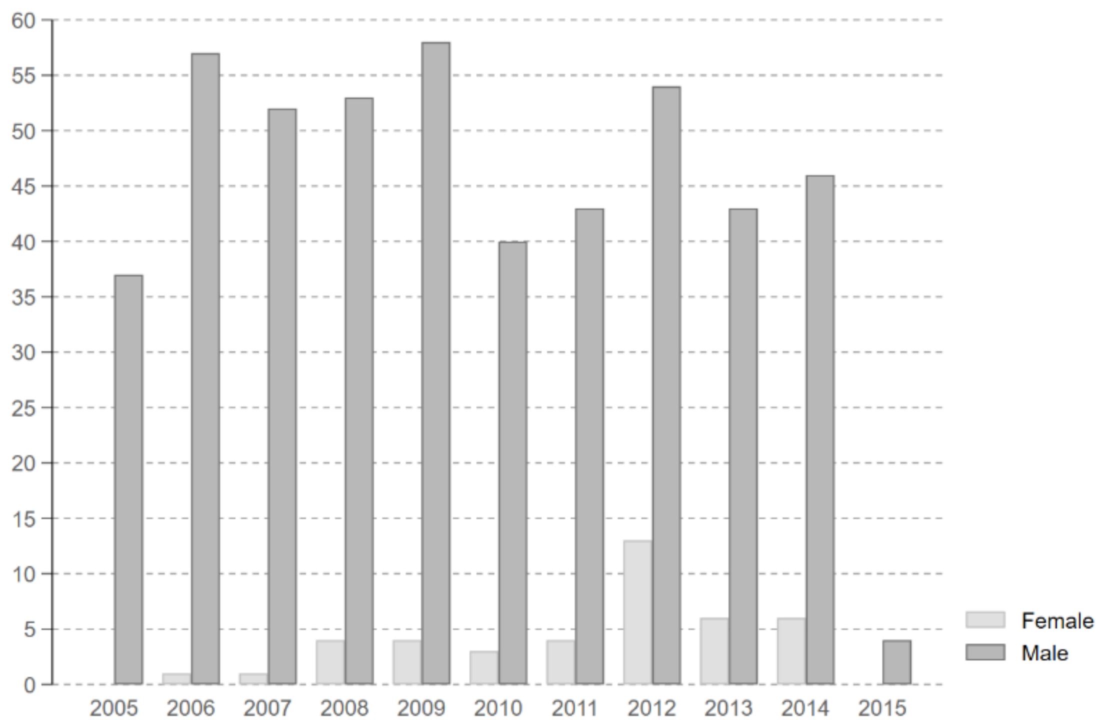

Table VII.1 presents univariate characteristics of our dataset. Indeed, there seem to be some gender-specific appointment characteristics: Women tend to become board members in larger firms with more employees and higher revenues. Most women (26.19%) are appointed Chief Human Resources Officers (CHRO), while most men (20.32%) become CFO. All new CEOs in our sample are men. Also, firms appointing women are predominantly active in the financial, industrial or consumer cyclical sector.

Table VII.1: Descriptive statistics (before and after matching) of German firms.

		Before matching			After matching		
	Female (SD)	Male (SD)	Difference (SE)	t	Male (SD)	Difference (SE)	t
Company age	83.119	96.472	13.353	1.253	89.976	6.857	0.585
	(55)	(67.122)	(10.656)		(52.368)	(11.718)	
No. of employees	97,412.19	64,297.82	-33,114.38*	-1.951	90,871.71	-6,540.48	-0.231
	(135,854.7)	(102,549.4)	(16969.41)		(123,117.9)	(28290.38)	
Total revenues	27,613.80	18,441.64	-9,172.162**	-1.997	26,121.32	-1,492.49	-0.211
	(32,283.21)	(28,219.69)	(4592.455)		(32,491.69)	(7067.558)	
Index							
DAX	0.476	0.398	-0.078	-0.985	0.452	-0.024	-0.216
	(0.505)	(0.49)	(0.079)		(0.504)	(0.11)	
MDAX	0.214	0.335	0.12	1.599	0.238	0.024	0.258
	(0.415)	(0.472)	(0.075)		(0.431)	(0.092)	
SDAX	0.238	0.158	-0.08	-1.341	0.238	0	0
	(0.431)	(0.365)	(0.06)		(0.431)	(0.094)	
TecDAX	0.071	0.109	0.037	0.755	0.071	0	0
	(0.261)	(0.312)	(0.05)		(0.261)	(0.057)	
Position							
CEO	0	0.092	0.092**	2.064	0	0	0
	(0)	(0.29)	(0.045)		(0)	(0)	
CFO	0.19	0.203	0.013	0.198	0.19	0	0
	(0.397)	(0.403)	(0.065)		(0.397)	(0.087)	
CHRO	0.262	0.031	-0.231***	-6.931	0.214	-0.048	-0.507
	(0.445)	(0.173)	(0.033)		(0.415)	(0.094)	
Legal	0.024	0.01	-0.014	-0.794	0	-0.024	-1
	(0.154)	(0.101)	(0.017)		(0)	(0.024)	
COO	0.095	0.051	-0.044	-1.199	0.095	0	0
	(0.297)	(0.221)	(0.037)		(0.297)	(0.065)	
CIO/CTO	0.048	0.029	-0.019	-0.684	0.048	0	0
	(0.216)	(0.167)	(0.028)		(0.216)	(0.047)	
Member	0.119	0.152	0.033	0.573	0.119	0	0
	(0.328)	(0.359)	(0.057)		(0.328)	(0.072)	

Continued on next page

Table VII.1 – continued from previous page

	Before matching				After matching		
	Female (SD)	Male (SD)	Difference (SE)	t	Male (SD)	Difference (SE)	t
Other	0.262	0.431	0.169**	2.14	0.333	0.071	0.71
	(0.445)	(0.496)	(0.079)		(0.477)	(0.101)	
Industry							
Basic materials	0.048	0.117	0.069	1.371	0.024	-0.024	-0.582
	(0.216)	(0.322)	(0.051)		(0.154)	0.044)	
Consumer cyclicals	0.214	0.177	-0.038	-0.61	0.19	-0.024	-0.268
	(0.415)	(0.382)	(0.062)		(0.397)	(0.089)	
Consumer non-cyclicals	0.048	0.053	0.006	0.16	0.095	0.048	0.841
	(0.216)	(0.225)	(0.036)		(0.297)	(0.057)	
Energy	0	0.008	0.008	0.589	0	0	0
	(0)	(0.09)	(0.014)		(0)	(0)	
Financials	0.262	0.16	-0.102*	-1.693	0.19	-0.071	-0.776
	(0.445)	(0.367)	(0.06)		(0.397)	(0.092)	
Healthcare	0.095	0.117	0.022	0.424	0.143	0.048	0.668
	(0.297)	(0.322)	(0.051)		(0.354)	(0.071)	
Industrials	0.238	0.23	-0.008	-0.12	0.262	0.024	0.249
	(0.431)	(0.421)	(0.068)		(0.445)	(0.096)	
Technology	0.024	0.078	0.054	1.29	0.024	0	0
	(0.154)	(0.268)	(0.042)		(0.154)	(0.034)	
Telecom. services	0.048	0.025	-0.023	-0.889	0.048	0	0
	(0.216)	(0.155)	(0.026)		(0.216)	(0.047)	
Utilities	0.024	0.035	0.011	0.38	0.024	0	0
	(0.154)	(0.184)	(0.029)		(0.154)	(0.034)	
Taking-office-date	14.09.2011	23.11.2009	-660.009***	-4.027	06.05.2011	-130.881	-0.715
	(809.51)	(1,034.819)	(163.888)		(867.889)	(183.13)	

Remark: This table presents mean values of the data for German firms. *Company age* is measured in years since the company's inception at the time of the board members' appointments, *total revenues* are given in million EUR. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

VII.3.2 Matching and instrumenting

To take into account the differences between firms appointing women and those promoting men to their management boards, it is important to control for the nonequivalent distribution of covariates which may obscure potential self-selection effects among firms (Faccio et al., 2016). The most often employed approach to correct for selection-induced biases relies on matching firms that appoint women to their management boards to a sample of companies that instead promote men but are otherwise comparable. Besides the nonequivalence of covariates, however, omitted third variables may also impair the validity of analyses. To address endogeneity concerns more fully, we therefore additionally perform a two-stage regression analysis using instrumental variables and we employ various panel estimation methods.

First, to create matched samples, we use genetic matching (Diamond and Sekhon, 2013) in our main analyses. Genetic matching is a nonparametric procedure that uses an evolutionary search algorithm developed by Mebane and Sekhon (1998, 2011) to determine the covariate weights. This algorithm allows maximizing the balance of observed covariates across matched subsamples in order to obtain similar joint distributions. Though propensity score matching (estimated by logistic regressions) is a limiting case of genetic matching, covariate balance remains a concern for it, particularly if covariate distributions are not ellipsoidal, which is likely in samples of limited size (Sekhon, 2011) such as ours. Even if this were not an issue, genetic matching would be more efficient than propensity scoring (Diamond and Sekhon, 2013) and is therefore preferred in our analysis.

We allow for ties but not for replacements of firms in our matching. Consequently, if one “treated” appointment (a company appointing a woman) matches more than one “control” appointment (a company appointing a man), the matched dataset will include the multiple matched control appointments. As the matched data will be weighted accordingly, the sum of the weighted appointments will nevertheless still equal the original number of appointments (Sekhon, 2015). However, once an appointment from the control group is selected, it cannot be “returned” to the matching process and serve as a matching partner for other treatment appointments in the same year. This procedure allows using a maximal amount of informational heterogeneity in our dataset. We do not allow appointments of female and male board members in the same firm to be matching partners.

In order to corroborate our findings, we employ two further matching methods: propensity scoring with a nearest-neighbor linkage (Guo and Fraser, 2014) and a stratification matching that classifies units into blocks with balanced propensity scores (Li, 2012). The analyses of samples that were matched based on these two procedures are presented in Appendix V.

Following previous research, we match companies on the basis of directors' board positions and appointment dates, companies' stock index affiliation, industry, company age, revenues and number of employees (see Boivie et al., 2016; Francis et al., 2012; Nekhili et al., 2017; Tanaka, 2014; Withisuphakorn and Jiraporn, 2017; Zou et al., 2018). While matching on firm size, industry and appointment period has become a standard feature in the literature on the glass cliff (see Brinkhuis and Scholtens, 2018; Elsaid and Ursel, 2017; Glass and Cook, 2016; Mulcahy and Linehan, 2013), our dataset makes further consideration of variables such as index affiliation and specific board position feasible.

With respect to board positions, we differentiate between CEO, CFO, CHRO, Legal Officer, Chief Operating/Operations Officer (COO), Chief Information/Technology Officer (CIO/CTO), members of the board without specific roles in day-to-day operations (Member), and a final category (Other) denoting members with less common positions, e.g. Chief Marketing Officer. Industry classification follows the Thomson Reuters (2012) Business Classification and differentiates between Basic Materials, Consumer Cyclicals, Consumer Non-Cyclicals, Energy, Financials, Healthcare, Industrials, Technology, Telecommunications Services, and Utilities. Company age refers to the age of the company (in years since its inception) at the time of board members' appointments, and revenues and number of employees are computed as weighted averages of the respective values at the beginning and end of the business year in which the appointment occurs.

Table VII.1 gives an overview of company characteristics before and after the matching procedure. The matched sample comprises 42 men from 38 firms and 42 women from 32 firms. As can be seen, the matching procedure is successful: After matching, there are no statistically significant differences between the matching variables of firms appointing women or men to their boards.

To address further endogeneity concerns that may arise from variables not considered in the matching procedure, we also employ an instrumental variable (IV) approach. Instead of correcting a potential selection bias, the IV approach attempts to estimate the influence of omitted variables by using a valid instrument. This two-stage estimation then allows replacing the endogenous explanatory variable, in our case the gender of the new board member, with an exogenous variable in the regression of interest. For example, omitted variables might affect firms' preferences for women as board members as well as their corporate performances, thereby "infecting" the explanatory variable with endogeneity. To apply the IV method, it is necessary to find a valid instrument that is related to the potentially endogenous variable (gender of board member) but not related to the dependent variable (firm performance) other than through the endogenous variable. However, exogenous variables that are strong predictors of the endogenous variables but do not correlate with the dependent variable are often hard to find (Semadeni et al., 2013).[4] Worse, weak instruments "can report results that are inferior to those reported by OLS" (Semadeni et al., 2013, p. 1070). We therefore follow the approach suggested by Lewbel (2012) that is meant to be used in applications where instrumental variables are not available. The procedure is similar to the traditional two-stage instrumental variable approach but performs the first-stage analysis by means of the control variables in the model which are heteroskedastic. Essentially, it achieves identification by exploiting the variation on higher moment conditions of the

[4] We initially chose the female labor market participation rate in the federal states where a company is headquartered as a feasible candidate for such an instrument. The extent of women's labor market participation has been shown to covary with women's likelihood of acquiring senior executive positions (Carli and Eagly, 2011; Grosvold et al., 2016). At the same time, these rates should hardly covary with companies' performance other than through the choice of female board members. However, this variable turned out as a weak instrument in our analyses.

error distribution in the first-stage regression (for more details see Lewbel, 2012).

VII.3.3 Measures

Dependent variables

To assess corporate performance, we employ market-based and accounting-based return measures, as previous research on the glass cliff examined both measures. The stock market aggregates information from many sources and filters this information through the perceptions of a large and diverse set of market participants. As such, market-based measures have been characterized as forward-looking (Fama, 1970; Fama et al., 1969). Accounting-based measures, in contrast, capture firm performance characteristics over the past accounting period and are subject to accounting rules that may allow for discretionary leeway on the part of the firm's management. Even though we examine both types of measures in order to remain consistent with the earlier literature, we deem market-based stock returns to be a more comprehensive and instantaneous measure for testing our hypotheses.

With regard to market-based returns, we collect monthly share prices for two years prior to the appointment of a new board member. The data hence contain 24 monthly stock returns for each board member appointment. Based on the monthly stock prices, we calculate risk-adjusted monthly returns (*RARs*) following Adams et al. (2009). In contrast to raw stock returns, adjusted returns make it possible to control for confounding effects of market movements and firms' systematic exposure to this market risk. More precisely, *RARs* capture that part of a firm's stock return that is due to active management decisions and do not account for market- or industry-wide developments that might have affected the stock return irrespective of the executives' decisions. The risk-adjustment is based on the Capital Asset Pricing Model (CAPM, see Lintner, 1965; Sharpe, 1964), so that *RAR* is calculated as the firm's actual monthly stock return minus the expected stock return estimated using the CAPM. We employ the one-year government bond rate as the riskless rate and use the respective stock index (DAX, MDAX, SDAX, Tec-DAX) as the market portfolio. Risk-adjusted returns hence represent the most refined measures of a firm's performance over and above the general market movement.

Whereas the main analyses concerned with hypothesis 1 focus on monthly *RARs* over a two-year period, we consider the short-term market reaction to the announcement of the appointment of a new board member to test hypotheses 2a and 2b. We therefore also calculate daily *RARs* for the days surrounding each appointment's announcement date in the news media (one day prior to/on the day of/ one day after the press release). Announcement dates are manually collected using the LexisNexis database. We follow standard event study methodology and accumulate these daily returns over the three-day period (Campbell et al., 1997).

As accounting-based returns, we employ the return on assets (*ROA*) and return on equity (*ROE*). *ROA* is a measure of a firm's profitability relative to its total assets and is defined as earnings before interest and taxes (EBIT) for the fiscal year divided by the year-end book value of total assets. *ROE* measures efficiency of equity deployment and is calculated as net income divided by the book value of common equity at the end of the firm's fiscal year (see also Haslam et al., 2009). As *ROA* and *ROE* are calculated on the basis of annual financial statements data, they cannot be translated into monthly performance measures, which tends to further reduce their informational content in comparison with market-based return measures. We compute *ROE* and *ROA* for the two years prior to each board appointment.

Explanatory variables

The main variables of interest in our analyses are the gender of appointed board members that is dummy-coded as *female* (1 = yes, 0 = no), and *time* measured in months and coded linearly, starting with -24 (i.e., two years prior to appointment) to -1 (month before appointment). It should be noted that hypothesis 1 refers to a difference in performance trends rather than performance levels between firms that appoint women instead of men. Literature on the relation between firm performance and management turnover has found evidence that a longer period (at least 12 months) prior to a change in executive board positions has to be examined to identify significant changes in performance (Coughlan and Schmidt, 1985; Dahya et al., 2002; Maury, 2006). Since firms aim at replacing their executives once the benefit of doing so reliably exceeds the cost (Eisfeldt and Kuhnen, 2013), increasing benefits due to worsening firm performance make changes in management boards more likely. To incorporate this dynamic view in our analysis we focus on performance trends prior to the promotion of new board members. Our focus is on the interaction of *female* and *time* to capture differences in performance trends between firms that appoint women instead of men.

When analyzing the short-term market reaction, we make use of two further dummy variables: The first, *declining performance*, takes a value of one for a firm whose accumulated market-based performance over a fixed number of months prior to the appointment is negative, and zero otherwise. We vary the number of months between 24, 12, 6 and 3 and, hence, consider four different declining performance indicators. The second dummy, *economic instability*, takes a value of one if the board member appointment occurs during the global financial crisis, the most extreme phase of macroeconomic instability in our dataset, and zero otherwise. To define the financial crisis, Kahle and Stulz (2013) suggest the time period Q3 2007 to Q1 2010, whereas a more restrictive definition might comprise a shorter time span starting with Lehman Brothers' default on September 15, 2008, ending Q4 2009. We create dummy variables for both time periods. Again, our focus is on the interaction with *female*.

Control variables

We control for firms' age (in years), leverage, and plant, property and equipment (PPE) in analyses of firm performance. Consideration of a company's age allows us to capture potential life-cycle effects on the firm's performance (Anthony and Ramesh, 1992). Leverage, calculated as the ratio of the firm's total liabilities to its market capitalization, indicates the degree of riskiness of a firm's capital structure, and is therefore seen as a relevant factor for explaining stock returns (Harris and Raviv, 1991; Myers, 2001). PPE is a proxy for firm size and indicates the amount of assets that may be pledged as collateral in any debt financing. Since higher collateral reduces financial risk, it may also play a role in stock returns (Gan, 2007). Analyses of the short-term market reaction also control for firms' revenues and number of employees as proxies for profitability and firms size, thus following standard features of event studies on stock market returns (Kothari and Warner, 2007). Control variables are calculated as average values taken from the firms' financial statements at the beginning and end of the year of appointment. All balance sheet variables are standardized relative to the firm's total assets, except for the leverage ratio.

Table VII.2 shows the intercorrelations of the variables in our analyses. Medium to strong correlations (above |0.3|) are observed only among the measures of performance (*RAR*, *ROE* and *ROA*) and between profit and firm size (revenues and number of employees).

Table VII.2: Intercorrelations of variables for German firms.

	Female	Company age	No. of employees	Revenues	PPE	Leverage	RAR	ROE	ROA
Female	1								
Company age	-0.055	1							
No. of employees	0.085	0.05	1						
Revenues	0.087	0.104	0.761	1					
PPE	0.007	0.012	0.013	0.051	1				
Leverage	-0.021	0.102	0.027	0.042	0.309	1			
RAR	0.007	0.01	-0.017	-0.042	0.072	-0.109	1		
ROE	0.025	-0.046	-0.045	-0.013	0.073	-0.184	0.347	1	
ROA	-0.018	-0.062	-0.195	-0.216	0.15	-0.262	0.284	0.725	1

VII.4 Results

VII.4.1 Performance prior to appointment

For a pre-test of hypothesis 1, we examine whether firm performance prior to the appointment of a new board member covaries with this person's gender. Table VII.3 shows the results from logistic regressions that employ the dummy variable *female* as dependent variable and the measures of both market- and accounting-based returns as predictor variables. We consider the risk-adjusted return in the 24 months prior to the appointments and the corresponding *ROE* and *ROA* measures of the same period. As can be seen from Table VII.3, there is no significant association between any return measure in the pre-appointment period and the gender of the new board member. This result also applies when we take into account the potential endogeneity in the relationship between performance and board member gender by instrumenting the respective performance measure using the approach of Lewbel (2012).

Table VII.3: Logistic regressions of gender-dependent appointment in German firms.

	(1)	(2)	(3)	(4)	(5)	(6)
	Logistic	Logistic+IV	Logistic	Logistic+IV	Logistic	Logistic+IV
RAR	0.921	-0.506				
	(0.659)	(0.43)				
ROE			1.399	-0.341		
			(2.389)	(1.099)		
ROA					-1.397	-2.275
					(6.795)	(3.429)
Company age	-0.00389	-0.00431	-0.00352	-0.00444*	-0.00391	-0.00445*
	(0.00338)	(0.00268)	(0.0033)	(0.00266)	(0.00317)	(0.00258)
No. of employees	-6.04E-08	2.06E-06	4.51E-09	2.03E-06	-1.47E-07	1.99E-06
	(1.73E-06)	(1.57E-06)	(1.65E-06)	(1.50E-06)	(1.65E-06)	(1.42E-06)
Revenue	3.32E-06	2.34E-06	3.18E-06	3.70E-06	3.60E-06	2.87E-06
	(8.16E-06)	(5.14E-06)	(7.94E-06)	(5.31E-06)	(7.73E-06)	(5.37E-06)
Taking-office-date	0.000207	0.000661***	0.000235	0.000689***	0.000235	0.000688***
	(0.000302)	(0.000179)	(0.000282)	(0.000182)	(0.000286)	(0.00018)
Leverage	0.000214	-0.00228	-0.0104	-0.00159	-0.0133	-0.00224
	(0.0241)	(0.0112)	(0.0217)	(0.0116)	(0.0234)	(0.0114)
PPE	-0.376	0.378	-0.486	0.236	-0.492	0.312
	(1.066)	(1.204)	(1.061)	(1.265)	(1.068)	(1.265)
Constant	-3.498	-14.64***	-4.227	-15.08***	-3.953	-14.99***
	(5.706)	(3.384)	(5.305)	(3.478)	(5.417)	(3.431)
Observations	84	525	84	525	84	525

Continued on next page

Table VII.3 – continued from previous page

	(1) Logistic	(2) Logistic+IV	(3) Logistic	(4) Logistic+IV	(5) Logistic	(6) Logistic+IV
R^2	0.0322	0.0827	0.0166	0.0786	0.0144	0.0793
χ^2	4.971	26.31	2.758	25.88	2.905	26.16

Remark: This table presents logistic estimates of pre-appointment firm performance on new board members' gender in German firms. The dependent variable is *female* (dummy variable). In models (2), (4) and (6), pre-appointment performance indices (24 months *RAR* and *ROE/ROA* in the business year before the appointment) are instrumented following Lewbel (2012). *Taking-office-date* is a numerical variable where January 1, 1900 takes the value 1. Standard errors are clustered on the firm level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix V.A shows that the picture does not change, even if we consider different matching procedures. There is no significant relation between the level of pre-appointment firm performance and the gender of new board members.

The logistic regressions only permit a static analysis of the relation between the level of pre-appointment performance and appointees' gender. The glass cliff hypothesis, however, points to a deterioration in firm performance as a reason for the appointment of a woman, i.e. an unfavorable performance development over time, so that a dynamic association arises between gender-specific board appointments and firm performance. We therefore employ panel data estimation methods in order to test the glass cliff hypothesis comprehensively. This allows us to examine differences in firm performance trends (rather than levels) prior to the appointments of women relative to men.

In order to test whether it would be justified to use random effects models, we first perform the Hausman (1978) test. After having established that it does not reject the null hypothesis of the time-invariant error term being uncorrelated with the regressors (the Chi-squared statistic of the Hausman test is equal to zero in our model), we use a random effects GLS estimation in our main analysis. Additionally, we run a pooled OLS regression analysis that enables us to include board members as fixed effects using dummy variables. This complements the random effects analysis because it allows controlling for unmeasured person-specific covariates that might cause differences between firms appointing women or men, thus contributing to endogeneity concerns.

However, it has to be noted that the large number of appointments (i.e., dummies) in our dataset strongly reduces the degrees of freedom and, hence, impairs the power of the pooled fixed effects analysis.

To deal with endogeneity concerns that may stem from time-variant omitted variables, we finally also use an instrumental variable estimation on the non-matched dataset, based on Lewbel (2012). This method requires that the distributions of errors in the equation are heteroskedastic, which is true for our data. Appendix V.B shows the exemplary output of the first-stage of the Lewbel instrumentation.

Table VII.4 presents the results from these three different regressions (panel random effects GLS, pooled OLS with fixed effects, and IV) where the market-based return (RAR) is the dependent variable.

As can be seen from both the random and the pooled fixed effects model, there is a significantly positive main effect of *female*, indicating that German companies appointing women to their management boards deliver higher risk-adjusted stock returns before the appointments than companies appointing men. These results are partly in line with hypothesis 1 and they are in contrast to the idea of a glass cliff: Firms appointing women to their boards perform better on average over the entire investigation period. The main effect of *time* is significantly negative in both the random effects and the pooled fixed effects model, suggesting that performance of all firms declines before the appointment of new board members. However and most important for the dynamic perspective of the glass cliff hypothesis, there is no significant interaction of *female* and *time*, so in clear contrast to hypothesis 1, we cannot conclude that prior to the appointment of new board members firms appointing men show different performance trends than firms appointing women. In the IV-model, the direction of effects remains the same but they are not significant. Accordingly, the IV-model suggests that there are no gender-specific differences at all. These results clearly contradict the idea of a glass cliff.

Table VII.4: Panel-regressions on market-based returns of German firms.

	(1) Panel RE	(2) Pooled FE	(3) IV
Female	0.113*	1.088***	0.00482
	(0.0637)	(0.0395)	(0.19)
Time	-0.00494**	-0.00494**	-0.0014
	(0.00238)	(0.00243)	(0.00124)
Female*Time	0.00389	0.00389	0.00284
	(0.0031)	(0.00316)	(0.00788)
Company age	0.000152	0.00693***	0.0000623
	(0.000483)	(0)	(0.000173)
Leverage	-0.00509***	-0.000428***	-0.00367***
	(0.00151)	(0)	(0.000383)
PPE	-0.0673	1.620***	-0.0111
	(0.104)	(0)	(0.0707)
Constant	-0.102	-1.279***	-0.0138
	(0.0677)	(0.0303)	(0.0357)
Observations	2,016	2,016	12,600
# Appointments	84		525
R^2 within	0.0367	0.663	0.00266
R^2 between	0.13	0.663	0.053
R^2 overall	0.0975	0.648	0.038

Remark: This table presents panel estimates of the effects of new board members' gender and time on pre-appointment performance in German firms. The dependent variable is *risk-adjusted stock returns (RAR)*. Coefficients are estimated using random effects (RE) GLS estimation (model (1)), pooled OLS with observation fixed effects (FE; model (2)) and an instrumental variables (IV) approach (model (3)) following Lewbel (2012). In the IV analysis, *female* (dummy variable) is instrumented (the second-stage analysis is estimated using GLS). *Time* is measured in months. Standard errors are clustered on the firm level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Analyzing the accounting-based measures of performance yields similar findings. Results are presented in Table VII.5. Though significant only in the fixed effects model, there is a positive main effect of *female*, suggesting that both *ROA* and *ROE* are higher in firms appointing women to their boards. The main effect of *time* is not significant, nor is the interaction of *female* and *time*. As before, these results refute the idea of a glass cliff.

Table VII.5: Panel regressions on accounting-based returns of German firms.

	ROA			ROE		
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel RE	Pooled FE	IV	Panel RE	Pooled FE	IV
Female	0.00383	0.0638***	0.0184	0.00214	0.924***	0.0292
	(0.0107)	(0.00706)	(0.0403)	(0.0326)	(0.0379)	(0.0875)
Time	0.00096	0.000964	-0.000122	0.00808	0.00808	0.00173
	(0.00151)	(0.00184)	(0.00121)	(0.00972)	(0.0118)	(0.00525)
Female*Time	-0.00201	-0.00201	-0.00414	0.00388	0.00388	-0.0131
	(0.00291)	(0.00353)	(0.00933)	(0.0156)	(0.019)	(0.0275)
Company age	-0.00001	0.000390***	-4.81E-05	-0.000124	0.00525***	-0.00017
	(0)	(0)	(4.79E-05)	(0.00018)	(0)	(0.000122)
Leverage	-0.00118***	0.000100***	-0.000692***	-0.000766*	0.00362***	-0.000732**
	(0.000389)	(0)	(0.000192)	(0.000401)	(0)	(0.000308)
PPE	0.01873	0.373***	0.0117	0.0121	2.693***	-0.000287
	(0.237)	(0)	(0.0205)	(0.0433)	(0)	(0.0424)
Constant	0.0444***	-0.0635***	0.0521***	0.107***	-0.940***	0.133***
	(0.0112)	(0.00367)	(0.00972)	(0.0286)	(0.0236)	(0.0233)
Observations	252	252	1,575	252	252	1,575
# appointments	84		525	84		525
R^2 within	0.0023		0.00055	0.0172		0.000139
R^2 between	0.145		0.08	0.0333		0.0217
R^2 overall	0.121	0.83	0.0667	0.0264	0.581	0.0139

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Table VII.5 – continued from previous page

Remark: This table presents panel estimates of the effects of new board members' gender and time on pre-appointment firm performance in German firms. The dependent variables are *return on assets (ROA)* and *return on equity (ROE)*. Coefficients are estimated using random effects (RE) GLS estimation (models (1) and (4)), pooled OLS with observation fixed effects (FE; models (2) and (5)) and an instrumental variables (IV) approach (models (3) and (6)) following Lewbel (2012). In the IV analyses *female* (dummy variable) is instrumented (the second-stage analysis is estimated using GLS). Time is measured in years. Standard errors are clustered on the firm level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

As a robustness check, we repeat the analyses with samples of firms that we matched with alternative algorithms. Appendix V.C and Appendix V.D report the results. Though the findings are slightly more heterogeneous,[5] they again contradict the glass cliff notion: Neither market- nor accounting-based performance trends are more negative prior to the appointment of female as compared to male board members.

VII.4.2 Short-term market reaction

Hypothesis 2a asserts that investors react more positively to the appointment of female rather than male board members if firms go through a period of performance downturns; hypothesis 2b asserts that macroeconomic conditions moderate investors' responses, resulting in less positive reactions to female versus male board member appointments if external instability seems to cause the performance downturn. In order

[5] More precisely, the main effect of *female* on market-based returns (Appendix V.C) is significantly negative in the pooled fixed effects models but not in the random effects models; *time* is not significant nor is the interaction of *female* and *time*. With regard to accounting-based returns, Appendix V.D shows a significantly negative main effect of *female* in the pooled fixed effects model for *ROE* when matched samples derive from propensity scoring with nearest neighbor matching. Employing stratified matching, there are significantly negative main effects of *female* for both *ROA* and *ROE* in the random effects and pooled fixed effects models. Interestingly, though there is no significant main effect of *time*, the interaction of *female* and *time* is significantly positive in the random effects models for *ROA* and *ROE* as well as in the pooled fixed effects model for *ROE*, indicating a more positive trend in accounting-based returns prior to the appointment of female board members. This even supports hypothesis 1, and refutes the idea of a glass cliff.

to test these hypotheses, we run an event study (following MacKinlay, 1997) on the matched sample and accumulate the daily risk-adjusted returns over a three-day window [-1, +1] with t = 0 being the announcement date (by press release) of the board member appointment. We are interested in the effect of the *female* dummy and its interaction with the two proxies for a precarious firm situation: the dummies *declining performance* and *economic instability*. Table VII.6 reports the results.

Table VII.6: Short-term market reaction to new board member appointments in German firms.

	Declining performance over...				Period of economic instability	
	(1)	(2)	(3)	(4)	(5)	(6)
	24 months	12 months	6 months	3 months	Q3/07 - Q1/10	Sep15/08 - Q4/09
Female	-0.00981	0.00775	0.0112	0.00887	-0.00367	-0.000133
	(0.00712)	(0.00891)	(0.0103)	(0.00856)	(0.00592)	(0.00543)
Decl. perf.	-0.0205**	-0.00121	-0.00735	-0.00137		
	(0.0085)	(0.0093)	(0.00989)	(0.00929)		
Female*Decl. perf.	0.0332**	-0.00462	-0.00632	-0.00601		
	(0.0126)	(0.0134)	(0.0151)	(0.0137)		
Eco. instability					-0.0164	-0.0141
					(0.0103)	(0.0179)
Female*Eco. inst.					0.0457**	0.0492*
					(0.0179)	(0.028)
Company age	-3.87E-05	-4.90E-05	-3.60E-05	-4.11E-05	-6.46E-05	-7.27E-05
	(6.37E-05)	(6.94E-05)	(6.45E-05)	(6.88E-05)	(6.52E-05)	(6.89E-05)
No. of employees	2.66E-08	2.90E-08	3.51E-08	3.07E-08	2.22E-08	1.70E-08
	(2.28E-08)	(2.79E-08)	(2.54E-08)	(2.60E-08)	(2.44E-08)	(2.69E-08)
Revenues	-1.19E-07	-1.63E-07	-1.79E-07	-1.75E-07	-9.07E-08	-7.62E-08
	(1.05E-07)	(1.37E-07)	(1.39E-07)	(1.31E-07)	(1.28E-07)	(1.31E-07)
Leverage	-0.000107	-0.000286	-0.000262	-0.000325	-0.000273	-0.000319
	(0.000263)	(0.000275)	(0.000237)	(0.000264)	(0.000221)	(0.000241)
PPE	-0.0375	-0.0440*	-0.0404*	-0.0438*	-0.0539**	-0.0544**
	(0.0227)	(0.0226)	(0.0214)	(0.0219)	(0.0224)	(0.0244)
Constant	0.0218**	0.0167	0.0168	0.0164	0.0219**	0.0209**

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Table VII.6 – continued from previous page

	Declining performance over...				Period of economic instability	
	(1)	(2)	(3)	(4)	(5)	(6)
	24 months	12 months	6 months	3 months	Q3/07 - Q1/10	Sep15/08 - Q4/09
	(0.00999)	(0.0104)	(0.01)	(0.01)	(0.01)	(0.0102)
Observations	84	84	84	84	84	84
R^2	0.171	0.105	0.131	0.108	0.195	0.178

Remark: This table presents OLS estimates of the effects of new board members' gender and of multiple dummies for precarious firm situations on the market response to the announcement of a board member appointment in German firms. The dependent variable is the *accumulated daily risk-adjusted stock return* over the three day window surrounding the announcement date (i.e., press release date). Since risk-adjusted returns are calculated as the difference between the actual stock returns and the expected returns according to the contemporaneous stock market development, the daily market performance is already accounted for in the dependent variable and is not included as a control variable. *Female* is a dummy variable. *Declining firm performance* in model (1) is a dummy variable that takes the value 1 if the accumulated monthly stock-market return over the 24 months (12 months for model (2), 6 months for model (3) and 3 months for model (4)) is negative and zero otherwise. *Economic instability* in models (5) and (6) is a dummy variable that takes the value 1 if the announcement occurs between Q3 2007 and Q1 2010 (September 15, 2008 and Q4 2009) and zero otherwise. Standard errors are clustered on the firm level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

As can be seen, the main effect of *female* on cumulative adjusted returns surrounding the announcement date is not significant in any of these models. Investors hence do not react more negatively to the appointment of a female board member in general. There is a significantly negative main effect of *declining performance* if the performance downturn persists over 24 months before new board members are appointed; but this effect is qualified by a significantly positive interaction of *female* with *declining performance*. This interaction supports hypothesis 2a: Shareholders respond more positively to firms that appoint female board members than to those that appoint male board members — provided that an extended period of performance declines (24 months) precedes these appointments. Shorter periods of performance downturns (three-, six- or twelve months) are not sufficient to channel shareholders' preferences in the direction of female board members.

In the remaining regressions, we employ the dummy *economic instability* that takes the value of one during the financial crisis that we measure as either the time period Q3 2007 to Q1 2010 or September 15, 2008 (Lehman Brother's default) to Q4 2009. As can be seen from Table VII.6, both *female* and *economic instability* remain non-significant. However, their interaction is significantly positive, irrespective of how we measure the financial crisis. Hence, and in contrast to hypothesis 2b, shareholders welcome German firms' decision to appoint female board members in times of economic instability. Appendix V.E and Appendix V.F report the corresponding results for the two alternative matching procedures. Nearest-neighbor matching supports and even enhances the delineated findings, whereas stratified matching delivers no significant results.

VII.5 Discussion

There are no signs of a glass cliff for female managers in German companies over the course of the decade studied: Prior to the appointments of female board members, firm performance trends are not more negative than those of firms appointing men. This result remains stable across various estimation techniques, including different types of matching algorithms, random versus pooled fixed effects analyses, and two-stage instrumental variables regressions to control for selection biases and omitted variables. Though firms in Germany hence do not appear to expose female managers to glass cliffs, they are reluctant to promote women to management boards in the first place. The total number of women who succeed in joining management boards is small: From 2005 to 2015, no more than 7.9% of all new board members were women, and none of the women in our dataset became CEO during this period. Nevertheless, in certain circumstances, shareholders perceive the appointment of women as a positive signal: Their immediate responses are more positive to new female board members than to male board members if firm performance has been negative for an extended period of two years or else is threatened by economic instability. The positive market reaction in times of economic instability is contrary to experimental findings suggesting that uncontrollable crises diminish people's preferences for women in leading positions (Kulich et al., 2015) or might increase shareholders desire for "male warriors" to ensure firms' competitive market strength (see Van Vugt and Spisak, 2008). Instead, the positive response corresponds to experimental findings that suggest people prefer women when firms need to endure difficult periods (Ryan et al., 2011).

In sum, our results contradict the existence of a glass cliff for female top managers in Germany, and they stand in contrast to previous archival studies performed in the U.K. or U.S. Unlike previous studies, we employ various matching techniques and different estimation approaches to address potential endogeneity concerns. These features lend support to the validity of our inferences. Still, although we expected results in German firms to differ from findings in U.K. or U.S. firms, one might object that methodological differences account for the differences between our analyses and previous studies. Prime among them might be that we focus on management board members in a two-tier board system. In a unitary board system, these board members would be equivalent to executive directors. Previous studies on U.K. or U.S. data usually did not differentiate between executive directors and non-executive directors on the board, or else focused on CEOs exclusively (e.g. Adams et al., 2009; Glass and Cook, 2016). To cross-validate our findings, we therefore perform a second study with data from the U.K. collected over the same time period. In line with previous studies (Haslam et al., 2009; Ryan and Haslam, 2005), we first analyze all board member appointments; we then exclusively inspect executive director appointments as this group might be a more appropriate reference sample for the results in German firms. In contrast to Germany, we expect to find confirming evidence for the glass cliff in the U.K., where the idea of the glass cliff originated (Ryan and Haslam, 2005).

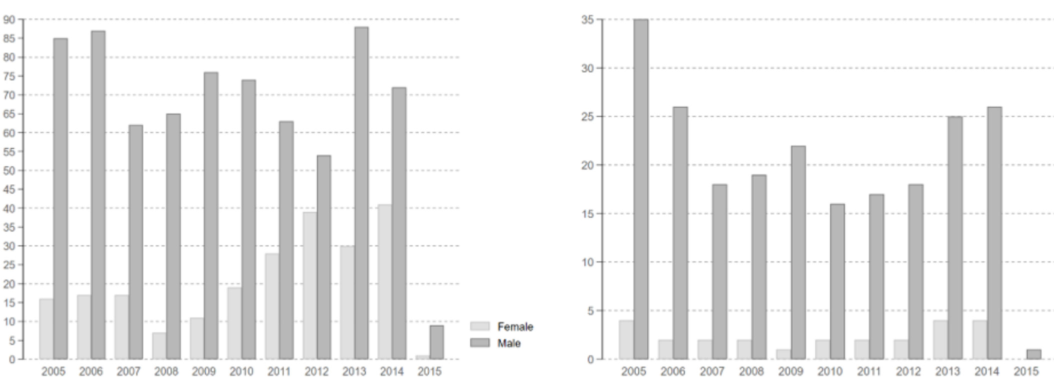
VII.6 U.K. comparison

VII.6.1 Sample

The U.K. sample consists of all board members appointed to boards of FTSE 100 companies between January 1, 2005 and January 1, 2015. Given the one-tier board structure in the U.K., the sample of board members comprises both executive and non-executive directors. Following the same selection procedure as in the German sample yields 105 firms that appoint a total of 961 board members (executive and non-executive directors). Of these, 226 are women (23.5%); among the 248 executive director appointments, only 25 (10.1%) are women. There are three female CEOs in our U.K. sample.

Figure VII.2 (left) displays the total number of directors (executive and non-executive) appointed to boards from 2005 to 2015; Figure VII.2 (right) shows the number of executive directors only. There is a positive trend in the number of women appointed to the boards of U.K. firms, but, as can be seen from comparing the figures, this trend is due to an increase in the number of female non-executive directors. Over the entire period, less than five women per year were promoted to executive director positions.

Figure VII.2: Total number of directors appointed to FTSE 100 boards from January 1, 2005 to January 1, 2015 (left); number of appointed executive directors (right).



VII.6.2 Matching and instrumenting

Again, we apply genetic matching to select a reference sample from the group of companies that appointed male directors, using the same matching variables as before.[6] In addition to the executive director positions, we differentiate between three further board positions of non-executive directors (non-executive chairman, non-executive member and non-executive independent member) for the matching.

The matched samples comprise 226 men from 74 firms and 226 women from 82 firms. As can be seen in Table VII.7, the matching on the total sample (executive and non-executive directors) achieves balance across all variables but one: This exception is the date on which directors took office, which remains significantly different even after the matching. Whereas female directors on average took office in early 2011, male directors did so in mid-2010.

Table VII.7: Descriptive statistics (before and after matching) of U.K. firms.

		Before matching			After matching		
	Female (SD)	Male (SD)	Difference (SE)	t	Male (SD)	Difference (SE)	t
Company age	106.168	107.559	1.391	0.223	104.478	-1.69	-0.225
	(81.693)	(82.242)	(6.246)		(78.069)	(7.517)	
No. of employees	74,979.68	75,114.94	135.261	0.018	73,057.25	-1,922.428	-0.211
	(97,642.2)	(101,683.3)	(7,666.623)		(95,994.04)	(9,108.212)	
Total revenue	20,905.83	21,382.41	476.5809	0.142	21,158.5	252.672	0.061
	(43,608.92)	(44,419.4)	(3,364.236)		(44,807.94)	(4,159.162)	
Position							
CEO	0.013	0.059	0.045***	2.794	0.013	0	0
	(0.115)	(0.235)	(0.016)		(0.115)	(0.011)	
CFO	0.035	0.106	0.071***	3.272	0.04	0.004	0.247
	(0.185)	(0.308)	(0.022)		(0.196)	(0.018)	

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[6]Results of the two other matching procedures (propensity scoring with nearest neighbor and stratified matching) are available from the authors upon request. The analyses carried out on the basis of these two matching procedures do not suggest any other conclusions than those reported in the text.

Table VII.7 – continued from previous page

		Before matching			After matching		
	Female	Male	Difference	t	Male	Difference	t
	(SD)	(SD)	(SE)		(SD)	(SE)	
CHRO	0.004	0	-0.004*	-1.806	0	-0.004	-1
	(0.067)	(0)	(0.002)		(0)	(0.004)	
Legal	0.004	0	-0.004*	-1.806	0	-0.004	-1
	(0.067)	(0)	(0.002)		(0)	(0.004)	
COO	0.004	0.016	0.012	1.354	0.004	0	0
	(0.067)	(0.127)	(0.009)		(0.067)	(0.006)	
CIO/CTO	0	0.003	0.003	0.784	0	0	0
	(0)	(0.052)	(0.003)		(0)	(0)	
Member	0	0.004	0.004	0.961	0	0	0
	(0)	(0.064)	(0.004)		(0)	(0)	
Other	0.049	0.116	0.067***	2.947	0.08	0.031	1.343
	(0.216)	(0.32)	(0.023)		(0.271)	(0.023)	
Non-exec. Chairman	0	0.054	0.054***	3.603	0	0	0
	(0)	(0.227)	(0.015)		(0)	(0)	
Non-exec. Director	0.142	0.107	-0.034	-1.403	0.119	-0.022	-0.697
	(0.349)	(0.31)	(0.024)		(0.325)	(0.032)	
Non-exec. indep. Dir.	0.748	0.535	-0.213***	-5.778	0.743	-0.004	-0.108
	(0.435)	(0.499)	(0.037)		(0.438)	(0.041)	
Industry							
Basic materials	0.084	0.107	0.023	1.017	0.084	0	0
	(0.278)	(0.31)	(0.023)		(0.278)	(0.026)	
Consumer cyclicals	0.164	0.114	-0.049*	-1.961	0.164	0	0
	(0.371)	(0.318)	(0.025)		(0.371)	(0.035)	
Consumer non-cyclicals	0.15	0.133	-0.017	-0.655	0.15	0	0
	(0.358)	(0.34)	(0.026)		(0.358)	(0.034)	
Energy	0.049	0.064	0.015	0.843	0.049	0	0
	(0.216)	(0.245)	(0.018)		(0.216)	(0.02)	
Financials	0.265	0.302	0.037	1.055	0.265	0	0
	(0.443)	(0.459)	(0.035)		(0.443)	(0.042)	
Healthcare	0.071	0.059	-0.012	-0.673	0.071	0	0

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Table VII.7 – continued from previous page

		Before matching			After matching		
	Female (SD)	Male (SD)	Difference (SE)	t	Male (SD)	Difference (SE)	t
	(0.257)	(0.235)	(0.018)		(0.257)	(0.024)	
Industrials	0.106	0.106	0	-0.003	0.106	0	0
	(0.309)	(0.308)	(0.023)		(0.309)	(0.029)	
Technology	0.013	0.016	0.003	0.323	0.013	0	0
	(0.115)	(0.127)	(0.009)		(0.115)	(0.011)	
Telecom. Services	0.04	0.033	-0.007	-0.517	0.04	0	0
	(0.196)	(0.178)	(0.014)		(0.196)	(0.018)	
Utilities	0.058	0.065	0.008	0.419	0.058	0	0
	(0.233)	(0.247)	(0.019)		(0.233)	(0.022)	
Taking-office-date	07.01.2011	14.11.2009	-418.836***	-5.043	20.05.2010	-231.956**	-2.335
	(1,072.298)	(1,097.838)	(83.051)		(1,039.468)	(99.341)	

Remark: This table presents mean values of the data for U.K. firms appointing both executive and non-executive directors. *Company age* is measured in years since the company's inception at the time of the board members' appointments, *total revenues* are given in million EUR. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

For the subsample of executive directors we perform another matching, which aligns firms with regard to all matching variables, as can be seen in Table VII.8. This subsample comprises 25 men from 22 firms, and 25 women from 23 firms.

Table VII.8: Descriptive statistics (before and after matching) of U.K. firms (executive directors only).

		Before matching			After matching		
	Female (SD)	Male (SD)	Difference (SE)	t	Male (SD)	Difference (SE)	t
Company age	124.24	112.892	-11.348	-0.63	119.68	-4.56	-0.189
	(86.621)	(85.232)	(18.005)		(83.52)	(24.066)	
No. of employees	53,878.13	75,949.75	22,071.62	0.988	49,290.67	-4,587.463	-0.254
	(78,460.22)	(108,411.5)	(22,333.64)		(45,045.2)	(18,094.28)	

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Table VII.8 – continued from previous page

		Before matching			After matching		
	Female (SD)	Male (SD)	Difference (SE)	t	Male (SD)	Difference (SE)	t
Total revenue	10,839.60	18,316.90	7,477.297	0.961	12,977.55	2,137.952	0.606
	(12,775.21)	(38,612.74)	(7,782.115)		(12,150.22)	(3,526.096)	
Position							
CEO	0.12	0.193	0.073	0.886	0.16	0.04	0.4
	(0.332)	(0.395)	(0.082)		(0.374)	(0.1)	
CFO	0.32	0.35	0.03	0.295	0.32	0	0
	(0.476)	(0.478)	(0.101)		(0.476)	(0.135)	
CHRO	0.04	0	-0.04***	-3.036	0	-0.04	-1
	(0.2)	(0)	(0.013)		(0)	(0.04)	
Legal	0.04	0	-0.04***	-3.036	0	-0.04	-1
	(0.2)	(0)	(0.013)		(0)	(0.04)	
COO	0.04	0.054	0.014	0.293	0.04	0	0
	(0.2)	-0.226	(0.047)		(0.2)	(0.057)	
CIO/CTO	0	0.009	0.009	0.474	0	0	0
	(0)	(0.094)	(0.019)		(0)	(0)	
Member	0	0.013	0.013	0.582	0	0	0
	(0)	(0.115)	(0.023)		(0)	(0)	
Other	0.44	0.381	-0.059	-0.571	0.48	0.04	0.278
	(0.507)	(0.487)	(0.103)		(0.51)	(0.147)	
Industry							
Basic materials	0.04	0.081	0.041	0.724	0.04	0	0
	(0.2)	(0.273)	(0.056)		(0.2)	(0.057)	
Consumer cyclicals	0.24	0.126	-0.114	-1.579	0.24	0	0
	(0.436)	(0.332)	(0.072)		(0.436)	(0.123)	
Consumer non-cyclicals	0.16	0.112	-0.048	-0.704	0.16	0	0
	(0.374)	(0.316)	(0.068)		(0.374)	(0.106)	
Energy	0	0.04	0.04	1.021	0	0	0
	(0)	(0.197)	(0.04)		(0)	(0)	
Financials	0.32	0.323	0.003	0.029	0.32	0	0
	(0.476)	(0.469)	(0.099)		(0.476)	(0.135)	

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Table VII.8 – continued from previous page

		Before matching			After matching		
	Female (SD)	Male (SD)	Difference (SE)	t	Male (SD)	Difference (SE)	t
Healthcare	0.04	0.063	0.023	0.451	0.04	0	0
	(0.2)	(0.243)	(0.05)		(0.2)	(0.057)	
Industrials	0.12	0.126	0.006	0.079	0.12	0	0
	(0.332)	(0.332)	(0.07)		(0.332)	(0.094)	
Technology	0.04	0.013	-0.027	-0.997	0.04	0	0
	(0.2)	(0.115)	(0.027)		(0.2)	(0.057)	
Telecom. Services	0	0.04	0.04	1.021	0	0	0
	(0)	(0.197)	(0.04)		(0)	(0)	
Utilities	0.04	0.076	0.036	0.66	0.04	0	0
	(0.2)	(0.266)	(0.055)		(0.2)	(0.057)	
Taking-office-date	05.04.2010	11.09.2009	-205.579	-0.836	31.05.2010	56.12	0.16
	(1,230.451)	(1,158.305	(245.828)		(1,253.939)	(351.362)	

Remark: This table presents mean values of the data for those U.K. firms appointing executive directors. *Company age* is measured in years since the company's inception at the time of the board members' appointments, *total revenues* are given in million EUR. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Tables VII.9 and VII.10 report the correlation coefficients of the main variables for the total sample and the subsample of executive directors only. For both samples we find correlations above |0.3| of leverage with company age, PPE and ROA, respectively, of company age with PPE, and of ROA with ROE.

Table VII.9: Intercorrelations of variables for U.K. firms.

	Female	Company age	No. of employees	Revenues	PPE	Leverage	RAR	ROE	ROA
Female	1								
Company age	-0.007	1							
No. of employees	-0.001	0.093	1						
Revenues	-0.005	0.007	0.174	1					
PPE	0.03	-0.313	-0.069	0.092	1				
Leverage	-0.022	0.386	0.109	-0.022	-0.38	1			
RAR	0.071	-0.119	-0.162	-0.146	-0.01	-0.187	1		

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Table VII.9 – continued from previous page

	Female	Company age	No. of employees	Revenues	PPE	Leverage	RAR	ROE	ROA
ROE	0.024	-0.103	-0.082	-0.048	0.002	-0.177	0.188	1	
ROA	0.03	-0.2	-0.162	-0.031	0.192	-0.471	0.243	0.429	1

Table VII.10: Intercorrelations of variables for U.K. firms (executive directors only).

	Female	Company age	No. of employees	Revenues	PPE	Leverage	RAR	ROE	ROA
Female	1								
Company age	0.04	1							
No. of employees	-0.063	0.055	1						
Revenues	-0.061	0.004	0.177	1					
PPE	0.033	-0.337	-0.061	0.031	1				
Leverage	-0.049	0.381	0.084	0.007	-0.358	1			
RAR	0.048	-0.031	-0.199	-0.118	0.004	-0.161	1		
ROE	0.059	-0.095	-0.087	-0.048	-0.011	-0.175	0.188	1	
ROA	0.073	-0.191	-0.148	-0.04	0.136	-0.457	0.148	0.407	1

VII.7 Results

VII.7.1 Performance prior to appointment

We carry out the analyses on the total sample and on the subsample of executive directors separately. Table VII.11 presents the results from logistic regressions with *female* as dependent variable that we consider as a pre-test for hypothesis 1. Neither for the total sample in Panel A nor for the subsample of executive directors in Panel B do we find a significant association between pre-appointment firm performance and gender of appointee. We take this as a first indication that there is no glass cliff in the appointment of female board members in U.K. firms.

Table VII.11: Logistic regressions of gender-dependent appointment in U.K. firms.

	Panel A: All directors					
	(1)	(2)	(3)	(4)	(5)	(6)
	Logistic	Logistic+IV	Logistic	Logistic+IV	Logistic	Logistic+IV
RAR	0.253	0.355				
	(0.306)	(0.545)				
ROE			0.0553	0.13		
			(0.212)	(0.162)		
ROA					0.872	-0.178
					(1.982)	(2.981)
Company age	0.000881	0.000676	0.000678	0.000611	0.000698	0.000507
	(0.000872)	(0.000872)	(0.000841)	(0.000784)	(0.000855)	(0.000795)
No. of employees	-3.95E-08	-2.21E-07	-1.34E-07	-3.74E-07	-6.39E-08	-4.05E-07
	(4.54E-07)	(5.28E-07)	(4.50E-07)	(4.22E-07)	(4.45E-07)	(5.14E-07)
Revenues	-7.35E-07	-1.06E-06	-9.87E-07	-1.37E-06	-9.63E-07	-1.42e-06*
	(6.84E-07)	(1.04E-06)	(6.37E-07)	(8.33E-07)	(6.31E-07)	(8.52E-07)
Taking-office-date	0.000218**	0.000374***	0.000221**	0.000382***	0.000222**	0.000384***
	(9.18E-05)	(5.93E-05)	(9.39E-05)	(6.04E-05)	(9.26E-05)	(6.02E-05)
Leverage	0.00184	-0.00166	0.000623	-0.00284	0.00198	-0.00365
	(0.00627)	(0.00403)	(0.00595)	(0.00339)	(0.00689)	(0.00523)
PPE	0.429	0.422	0.371	0.374	0.386	0.376
	(0.344)	(0.263)	(0.341)	(0.251)	(0.342)	(0.255)
Constant	-4.283**	-8.256***	-4.260**	-8.334***	-4.348**	-8.305***
	(1.725)	(1.127)	(1.76)	(1.148)	(1.729)	(1.159)
Observations	427	898	423	893	427	898
R^2	0.0121	0.0287	0.0104	0.0281	0.0108	0.0283
χ^2	7.494	50.97	6.763	49.98	7.145	50.11

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Table VII.11 – continued from previous page

	Panel B: Executive directors only					
	(7)	(8)	(9)	(10)	(11)	(12)
	Logistic	Logistic+IV	Logistic	Logistic+IV	Logistic	Logistic+IV
RAR	0.16	0.209				
	(1.027)	(1.119)				
ROE			-0.266	0.213		
			(0.53)	(0.199)		
ROA					-1.017	6.322
					(6.316)	(4.755)
Company age	0.00324	0.00442*	0.00307	0.00461*	0.00311	0.00483*
	(0.00345)	(0.00252)	(0.00327)	(0.00261)	(0.00326)	(0.00267)
No. of employees	-5.18E-06	-6.44E-06	-6.20E-06	-6.50E-06	-5.71E-06	-6.52E-06
	(7.28E-06)	(4.31E-06)	(6.49E-06)	(4.35E-06)	(6.47E-06)	(4.62E-06)
Revenues	-1.81E-05	-1.31E-05	-2.02E-05	-1.34E-05	-1.91E-05	-1.28E-05
	(1.76E-05)	(1.56E-05)	(1.87E-05)	(1.61E-05)	(2.16E-05)	(1.58E-05)
Taking-office-date	5.20E-05	1.53E-04	5.83E-05	0.000165	5.62E-05	0.000132
	(0.000226)	(0.000224)	(0.000225)	(0.000216)	(2.43E-04)	(0.000218)
Leverage	-0.0268	-0.0321	-0.032	-0.0309	-0.0311	-0.0169
	(0.0266)	(0.0271)	(0.0272)	(0.0266)	(0.0307)	(0.0264)
PPE	-0.0271	-0.0892	-0.106	-0.043	-0.0821	-0.0382
	(0.997)	(0.612)	(0.998)	(0.628)	(1.007)	(0.634)
Constant	-0.879	-4.93	-0.743	-5.218	-0.777	-5.055
	(4.346)	(4.069)	(4.21)	(3.954)	(4.228)	(3.954)
Observations	45	229	45	229	45	229
R^2	0.0401	0.0657	0.0428	0.0681	0.04	0.0708
χ^2	7.035	13.45	6.729	13.69	6.475	15.77

Remark: This table presents logistic estimates of the effects of pre-appointment firm performance on new board members' gender in U.K. firms. The dependent variable is *female* (dummy variable). In models (2), (4), (6), (8), (10) and (12) coefficients are estimated using logistic regressions, where pre-appointment performance indices (24 months *RAR* and *ROE/ROA* in the business year before the appointment) are instrumented following Lewbel (2012). *Taking-office-date* is a numerical variable where January 1, 1900 takes the value 1. Standard errors are clustered on the firm level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table VII.12 displays the results from analyses of market-based performance, employing panel random effects, pooled fixed effects and IV-estimations following Lewbel (2012). In the total sample of directors in Panel A, there is a significantly positive main effect of *female* in the pooled fixed effects model. Time shows a significantly positive effect in both the random effects and the pooled fixed effects model, which is moderated by a significantly positive interaction term of *female* and *time* in the random effects model. The IV model does not yield any significant results. Consequently, the pattern of results is rather inconclusive. There is some evidence that the performance trend of U.K. firms is positive prior to the appointment of new board members, and the effect seems to be even stronger for firms appointing women. But the results are clear with regard to one finding: There is no evidence (from either estimation model) that firms appointing female board members show a more negative performance trend than firms appointing male board members.

Table VII.12: Panel regressions of market-based returns of U.K. firms.

	Panel A: All directors			*Panel B: Executive directors only*		
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel RE	Pooled FE	IV	Panel RE	Pooled FE	IV
Female	0.0287	0.0880***	-0.37	0.111	-0.310***	0.113
	(0.018)	(0.0189)	(0.532)	(0.0985)	(0.0443)	(0.164)
Time	0.00410***	0.00410***	0.00661	0.00392*	0.00392	0.00231**
	(0.000258)	(0.00118)	(0.00587)	(0.00237)	(0.00242)	(0.00114)
Female*Time	0.000938**	0.000938	-0.0127	0.00199	0.00199	0.00543
	(0.000365)	(0.00151)	(0.0234)	(0.00348)	(0.00354)	(0.0065)
Company age	-0.000378***	-0.0198***	-0.000299***	-0.000622***	0.000983***	-0.000344***
	(0.000117)	(0)	(0.000109)	(0.000234)	(0)	(0.000127)
Leverage	-0.00378***	-0.0528***	-0.00433***	-0.00293**	-0.0556***	-0.00399***
	(0.000749)	(1.43E-10)	(0.000741)	(0.00146)	(0)	(0.000695)
PPE	-0.121***	3.379***	-0.110***	-0.169**	0.386***	-0.116***
	(0.0356)	(1.29E-09)	(0.0314)	(0.0781)	(0)	(0.0364)
Constant	0.204***	0.463***	0.277**	0.212***	0.288***	0.167***
	(0.021)	(0.0148)	(0.129)	(0.0712)	(0.0302)	(0.0344)
Observations	10,248	10,248	21,600	1,080	1,080	5,544
# appointments	427		900	45		231
R^2 within	0.0606	0.702	0.0372	0.0975	0.781	0.0282
R^2 between	0.105	0.702	0.116	0.153	0.781	0.119
R^2 overall	0.0909	0.689	0.0909	0.14	0.771	0.091

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Table VII.12 – continued from previous page

Remark: This table presents panel estimates of the effects of new board members' gender and time on pre-appointment performance of U.K. firms. The dependent variable is *risk-adjusted stock returns (RAR)*. Coefficients are estimated using random effects (RE) GLS estimation (models (1) and (4)), pooled OLS with observation fixed effects (FE; models (2) and (5)) and an instrumental variables (IV) approach (models (3) and (6)) following Lewbel (2012). In the IV analyses, *female* (dummy variable) is instrumented (the second-stage analysis is estimated using GLS). *Time* is measured in months. Standard errors are clustered on the firm level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The results for the subsample of executive directors in Panel B are even more heterogeneous: While two models (random effects and IV-analysis) do not yield significant effects for *female*, the pooled fixed effects model does. In contrast to the total sample, the effect is negative. The main effect of *time* as well as the interaction of *female* and *time* are not significant in any model, however, again contradicting the idea of the glass cliff.

As for accounting-based returns (Table VII.13), the results are similarly heterogeneous. With regard to *ROA*, there is a significantly positive effect of *female* when a pooled fixed effects model is used, both for the total sample in Panel A and for the subsample of executive directors in Panel B. Neither *time* nor the interaction with *female* shows a significant effect, however. The IV model delivers a significantly positive effect of *female* for the total sample, but not for the subsample of executive directors. There we find a significantly positive interaction of *female* and *time*, however, indicating that, as compared to men, female executive directors tend to be appointed after a more positive performance trend in U.K. firms. Again, this finding speaks against the glass cliff hypothesis.

Table VII.13: Panel regressions on accounting-based returns of U.K. firms.

	Panel A: All directors					
	RoA			RoE		
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel RE	Pooled FE	IV	Panel RE	Pooled FE	IV
Female	-0.000331	0.00975**	0.134**	-0.117**	0.00116	0.515
	(0.00473)	(0.00415)	(0.0527)	(0.0588)	(0.0455)	(0.335)
Time	-0.000225	-0.000219	0.00224	-0.02	-0.0195	0.0136
	(0.00125)	(0.00153)	(0.00209)	(0.0133)	(0.0162)	(0.031)
Female*Time	0.000775	0.000769	-0.00958	0.0311*	0.0306	-0.0813
	(0.0017)	(0.00208)	(0.00858)	(0.0182)	(0.0227)	(0.132)
Company age	-3.20E-05	-0.000112***	-5.09E-05	-0.000499	-0.00509***	-0.000448
	(7.63E-05)	(0)	(7.46E-05)	(0.000676)	(0)	(0.000538)
Leverage	-0.00174***	0.0278***	-0.00151***	-0.00597***	0.634***	-0.00452***
	(0.000409)	(0)	(0.000414)	(0.00217)	(5.69E-11)	(0.00158)
PPE	0.00175	-0.00238***	0.00689	-0.124	0.379***	-0.121
	(0.0163)	(0)	(0.0178)	(0.129)	(1.61E-10)	(0.115)
Constant	0.0752***	0.0719***	0.0420***	0.461***	0.0465	0.244**
	(0.00995)	(0.00305)	(0.0159)	(0.15)	(0.0324)	(0.118)
Observations	1,279	1,279	2,696	1,270	1,270	2,685
# appointments	427		900	427		900
R^2 within	0.000687	0.934	0.000248	0.00325	0.831	0.000577
R^2 between	0.233		0.234	0.0338		0.0319
R^2 overall	0.218		0.215	0.0263		0.0253

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Table VII.13 – continued from previous page

	Panel B: Executive directors only					
	RoA			RoE		
	(7)	(8)	(9)	(10)	(11)	(12)
	Panel RE	Pooled FE	IV	Panel RE	Pooled FE	IV
Female	-0.00832	0.0242**	-0.0091	-0.0676	-0.0569	-0.158
	(0.0127)	(0.0116)	(0.0274)	(0.128)	(0.133)	(0.237)
Time	0.000935	0.000935	0.000162	0.0461	0.0461	-0.00914
	(0.00405)	(0.00489)	(0.00107)	(0.0526)	(0.0634)	(0.0128)
Female*Time	0.00461	0.00461	0.00654**	0.0138	0.0138	0.120**
	(0.00482)	(0.00582)	(0.00323)	(0.0552)	(0.0665)	(0.0609)
Company age	-4.37E-05	0.000217***	-5.29E-05	-0.000244	0.00125***	-0.000482
	(1.05E-04)	(0)	(8.74E-05)	(0.00056)	(0)	(0.000463)
Leverage	-0.00241**	-0.0262***	-0.00159***	-0.00874**	-0.106***	-0.00459**
	(0.00105)	(0)	(0.000572)	(0.00382)	(0)	(0.00178)
PPE	-0.0134	-0.0861***	-0.000886	-0.127	-0.165***	-0.122
	(0.0293)	(0)	(0.0172)	(0.127)	(0)	(0.0952)
Constant	0.0826***	0.0665***	0.0723***	0.317***	0.12	0.367***
	(0.0175)	(0.00978)	(0.0106)	(0.0821)	(0.127)	(0.0798)
Observations	135	135	692	135	135	692
# appointments	45		231	45		231
R^2 within	0.0556	0.935	0.00595	0.0455	0.794	0.00597
R^2 between	0.254		0.209	0.0562		0.0366
R^2 overall	0.241		0.195	0.0539		0.0311

Remark: This table presents panel estimates of the effects of gender and time on pre-appointment performance in U.K. firms. The dependent variables are *return on assets (ROA)* and *return on equity (ROE)*. Coefficients are estimated using random effects (RE) GLS estimation (models (1), (4), (7) and (10)), pooled OLS with observation fixed effects (FE; models (2), (5), (8) and (11)) and an instrumental variables (IV) approach (models (3), (6), (9) and (12)) following Lewbel (2012). In the IV analyses *female* (dummy variable) is instrumented (the second-stage analysis is estimated using GLS). Time is measured in years. Standard errors are clustered on the firm level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

As for *ROE*, there is a significantly negative main effect of *female* in the total sample if a random effects model is employed. The marginally significant positive interaction of *female* and *time* in this model indicates, however, that, as time progresses in the pre-appointment period, *ROEs* of firms that appoint women increase. Neither of these effects remains significant in the subsample of executive directors, but there are marginally significant positive interactions of *female* and *time* in the IV models, again refuting the idea of a glass cliff.

Overall, these results contradict the idea of a glass cliff in the U.K. as they do in Germany: There is no sign of a deteriorating performance trend for companies prior to the appointment of female board members. Instead, there are weak effects pointing into the opposite direction for the total sample: Firms that appoint women to their boards show a more positive performance trend prior to the appointments than firms promoting men.

In the subsample of executive directors, the pooled fixed effects regression does yield a negative effect for *female*, suggesting that firms appointing female executives perform worse in general — but again, there is no evidence for a performance decline prior to the appointment of female executive directors. Furthermore, neither random effects nor two-stage regression analyses confirm the negative main effect for *female*. We therefore conclude that there is no reliable indication for a general performance difference between firms appointing female executive directors and those appointing male executive directors and there is no indication at all for a gender-specific performance trend prior to appointment.

VII.7.2 Short-term market reaction

With regard to the short-term market reaction to the announcement of new board member appointments, Table VII.14 shows a significantly negative main effect of *female* in the total sample (models (2)-(4)). Investors hence react more negatively to the announcement of a woman being appointed to the board of a U.K. firm as compared to a man. In addition, there is a significantly negative reaction of investors if the appointment follows a period of performance declines, i.e. investors react negatively to any changes in board composition if firms' performance has been declining in the preceding twelve months. For performance declines of twelve month lengths, however, there is a significantly positive interaction of *female* and *declining performance*, suggesting that in this particular case investors react more positively to the appointments of women rather than men. But the effect is not stable: If the decline in performance continues for 24 months or is shorter than 12 months, investors become indifferent towards the gender of new board members again.

Table VII.14: Short-term market reaction to new board member appointments in U.K. firms (all directors).

	All directors					
	Declining performance over...				Period of economic instability	
	(1)	(2)	(3)	(4)	(5)	(6)
	24 months	12 months	6 months	3 months	Q3/07 - Q1/10	Sep15/08 - Q4/09
Female	-0.00382	-0.00752**	-0.00599*	-0.00690*	-0.00575**	-0.00568**
	(0.00291)	(0.00308)	(0.00346)	(0.00372)	(0.00265)	(0.00268)
Decl. perf.	-0.00151	-0.0106**	-0.0128**	-0.0219***		
	(0.00544)	(0.00403)	(0.00562)	(0.00491)		
Female*Decl. perf.	-0.000974	0.0111*	0.00403	0.00726		
	(0.00736)	(0.00598)	(0.0076)	(0.00741)		
Eco. instability					-0.00454	-0.011
					(0.00653)	(0.00772)
Female*Eco. inst.					0.00913	0.0158
					(0.0111)	(0.017)
Company age	1.05E-05	8.96E-06	8.23E-06	8.91E-06	9.60E-06	1.01E-05
	(1.86E-05)	(1.83E-05)	(1.84E-05)	(1.77E-05)	(1.87E-05)	(1.85E-05)
No. of employees	4.83E-09	2.42E-09	9.40E-09	5.02E-09	2.54E-09	4.30E-09
	(1.17E-08)	(1.15E-08)	(1.13E-08)	(9.61E-09)	(1.26E-08)	(1.21E-08)
Revenues	1.40E-08	1.87E-08	1.52E-08	1.97E-08	1.60E-08	1.10E-08
	(1.32E-08)	(1.23E-08)	(1.28E-08)	(1.39E-08)	(1.38E-08)	(1.37E-08)
Leverage	-0.000849***	-0.000822***	-0.000824***	-0.000791***	-0.000857***	-0.000824***
	(0.000253)	(0.000234)	(0.000231)	(0.000234)	(0.000232)	(0.000223)
PPE	-0.0132***	-0.0130***	-0.0138***	-0.0103*	-0.0135***	-0.0120**
	(0.00499)	(0.0049)	(0.00501)	(0.00523)	(0.00501)	(0.005)
Constant	0.0120***	0.0150***	0.0162***	0.0187***	0.0130***	0.0127***
	(0.00394)	(0.00398)	(0.00442)	(0.00435)	(0.00404)	(0.00384)
Observations	427	427	427	427	427	427
R^2	0.103	0.113	0.127	0.175	0.105	0.109

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Table VII.14 – continued from previous page

Remark: This table presents OLS estimates of the effects of new board members' gender and of multiple dummies for precarious firm situations on the market response to the announcement of a board member appointment in U.K. firms. The dependent variable is the *accumulated daily risk-adjusted stock return* over the three day window surrounding the announcement date (i.e., press release date). Since risk-adjusted returns are calculated as the difference between the actual stock returns and the expected returns according to the contemporaneous stock market development, the daily market performance is already accounted for in the dependent variable and is not included as a control variable. *Female* is a dummy variable. *Declining firm performance* in model (1) is a dummy variable that takes the value 1 if the accumulated monthly stock-market return over the 24 months (12 months for model (2), 6 months for model (3) and 3 months for model (4)) is negative and zero otherwise. *Economic instability* in models (5) and (6) is a dummy variable that takes the value 1 if the announcement occurs between Q3 2007 and Q1 2010 (September 15, 2008 and Q4 2009) and zero otherwise. Standard errors are clustered on the firm level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

In sum, these results indicate that in contrast to Germany investors are skeptical about the appointments of women, and this effect is largely independent from firms' pre-appointment performance. This finding is in contrast to what the glass cliff literature suggests: that shareholders might prefer women on the boards when firm performance declines. Our data does not support this assumption, neither after brief periods of performance decline (three to six months) nor after a long period (24 months).

The financial crisis as an external indicator of economic instability does not moderate investors' continuously negative reaction to the appointments of female board members in U.K. firms: Their negative attitudes towards women on the boards persist.

In the subsample of executive directors (see Table VII.15), there is no significant effect of *female* across the six models analyzing *declining performance* or *economic instability*. Furthermore, there is no significant interaction of *female* and *declining performance*, suggesting that negative performance does not moderate investors' attitudes towards the appointments of executive directors. This also applies to the interaction of *female* and *economic instability*. However, it should be noted that the non-significant effects for executive directors may be due to the small sample size.

Table VII.15: Short-term market reaction to new board member appointments in U.K. firms (executive directors only).

	Executive directors only					
	Declining performance over...				Period of economic instability	
	(1)	(2)	(3)	(4)	(5)	(6)
	24 months	12 months	6 months	3 months	Q3/07 - Q1/10	Sep15/08 - Q4/09
Female	-0.00757	-0.0058	-0.00668	-0.012	-0.014	-0.0116
	(0.00964)	(0.0103)	(0.0116)	(0.00829)	(0.0102)	(0.00949)
Decl. perf.	0.00569	0.0181	-0.0167**	-0.0272		
	(0.0108)	(0.0206)	(0.00734)	(0.0181)		
Female*Decl. perf.	-0.0289	-0.0349	-0.00325	0.0061		
	(0.0259)	(0.0296)	(0.0162)	(0.0215)		
Eco. instability					0.0291	0.0303
					(0.0234)	(0.0242)
Female*Eco. inst.					-0.0124	-0.0131
					(0.0226)	(0.0253)
Company age	-9.08e-05**	-9.25e-05*	-0.000104**	-9.37e-05**	-6.65E-05	-7.52E-05
	(4.30E-05)	(4.56E-05)	(4.74E-05)	(4.54E-05)	(4.80E-05)	(4.73E-05)
No. of employees	-4.03E-08	-1.92E-08	1.65E-08	-6.85E-09	-5.07E-08	-4.81E-08
	(1.00E-07)	(1.01E-07)	(1.06E-07)	(9.71E-08)	(9.55E-08)	(9.91E-08)
Revenues	1.44E-07	1.88E-07	1.43E-07	1.41E-09	1.78E-07	1.28E-07
	(3.52E-07)	(4.07E-07)	(3.05E-07)	(2.73E-07)	(3.43E-07)	(3.63E-07)
Leverage	0.00165*	0.00147*	0.00176**	0.00163**	0.00123	0.00121
	(0.000808)	(0.000841)	(0.000782)	(0.000736)	(0.000921)	(0.000942)
PPE	-0.00565	-0.00546	-0.00796	-0.0154	-0.00685	-0.0082
	(0.0142)	(0.014)	(0.0142)	(0.0132)	(0.0181)	(0.0169)
Constant	0.0201	0.0183	0.022	0.0319**	0.0179	0.0198
	(0.0149)	(0.0154)	(0.0152)	(0.0139)	(0.0151)	(0.0153)
Observations	45	45	45	45	45	45
R^2	0.359	0.363	0.364	0.422	0.371	0.36

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Table VII.15 – continued from previous page

Remark: This table presents OLS estimates of the effects of new board members' gender and of multiple dummies for precarious firm situations on the market response to the announcement of a board member appointment in U.K. firms. The dependent variable is the *accumulated daily risk-adjusted stock return* over the three day window surrounding the announcement date (i.e., press release date). Since risk-adjusted returns are calculated as the difference between the actual stock returns and the expected returns according to the contemporaneous stock market development, the daily market performance is already accounted for in the dependent variable and is not included as a control variable. *Female* is a dummy variable. *Declining firm performance* in model (1) is a dummy variable that takes the value 1 if the accumulated monthly stock-market return over the 24 months (12 months for model (2), 6 months for model (3) and 3 months for model (4)) is negative and zero otherwise. *Economic instability* in models (5) and (6) is a dummy variable that takes the value 1 if the announcement occurs between Q3 2007 and Q1 2010 (September 15, 2008 and Q4 2009) and zero otherwise. Standard errors are clustered on the firm level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

VII.8 General discussion

Previous studies that found supportive evidence of the glass cliff focused on firms located in the U.K. and U.S. Because culture affects people's expectations of leaders and may therefore influence promotion patterns in firms, it cannot be taken for granted that the glass cliff phenomenon is generalized across cultures. Therefore, we examined the glass cliff phenomenon in Germany with data from a sample of 128 listed firms over a ten-year period from 2005 to 2015. To test the robustness of our findings, we additionally analyzed the glass cliff in the U.K. on 105 listed firms over the same time period. We expected to find supportive evidence of the glass cliff in the U.K. but not in Germany — in fact, we found it in neither country.

For decades, there has been an ongoing public debate in Western countries concerning structural barriers in organizations that prevent women from ascending to top managerial positions. In the 1980s, the discussion revolved around the metaphor of a glass ceiling, describing invisible barricades blocking women's way to the top. Since the early 2000s, the glass cliff metaphor has been added to this discussion. Compared to the glass ceiling, the glass cliff phenomenon is more subtle and intricate, as it is concerned primarily with the quality of the leadership positions to which women gain access, rather than the question of whether women acquire leadership positions at all. Does a firm offer a prestigious position to a male or female candidate because the firm's performance is high or low? To answer this question one would ideally perform an experiment and manipulate firms' performance so as to study if this change predicts gender-related promotion patterns. But of course, this procedure is impossible to implement. The challenge therefore is to analyze comparable firms that are as similar as possible, but select candidates of the opposite gender.

In order to subject the glass cliff hypothesis to valid examination, we selected all executives appointed to management boards of listed firms in Germany and the U.K. during our ten-year investigation period. In a second step, we built two samples of firms that appointed either women or men to board positions. To ensure comparability of these samples and in contrast to previous research, we applied various matching algorithms, followed by random and fixed effects estimation methods to study the hypotheses, and to address further endogeneity problems, we additionally conducted an instrumental variable estimation. None of these analyses confirmed the idea of a glass cliff.

Instead, both random effects and fixed effects analyses indicated that German firms appointing women to their boards tend to perform better overall — both in terms of market-based and, partly, also of accounting-based performance indicators. These results pertained to matching samples generated using genetic matching. The analyses based on two additional matching algorithms yielded somewhat more heterogeneous results. It is important to note, however, that none of the analyses found supportive evidence for the glass cliff: More precisely, there was no evidence of a more negative performance trend in firms that appointed women to their boards compared to those appointing men. This result remained stable, regardless of the matching algorithm we used, the analyses we performed (random effects or fixed effects models) or the firm performance indicators we evaluated (market- or accounting-based measures). Nevertheless, in order to arrive at a final result, we still carried out a two-stage regression in which we instrumented gender of board members to account for omitted third variables. In these analyses, there was no difference at all between firms appointing either women or men to their boards. Most importantly, there was also no evidence of a more negative performance trend in companies appointing women to their boards.

In a second set of analyses, we examined the short-term market response to firms' appointment decisions. We assumed that in periods of performance downturns investors would prefer to see women appointed to management boards because they might interpret the promotions of women as a positive signal of change. This assumption was partly confirmed in Germany: If firms go through an extended period of performance downturn, it turns out to be true. This finding remained stable across two of three matching algorithms we used. Shorter periods of negative performance, however, are not sufficient to get investors to favor the appointment of women; this result remained stable across all matching algorithms. In sum, these results suggest that investors in German firms seem to overcome the "Think Manager, Think Male" stereotype (Schein, 1973; Schein et al., 1996; Schein, 2001) and rather adopt the "Think Crisis, Think Female" stereotype (Bruckmüller and Branscombe, 2010; Gartzia et al., 2012; Koenig et al., 2011; Ryan et al., 2011) after longer periods of performance declines.

Notably, these results extend to times of macroeconomic instability when investors may be less inclined to attribute decline in firm performance to internal mismanagement: During the financial crisis, investors reacted more positively to the appointment of female board members in German firms as compared to male members; again, this finding remained stable across two of three matching algorithms and across different types of approximating the crisis period. It contradicts the assumption that in times of macroeconomic instability investors prefer to see men promoted to boards because they hope for "male warriors" to lead firms through times of uncertainty.

These short-term responses of investors to the appointment of women were the only results that clearly differentiated between Germany and the U.K. In the U.K., investors negatively react to firms' decisions to appoint female board members, regardless of whether firm performance is declining or not and regardless of macroeconomic conditions. Thus, no external crisis is needed to strengthen investors' preference for men on U.K. management boards. Only if there has been a continuous decline of firm performance over twelve months, there is some weak evidence that investors more positively react to female board members. But these results pertain to the total sample of directors, including non-executive directors, and they do not extend to longer periods of performance decline. In the subsample of executive directors, who actually run the firms, these results are no longer significant. This may be due, however, to the small sample of women (n = 25) who became executive directors in the U.K. during our ten-year investigation period.

Other than that, the results in the U.K. are similar to the German data: There is no evidence of a more negative performance trend in firms that appoint women to their boards — neither in the sample of firms appointing non-executives and executive directors nor in the subsample of executive directors only. On the contrary, firms that promoted women to their boards showed a more positive trend in market-based returns and return on equity in the pre-appointment period in the random effects models. These findings are remarkable as in the early 2000s promotion patterns in U.K. firms prompted the idea of the glass cliff in the scientific literature.

How do our findings reconcile with previous studies on the glass cliff metaphor? First, this study is about the glass cliff in corporate contexts; it does not address the glass cliff in in other fields such as politics (e.g. Kulich et al., 2014; Ryan et al., 2010). We believe that becoming a top executive in precarious firm circumstances is different from being nominated as the top political candidate in voting districts where the chances of winning are low. This is because political parties do not cease to exist if they lose. Rather, they may decide to accept a current campaign loss in order to build up strength for future elections. Nominating a stopgap candidate to step into the breach may therefore be a viable solution for both the party and the candidate. Firms, however, cannot afford to promote "sacrificial lambs" to their top leadership positions because even a single "loss" may be fatal. Thus, the stakes are higher for firms than for political parties and so are the consequences for the executives.

Second, in contrast to experimental research, this paper analyzes real promotions instead of hypothetical promotion decisions where nothing is at stake and which may be affected by social desirability concerns (e.g. Kulich et al., 2015). Whereas in experiments people report whom they would allegedly promote, this paper analyzes whom they actually promoted.

Third, this study analyzes financial indicators of corporate performance rather than firms' public images (Glass and Cook, 2016). We do not deny that public scandals may motivate some firms' decisions to change board members — not unlike football clubs which dismiss their coaches after a couple of lost games (e.g. van Ours and van Tuijl, 2015).

Fourth, the two-tier board structure of German firms allows us to focus on executive directors who actually run the firms. In an attempt to transfer our analytical approach to the U.K. context, we therefore considered appointments to executive directorship positions in U.K. firms separately. Earlier studies either disregarded differences between executive and non-executive directors on unitary boards (Brady et al., 2011; Haslam et al., 2009; Mulcahy and Linehan, 2013; Ryan and Haslam, 2005) or they studied only CEOs as the "top" executives (Adams et al., 2009; Cook and Glass, 2013a,b; Elsaid and Ursel, 2017; Glass and Cook, 2016). Still, and in contrast to previous research, we find no evidence of a glass cliff in the total sample of directors promoted to boards in the U.K., nor in the subsample of executive directors. This persistent result may be due to the perhaps largest difference between our study and previous studies: our rigorous focus on causal effects. Whereas some previous field research relied on the interpretation of correlational results (e.g. Haslam et al., 2009), we not only went to great lengths to ensure comparability of firms, we also controlled for omitted variables that may have causal effects, in order to reduce endogeneity concerns. These features corroborate the validity of our results.

VII.8.1 Limitations and recommendations for future research

Since we believe that an examination of the dynamic relationship between performance and gender of the board member through panel regressions is the most fruitful approach to examining the glass cliff, our analyses are based on data from a sufficiently long period prior to appointments. Although focused in this respect, this approach hardly allows us to test possible reasons for why women were appointed to executive boards. However, this aspect would significantly enrich the discussion about gender-specific appointment strategies in top management. The analysis of other personal characteristics besides gender such as age, religion or cultural aspects in general (Oc, 2018) could help to gather further insights into the role of sociodemographic characteristics in decisions on management board compositions. The analysis of the different — and sometimes interconnected — contextual levels at which these appointment decisions are made could bring together insights from psychology, sociology, management and economics. Also, comparing performance trends before and after board member appointments could provide insights into the effectiveness of demographic changes on boards. From a methodological perspective, however, relating post-appointment performance with person-specific characteristics raises even stronger endogeneity concerns, as reverse causality is a severe problem in this case. Our analyses tried to deal with endogeneity by employing both matching procedures and a novel IV estimation procedure in order to circumvent the difficulty of finding suitable instruments. Since person-specific characteristics such as gender do not vary per board member appointment, other approaches such as a Heckman correction, were impossible to use. Similarly, our analytical design did not allow for regression discontinuity models to be employed. In samples that stretch over longer time periods, however, it might be possible to collect data specifically on situations where corporate disruptions allow a regression discontinuity design to be applied. As one example, one might think about acquisition processes that trigger a change in control so that new board members are appointed at short notice. Furthermore, the instrumentation approach by Lewbel (2012) might also be helpful for datasets that link pre- and post-appointment firm performance as it solely requires the distribution of control variables to be sufficiently heterogeneous for the first-stage of the estimation procedure. As such, we believe that our study delivers a fruitful ground, both with regard to content and methodology, for future research, including different cultures. Although we did not find evidence for the glass cliff in two European economies we cannot preclude the possibility that it exists in other cultures. Therefore, we call for more rigorous analyses of the glass cliff in other cultures than in the past.

VII.9 Conclusion

Promotion patterns of the current generation of female top managers in both Germany and the U.K. do not support the idea of the glass cliff. The positive interpretation of these findings would be that female top-managers are not at higher risk than men to be promoted to precarious leadership positions. A less positive interpretation of the data, however, might be that firms are either still hesitant to promote women to top executive positions or that there are too few women in firms' pipelines because companies failed to support women in their careers. For whatever reason, the overall number of women who become executive directors is small. We conclude, however, that the glass cliff seems to be more of a myth than a real phenomenon for female top managers in Germany and the U.K.

Appendix I (to Chapter II)

Appendix I.A: Description of variables.

Panel A: Equity Risks	
σ	The σ reflects the annual stock volatility which is calculated from daily stock returns.
σ_ϵ	Idiosyncratic risk σ_ϵ of company i in year t is derived as the volatility of the stock return that is not explained by the company's β according to the capital asset pricing model. To calculate σ_ϵ, we therefore first estimate each company's β, based on the Fama-French market return in excess of the respective risk-free rate (the one-month government bond rate) downloaded from Kenneth French's website using daily data. Idiosyncratic risk σ_ϵ is then calculated as follows: $\sigma_{\epsilon_{i,t}} = \sqrt{\sigma_{i,t}^2 - \beta_{i,t}^2 * \sigma_{m_t}^2}$ Here, $\sigma_{i,t}$ denotes the return volatility of stock i in year t, $\beta_{i,t}$ the firm's beta and σ_{m_t} the volatility of the Fama-French market return based on daily returns in year t.
Value at Risk (VaR)	The VaR is calculated as the 0.05-quantile of the empirical daily stock return distribution. This yields negative values which we translate into a positive number so that a lower VaR will mirror a risk-reduction.

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Conditional Value at Risk (CVaR)	The CVaR corresponds to the mean value of daily returns below the VaR threshold. It is translated into a positive risk number so that lower risk corresponds with a lower CVaR.
Lower Partial Moment (0,2) (LPM(0,2))	We calculate the LPM(0,2) based on the return distribution below the 0%-return-threshold following Bawa (1975) and Fishburn (1977). To compare our results metrically, we employ the square root of LPM(0,2). LPM(0,2) is hence calculated as follows: $$\text{LPM(0,2)} = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(R_{n,i})^2}$$ $R_{n,i}$ denotes the negative daily return of firm i and N represents the number of observed negative daily returns of firm i in the respective year.
Lower Partial Moments (0,3) (LPM(0,3))	We calculate the LPM(0,3) based on the return distribution below the 0%-return-threshold following Bawa (1975) and Fishburn (1977). To compare our results metrically, we employ the cube root of LPM(0,3). LPM(0,3) is hence calculated as follows: $$\text{LPM(0,3)} = \sqrt[3]{\frac{1}{N}\sum_{i=1}^{N}(\lvert R_{n,i}\rvert)^3}$$ $R_{n,i}$ denotes the negative daily return of firm i and N represents the number of observed negative daily returns of firm i in the respective year.

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Panel B: CSR variables	
CSR	The ESG score from Refinitiv EIKON approximates the strength of firms' CSR activities. It is based on comprehensive data from more than 400 measures and aggregated from the pillar scores in the areas of environmental, social and governance issues.
Environment	The Environment pillar score reflects the strength of a firm with regards to environmental subjects in categories such as Resource use, Emissions and Environmental Innovation.
Social	The Social pillar score is calculated based on the performance of a firm in social matters such as Workforce, Human rights, Community and Product responsibility.
Governance	The Governance pillar reflects the effectiveness of a company's corporate governance system in the categories Management, Shareholders and CSR strategy.
Panel C: Moderator variables	
CSR Rep. intensity	Based on Stolowy and Paugam (2018) CSR Reporting captures the Refinitiv EIKON variable covering whether a firm has a CSR report in place. Based on an aggregation for all companies in the respective sample (U.S. vs. EU) this variable reflects the percentage share of how many companies in the respective region publish CSR reports.

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DiffCSR Reporting	The variable captures differences in *CSR Reporting intensity* between the U.S. and EU so that it takes a value of 1 for firms in the U.S. reporting system and $DiffCSRReporting_{EU} = 0 \leq 1-(CSRRep.intensity_{EU} - CSRRep.intensity_{U.S.}) \leq 1$ for EU firms.
σ_{m_t}	The annual volatility of daily returns is calculated based on Kenneth R. French's return of the developed market factor and downloaded from his website: (https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).
Panel D: Firm-specific control variables	
Dividend Yield	Dividend yield is the percentage payout relative to the stock price.
Leverage	Firm leverage is proxied as debt divided by total assets.
Profitability	Profitability is measured as ratio of operating income divided by total assets.
Sales Growth	Sales growth is the yearly growth rate of total sales.
Size	Size is measured as the natural logarithm of total assets.

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Domestic Ownership	This variable is a ratio of the proportion of stocks held by domestic owners (i.e. U.S. shareholders for U.S. firms and vice versa for EU firms) in relation to the proportion of stocks held by foreign owners (i.e. EU shareholders for U.S. firms and vice versa for EU firms) in the respective year for each firm.
Panel E: Country-specific control variables	
Interim Rep. Freq.	This variable captures how often Interim (during the year) financial reporting in a country is mandatory based on the values in the study of DeFond et al. (2007).
Legal Enforcement	Leuz et al. (2003) aggregated the Legal Enforcement score per country based on the study of La Porta et al. (1998). The variable is the arithmetic average of the Efficiency of the judicial system, an assessment of the rule of law and a corruption index.
Sec. Reg.	This variable reflects the effectiveness of a country's security regulation (Hail and Leuz, 2006). It combines a country's rating in the three categories from La Porta et al. (2006): 1. Disclosure requirements index: description in the following variable. 2. Liability standard: Index of liability standards for (1) the issuer and its directors; (2) the distributor; (3) the accountants.

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	3. Public enforcement index: average with regards to the categories Supervisor characteristics, rule-making power, investigative powers, orders and criminal sanctions.
Disc. Requ.	The Disclosure Requirements is an arithmetic average egarding the categories Prospectus, Compensation, Shareholders, Inside Ownership, Irregular contracts and Transactions (La Porta et al., 2006).
Aggr. Earn. Mgmt.	The aggregate earnings management score captures differences in earnings management across countries (Leuz et al., 2003). The score reflects the average rank of a country in four distinct categories: 1. Median of standard deviation of operating income per country divided by operating cash flow. 2. Correlation between change in accruals and change in operating cash flow. 3. Median ratio of absolute value of accruals divided by absolute value of operating cash flow. 4. No. of "small profits" divided by "small losses".
Civil Law	This variable captures whether a company is headquartered in a country committed to a civil or common law system. Common Law countries equal a value of 0 whilst Civil Law countries are assigned a value of 1.

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Panel F: Portfolio return factors	
RMRF	This risk factor is often referred to as "market factor". It is estimated as the value-weighted return of all listed firms in the respective investigated market for which equity data is available (Fama and French, 1993).
SMB	The SMB factor "Small minus big" covers the risk factor in returns with respect to size. It is the average return of the portfolios of smallest firms according to the Market value in excess of the average return of the portfolios of biggest firms according to Fama and French (1993).
HML	The HML factor "High minus low" is the risk factor in returns with respect to Book-to-market ratios. The factor invests long in the average return of the value portfolio (highest to Book-to-market ratios) and short in the growth portfolio (lowest Book-to-market ratios) according to Fama and French (1993). It is also referred to as 'value versus growth' factor.
MOM	This risk factor is also called the "momentum factor". Based on a difference portfolio of most and least performing stocks in the 11 months from -12 to -2 the factor analyzes the persistence of such momentum according to Carhart (1997).
RMW	Firm profitability in portfolio returns is considered in the RMW factor. It captures the difference in returns between most and least profitable portfolios of firms as defined by Fama and French (2015).

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CMA	Investment activities of firms are incorporated in the CMA factor. Here, the factor differences the returns of firms with conservative investment spending and aggressive investment spending (Fama and French, 2015).
Panel G: Return coefficients	
α	The return coefficient α denotes the abnormal return in excess of the return from a passive investment into either the Carhart (1997) four-factor model or the Fama and French (2015) five-factor model.
ER	The excess return (ER) is the average monthly realized return in excess of the risk-free rate.

Remark: This table presents the descriptions of the variables employed in this study. Panel A delineates the equity risk measures, Panel B the CSR variables, Panel C the moderator variables, Panel D the firm-specific control variables, Panel E the country-specific control variables, Panel F the portfolio return factors and Panel G the return coefficients.

Appendix I.B: CSR and equity risk — Dynamic OLS estimations.

	Panel A: Dependent Variable — CSR Score (t)						*Panel B: Dependent Variable — CSR Score (t+1)*					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
σ (t-1)	-0.017***						-0.019***					
	(-5.373)						(-5.642)					
σ_ϵ (t-1)		-0.021***						-0.023***				
		(-5.863)						(-6.046)				
VaR (t-1)			-0.009***						-0.009***			
			(-4.460)						(-4.388)			
CVaR (t-1)				-0.007***						-0.008***		
				(-5.415)						(-5.819)		
LPM(0,2) (t-1)					-0.017***						-0.019***	
					(-5.342)						(-5.619)	
LPM(0,3) (t-1)						-0.011***						-0.014***
						(-5.657)						(-6.294)
Leverage	0.012	0.014	0.011	0.012	0.012	0.012	0.010	0.012	0.009	0.010	0.010	0.010
	(0.771)	(0.847)	(0.701)	(0.766)	(0.737)	(0.757)	(0.602)	(0.685)	(0.507)	(0.582)	(0.568)	(0.604)
Profitability	0.159***	0.154***	0.164***	0.160***	0.159***	0.163***	0.173***	0.169***	0.180***	0.171***	0.172***	0.173***
	(5.848)	(5.639)	(6.016)	(5.839)	(5.809)	(6.016)	(6.047)	(5.874)	(6.277)	(5.958)	(5.988)	(6.079)
Size	0.048***	0.047***	0.049***	0.048***	0.048***	0.048***	0.048***	0.047***	0.049***	0.049***	0.049***	0.048***
	(22.205)	(21.325)	(22.492)	(22.281)	(22.266)	(22.269)	(21.829)	(20.889)	(22.138)	(21.901)	(21.884)	(21.815)
Sales Growth	-0.052***	-0.051***	-0.053***	-0.053***	-0.053***	-0.053***	-0.052***	-0.051***	-0.054***	-0.054***	-0.054***	-0.054***
	(-8.933)	(-8.781)	(-9.146)	(-9.209)	(-9.153)	(-9.233)	(-8.466)	(-8.346)	(-8.687)	(-8.693)	(-8.655)	(-8.678)
Dividend Yield	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.002	-0.001	-0.001	-0.001	-0.001
	(-0.847)	(-0.943)	(-0.613)	(-0.705)	(-0.726)	(-0.686)	(-1.009)	(-1.123)	(-0.729)	(-0.853)	(-0.879)	(-0.870)
Constant	-0.537***	-0.508***	-0.555***	-0.543***	-0.540***	-0.546***	-0.534***	-0.504***	-0.559***	-0.540***	-0.538***	-0.538***
	(-10.962)	(-10.094)	(-11.446)	(-11.163)	(-11.067)	(-11.259)	(-10.671)	(-9.758)	(-11.262)	(-10.843)	(-10.759)	(-10.818)

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	Panel A: Dependent Variable — CSR Score (t)						*Panel B: Dependent Variable — CSR Score (t+1)*					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Observations	16,443	16,443	16,429	16,429	16,443	16,443	14,552	14,552	14,541	14,541	14,552	14,552
R^2	0.232	0.233	0.230	0.231	0.232	0.231	0.239	0.240	0.236	0.239	0.238	0.239
Year-fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Remark: This table presents the results of an OLS regression of the past equity risk measures on the CSR level (in t) in Panel A and future CSR level (in t+1) in Panel B. Coefficients are estimated according to the following equation: $CSR_{i,t(+1)} = \beta_1 \lambda_{i,t-1} + \beta_2 x_{i,t} + \varphi_t + \epsilon_{i,t}$ The dependent variable is the CSR score. $\lambda_{i,t}$ captures the respective one-year lagged equity risk measures σ in model (1) & (7), σ_ϵ in models (2) & (8), VaR in models (3) & (9), CVaR in models (4) & (10), LPM(0,2) in models (5) & (11) and LPM(0,3) in models (6) & (12) which serve as explanatory variables in these regressions. $x_{i,t}$ is a vector of control variables. Descriptions of all variables are provided in Appendix I.A. Standard errors are clustered at the firm level and t-statistics are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix I.C: Post-matching descriptive statistics for the U.S. and EU sample.

	U.S.						**EU**						**Difference EU-U.S.**	
	Firm-year obs.	Mean	Median	SD	Min	Max	Firm-year obs.	Mean	Median	SD	Min	Max	Difference	t-Value
Panel A: Risk measures														
σ [%]	7,117	2.043	1.732	1.081	0.809	6.921	6,994	2.096	1.848	0.902	0.803	6.329	0.053***	3.17
σ_ϵ [%]	7,117	1.641	1.389	0.867	0.66	5.785	6,994	1.699	1.505	0.746	0.651	5.963	0.058***	4.27
VaR [%]	7,114	3.194	2.682	1.744	1.214	10.651	6,993	3.336	2.934	1.495	1.21	9.73	0.142***	5.2
CVaR [%]	7,114	4.547	3.846	2.478	1.68	15.391	6,993	4.652	4.098	2.114	1.669	14.561	0.105***	2.713
LPM(0,2) [%]	7,117	2.014	1.715	1.049	0.783	6.548	6,994	2.053	1.821	0.879	0.767	5.956	0.038**	2.353
LPM(0,3) [%]	7,117	2.611	2.205	1.435	0.958	8.992	6,994	2.634	2.299	1.222	0.929	8.282	0.023	1.005
Panel B: CSR variables														
CSR	7,117	0.514	0.5	0.173	0.099	0.969	6,994	0.593	0.605	0.159	0.078	0.959	0.079***	28.131
Environment	7,115	0.491	0.455	0.221	0.03	0.988	6,991	0.638	0.66	0.2	0.025	0.993	0.147***	41.505
Social	7,115	0.528	0.51	0.194	0.047	0.99	6,991	0.616	0.633	0.197	0.049	0.991	0.089***	26.941
Governance	7,117	0.525	0.531	0.216	0.034	0.991	6,994	0.516	0.519	0.209	0.01	0.99	-0.009***	-2.605
Panel C: Firm-specific control variables														
Leverage	7,117	0.616	0.615	0.206	0.087	1.408	6,994	0.617	0.618	0.198	0.018	1.165	0.001	0.335
Sales Growth	7,117	0.085	0.057	0.256	-0.509	2.284	6,994	0.081	0.052	0.309	-1.382	2.861	-0.004	-0.894
Profitability	7,117	0.083	0.077	0.098	-0.539	0.393	6,994	0.081	0.069	0.085	-0.328	0.417	-0.002	-1.261
Size	7,117	22.731	22.586	1.294	19.216	26.748	6,994	22.823	22.745	1.704	17.771	28.361	0.092***	3.623
Dividend Yield [%]	7,117	1.937	1.393	2.25	0	12.439	6,994	1.994	1.499	2.242	0	10.732	0.057	1.507
Panel D: Industry														
Basic Materials	659	0.093					663	0.095					0.002	0.448
Cons. Cyclicals	1,417	0.199					1,434	0.205					0.006	0.877
Cons. Non-Cyclicals	560	0.079					567	0.081					0.002	0.522

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	U.S.						EU						Difference EU-U.S.	
	Firm-year obs.	Mean	Median	SD	Min	Max	Firm-year obs.	Mean	Median	SD	Min	Max	Difference	t-Value
Energy	478	0.067					511	0.073					0.006	1.372
Financials	1,149	0.161					1,222	0.175					0.013**	2.109
Healthcare	517	0.073					489	0.07					-0.003	-0.629
Industrials	1,342	0.189					1,199	0.171					-0.017***	-2.648
Technology	516	0.073					460	0.066					-0.007	-1.576
Tele. Services	103	0.014					25	0.004					-0.011***	-6.838
Utilities	376	0.053					424	0.061					0.008**	2.001

Remark: This table presents the descriptive statistics for the U.S. sample, the EU sample as well as a comparison of both samples after the propensity score matching. Differences between the EU and U.S. sample are calculated and tested for significance using t-tests. *Panel A* provides descriptive statistics for the equity risk measures, *Panel B* for the CSR variables, *Panel C* for the firm-specific control variables and *Panel D* for the industry breakdown according to the TRBC Economic sector code as well as differences between the EU and U.S. firms. Descriptions of all variables are provided in Appendix I.A. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix I.D: Five-factor portfolio model for the U.S. and EU.

	Panel A: U.S.							
	α	RMRF	SMB	HML	RMW	CMA	Obs.	Adjust. R^2
Difference PF	-0.433***	0.005	-0.446***	0.101*	0.091	0.272***	180	0.293
(Q5-Q1)	(-3.283)	(0.127)	(-7.175)	(1.665)	(1.054)	(2.649)		
Q5	0.156***	0.936***	-0.214***	0.077***	0.063*	0.112***	180	0.963
	(2.857)	(58.163)	(-8.318)	(3.063)	(1.755)	(2.646)		
Q4	0.257***	1.046***	0.047	-0.039	0.192***	-0.063	180	0.935
	(3.099)	(42.693)	(1.194)	(-1.028)	(3.509)	(-0.975)		
Q3	0.382***	1.053***	0.105**	-0.042	0.080	-0.041	180	0.922
	(3.999)	(37.349)	(2.341)	(-0.962)	(1.268)	(-0.549)		
Q2	0.533***	1.042***	0.160***	0.034	0.038	-0.326***	180	0.905
	(4.875)	(32.307)	(3.099)	(0.682)	(0.529)	(-3.825)		
Q1	0.589***	0.931***	0.232***	-0.024	-0.029	-0.160*	180	0.889
	(5.378)	(28.818)	(4.502)	(-0.480)	(-0.396)	(-1.874)		

	Panel B: EU							
	α	RMRF	SMB	HML	RMW	CMA	Obs.	Adjust. R^2
Difference PF	-0.554***	-0.018	-0.609***	0.058	0.120	0.286***	180	0.387
(Q5-Q1)	(-4.273)	(-0.621)	(-9.362)	(0.605)	(0.945)	(2.723)		
Q5	0.013	0.974***	-0.270***	0.204***	0.038	-0.017	180	0.981
	(0.197)	(69.027)	(-8.395)	(4.283)	(0.610)	(-0.329)		
Q4	0.184*	1.001***	-0.193***	0.182**	0.041	-0.084	180	0.956
	(1.843)	(45.477)	(-3.836)	(2.455)	(0.417)	(-1.040)		
Q3	0.443***	1.089***	-0.008	-0.287***	-0.250*	-0.173	180	0.926
	(3.226)	(36.052)	(-0.118)	(-2.820)	(-1.860)	(-1.555)		
Q2	0.579***	1.129***	0.250***	-0.235**	-0.283**	-0.091	180	0.932
	(4.243)	(37.634)	(3.650)	(-2.330)	(-2.122)	(-0.828)		
Q1	0.567***	0.991***	0.339***	0.145*	-0.082	-0.303***	180	0.946
	(5.001)	(39.780)	(5.960)	(1.732)	(-0.736)	(-3.302)		

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Appendix I.D – continued from previous page

Remark: This table presents the Fama and French (2015) five-factor model regressions of value-weighted monthly returns from firm portfolios sorted by their respective CSR score in the U.S. in Panel A and the EU in Panel B subdivided into quintiles. Q5 represents the companies with the highest CSR scores (top 20%) while Q1 comprises the companies with the lowest CSR scores (bottom 20%). Portfolios are reallocated annually. The difference portfolio represents a portfolio that buys Q5 companies and sells short Q1 companies. Coefficients are estimated using the following OLS estimation: $R_{i,t} - r_{f,t} = \alpha_i + \beta_{1,i} * RMRF_t + \beta_{2,i} SMB_t + \beta_{3,i} HML_t + \beta_{4,i} RMW_t + \beta_{5,i} CMA_t + \epsilon_{i,t}$. Explanatory variables are *RMRF*, *SMB*, *HML*, *RMW* and *CMA*. The intercept (α) measures the abnormal return of the respective portfolio. Descriptions of all variables are provided in Appendix I.A. T-statistics are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix I.E: Four-factor model for the U.S. and EU — Equally-weighted portfolios.

	Panel A: U.S.						
	α	RMRF	SMB	HML	MOM	Obs.	Adj. R^2
Difference PF	-0.247**	-0.011	-0.448***	0.079*	0.047*	180	0.389
(Q5-Q1)	(-2.427)	(-0.390)	(-9.470)	(1.732)	(1.879)		
Q5	0.004	1.021***	0.051**	0.068***	-0.091***	180	0.973
	(0.069)	(65.037)	(2.032)	(2.815)	(-6.769)		
Q4	0.123	1.077***	0.325***	0.059	-0.195***	180	0.936
	(1.227)	(37.138)	(6.977)	(1.317)	(-7.816)		
Q3	0.161*	1.061***	0.395***	0.015	-0.170***	180	0.949
	(1.825)	(41.595)	(9.650)	(0.389)	(-7.752)		
Q2	0.158*	1.085***	0.459***	0.046	-0.135***	180	0.957
	(1.909)	(45.369)	(11.954)	(1.262)	(-6.582)		
Q1	0.251**	1.033***	0.499***	-0.010	-0.139***	180	0.938
	(2.596)	(36.991)	(11.122)	(-0.243)	(-5.787)		

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Appendix I.E – continued from previous page

	Panel B: EU						
	α	RMRF	SMB	HML	MOM	Obs.	Adj. R^2
Difference PF	-0.295***	-0.013	-0.710***	0.039	0.087***	180	0.365
(Q5-Q1)	(-2.840)	(-0.579)	(-13.006)	(0.704)	(2.908)		
Q5	-0.075	1.018***	0.024	0.222***	-0.081***	180	0.981
	(-1.096)	(69.145)	(0.660)	(6.109)	(-4.125)		
Q4	0.096	1.053***	0.230***	0.179***	-0.208***	180	0.960
	(1.000)	(50.837)	(4.574)	(3.496)	(-7.531)		
Q3	-0.003	1.088***	0.559***	0.021	-0.199***	180	0.924
	(-0.029)	(47.136)	(9.948)	(0.362)	(-6.449)		
Q2	0.192**	1.109***	0.619***	-0.031	-0.166***	180	0.935
	(2.152)	(57.601)	(13.212)	(-0.659)	(-6.471)		
Q1	0.220**	1.031***	0.733***	0.183***	-0.168***	180	0.944
	(2.088)	(45.257)	(13.229)	(3.255)	(-5.529)		

Remark: This table presents the Carhart (1997) four-factor model regressions of equal-weighted monthly returns from firm portfolios sorted by their respective CSR score in the U.S. in Panel A and the EU in Panel B subdivided into quintiles. Q5 represents the companies with the highest CSR scores (top 20%) while Q1 comprises the companies with the lowest CSR scores (bottom 20%). Portfolios are reallocated annually. The difference portfolio represents a portfolio that is long Q5 companies and short Q1 companies. Coefficients are estimated according to equation II.3 using standard OLS regressions. Explanatory variables are *RMRF*, *SMB*, *HML* and *MOM*. The intercept (α) measures the abnormal return of the respective portfolio. Descriptions of all variables are provided in Appendix I.A. T-statistics are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix I.F: Supplemental Analyses.

This section reports supplemental studies to the risk-return analyses of section II.5.5. We first try to establish robustness by considering the financial crisis in our dataset. To do so, we include NBER business cycle periods in our analyses in line with Brøgger and Kronies (2021). According to the NBER business cycle, the financial crisis started in December 2007 and ended in June 2009. We therefore introduce two dummy variables, where the NBER-Dummy equals 1 in all crisis months and 0 otherwise and vice versa for the NBERFALSE-Dummy.

Appendix I.G illustrates the results from a portfolio analysis for U.S. firms in Panel A and for EU firms in Panel B. Due to the employment of the dummies, the NBER-Dummy coefficient captures the α of the portfolios during the financial crisis. During all other months the α for the portfolios is captured in the coefficient of the NBERFALSE-Dummy. The results for the difference portfolios (Q5 - Q1) during non-crisis months confirm that a strategy long in high-CSR firms and short in low-CSR firms in the U.S. and EU yields highly significant, negative abnormal returns. This effect disappears during the financial crisis, however, though we still observe a negative alpha, i.e. coefficient of the NBERFALSE-Dummy, in the EU sample.

Appendix I.G: Four-factor model for the U.S. and EU in crisis and non-crisis periods.

	Panel A: U.S.							
	RMRF	SMB	HML	MOM	NBER	NBERFALSE	Obs.	Adj. R^2
Difference PF	0.023	-0.472***	0.239***	0.106***	0.100	-0.475***	180	0.342
(Q5-Q1)	(0.581)	(-7.871)	(4.218)	(3.280)	(0.250)	(-3.455)		
Q5	0.941***	-0.242***	0.114***	0.003	0.933***	0.084	180	0.968
	(60.578)	(-10.069)	(5.039)	(0.210)	(5.815)	(1.523)		
Q4	1.023***	-0.006	-0.059	-0.009	0.598**	0.290***	180	0.935
	(40.037)	(-0.157)	(-1.586)	(-0.419)	(2.268)	(3.208)		
Q3	1.025***	0.081**	-0.107***	-0.100***	0.919***	0.366***	180	0.938
	(38.827)	(1.985)	(-2.764)	(-4.539)	(3.371)	(3.915)		
Q2	1.066***	0.109**	-0.065	-0.029	1.284***	0.430***	180	0.909
	(32.141)	(2.120)	(-1.346)	(-1.054)	(3.749)	(3.662)		
Q1	0.919***	0.230***	-0.125***	-0.103***	0.833**	0.559***	180	0.908
	(29.453)	(4.775)	(-2.737)	(-3.975)	(2.586)	(5.056)		

	Panel B: EU							
	RMRF	SMB	HML	MOM	NBER	NBERFALSE	Obs.	Adj. R^2
Difference PF	-0.052*	-0.653***	0.096	0.012	-0.345	-0.468***	180	0.426
(Q5-Q1)	(-1.889)	(-10.135)	(1.475)	(0.332)	(-0.956)	(-3.501)		
Q5	0.976***	-0.266***	0.158***	-0.028	0.430**	-0.002	180	0.982
	(75.350)	(-8.741)	(5.109)	(-1.616)	(2.528)	(-0.030)		
Q4	0.988***	-0.182***	0.075	-0.102***	0.176	0.290***	180	0.961
	(49.459)	(-3.891)	(1.576)	(-3.885)	(0.671)	(2.979)		
Q3	1.126***	0.036	-0.226***	-0.019	1.257***	0.198	180	0.929
	(39.889)	(0.550)	(-3.358)	(-0.521)	(3.388)	(1.439)		
Q2	1.136***	0.285***	-0.172***	-0.105***	1.305***	0.442***	180	0.94
	(41.480)	(4.435)	(-2.636)	(-2.901)	(3.624)	(3.311)		
Q1	1.028***	0.387***	0.061	-0.040	0.776**	0.466***	180	0.947
	(42.790)	(6.871)	(1.070)	(-1.251)	(2.456)	(3.985)		

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Appendix I.G – continued from previous page

Remark: This table presents the Carhart (1997) four-factor model regressions of value-weighted monthly returns from firm portfolios sorted by their respective CSR score in the U.S. in Panel A and the EU in Panel B subdivided into quintiles. Q5 represents the companies with the highest CSR scores (top 20%) while Q1 comprises the companies with the lowest CSR scores (lowest 20%). Portfolios are reallocated annually. The difference portfolio represents a portfolio that is long Q5 companies and short Q1 companies. Coefficients are estimated using standard OLS regressions as follows: $R_{i,t} - r_{f,t} = NBER_i + NBERFALSE_i + \beta_{1,i} * RMRF_t + \beta_{2,i} SMB_t + \beta_{3,i} HML_t + \beta_{4,i} MOM_t + \epsilon_{i,t}$. Explanatory variables are *RMRF*, *SMB*, *HML* and *MOM*. The coefficient for *NBER* reflects the α (abnormal return of the respective portfolio) during crisis months as defined by NBER (December 07 - June 09). During all other months the αs of the respective portfolios are captured in the *NBERFALSE* coefficient. Descriptions of these variables are provided in Appendix I.A. T-statistics are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

As a second analysis, we compare the CSR-return association in the U.S. and EU disclosure regimes in more detail. We do so by applying the Carhart (1997) four-factor model in a difference portfolio approach. While in a first step, the quintile portfolios and the long-short portfolio (Q5-Q1) are formed as in Table II.11 for the EU and U.S. sample individually, we augment this approach in a second step: We build region-difference portfolios that invest long in the respective EU (quintile or long-short) portfolio and short in the respective U.S. portfolio. These region-difference portfolios should reveal the existence of any significant return difference between the two disclosure regimes. Appendix I.H illustrates the results. As can be seen from the table, the abnormal returns in Q5 and Q4 are significantly negative and imply that U.S. firms with very high CSR activity deliver higher returns than similar firms in the EU. Apart from these highly active firms with regard to CSR, there is no significant return difference due to CSR between the two reporting regimes.

Appendix I.H: Four-factor model sample comparison between the U.S. and EU.

	α	RMRF	SMB	HML	MOM	Obs.	Adj. R^2
Difference PF	-0.172	0.044	-0.132	-0.011	-0.035	180	-0.004
(Q5-Q1)	(-1.003)	(1.056)	(-1.157)	(-0.095)	(-0.641)		
Q5	-0.480**	0.411***	0.059	0.050	-0.025	180	0.335
	(-2.492)	(8.718)	(0.466)	(0.402)	(-0.412)		
Q4	-0.416**	0.313***	-0.068	0.113	-0.094	180	0.223
	(-1.976)	(6.076)	(-0.488)	(0.832)	(-1.410)		
Q3	-0.357	0.351***	0.004	-0.162	0.019	180	0.183
	(-1.585)	(6.361)	(0.026)	(-1.109)	(0.267)		
Q2	-0.268	0.370***	0.273*	-0.226	-0.085	180	0.236
	(-1.154)	(6.495)	(1.769)	(-1.500)	(-1.153)		
Q1	-0.307	0.366***	0.191	0.061	0.010	180	0.222
	(-1.355)	(6.599)	(1.273)	(0.413)	(0.137)		

Remark: This table presents the Carhart (1997) four-factor model regressions of equal-weighted monthly returns from firm portfolios sorted by their respective CSR score in the U.S. in Panel A and the EU in Panel B subdivided into quintiles. Q5 represents the companies with the highest CSR scores (top 20%) while Q1 comprises the companies with the lowest CSR scores (bottom 20%). Portfolios are reallocated annually. The difference portfolio represents a portfolio that is long Q5 companies and short Q1 companies. Coefficients are estimated according to equation II.3 using standard OLS regressions. Explanatory variables are *RMRF*, *SMB*, *HML* and *MOM*. The intercept (α) measures the abnormal return of the respective portfolio. Descriptions of all variables are provided in Appendix I.A. T-statistics are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Lastly, we extend our analyses by considering the CSR pillars separately. Appendices I.I to I.K illustrate the results for the three pillars environment, social and governance. Irrespective of the utilized pillar score (E, S or G) the results reveal that the difference portfolio (Q5 - Q1) yields significantly negative returns in all regressions. Hence, the findings confirm that the overall results from Table II.11 are not driven by one particular CSR pillar.

Appendix I.I: Four-factor model for the U.S. and EU for the environmental pillar.

	Panel A: U.S.						
	α	RMRF	SMB	HML	MOM	Obs.	Adj. R^2
Difference PF	-0.308***	0.016	-0.303***	0.066	0.027	180	0.159
(Q5-Q1)	(-2.716)	(0.504)	(-5.756)	(1.309)	(0.971)		
Q5	0.139**	0.946***	-0.203***	0.103***	-0.004	180	0.960
	(2.438)	(57.398)	(-7.653)	(4.063)	(-0.294)		
Q4	0.492***	0.927***	-0.069*	-0.062*	-0.034*	180	0.928
	(6.420)	(41.847)	(-1.925)	(-1.807)	(-1.798)		
Q3	0.555***	1.031***	0.125***	-0.159***	-0.068***	180	0.921
	(5.913)	(38.020)	(2.869)	(-3.814)	(-2.918)		
Q2	0.425***	0.968***	0.195***	-0.087*	-0.134***	180	0.898
	(3.925)	(30.938)	(3.872)	(-1.798)	(-5.005)		
Q1	0.447***	0.930***	0.100**	0.037	-0.031	180	0.898
	(4.499)	(32.421)	(2.165)	(0.842)	(-1.277)		

	Panel B: EU						
	α	RMRF	SMB	HML	MOM	Obs.	Adj. R^2
Difference PF	-0.228*	-0.033	-0.618***	0.265***	0.002	180	0.356
(Q5-Q1)	(-1.824)	(-1.227)	(-9.414)	(3.973)	(0.069)		
Q5	0.142*	1.001***	-0.293***	0.258***	-0.091***	180	0.972
	(1.852)	(60.346)	(-7.271)	(6.279)	(-4.125)		
Q4	0.050	0.993***	-0.117***	-0.045	-0.006	180	0.968
	(0.659)	(60.972)	(-2.959)	(-1.117)	(-0.272)		
Q3	0.397***	0.997***	-0.110**	-0.215***	-0.029	180	0.949
	(4.245)	(49.294)	(-2.231)	(-4.304)	(-1.084)		
Q2	0.562***	1.052***	0.170***	-0.132**	-0.032	180	0.924
	(4.549)	(39.445)	(2.624)	(-2.002)	(-0.893)		
Q1	0.370***	1.035***	0.325***	-0.008	-0.094***	180	0.951
	(3.675)	(47.538)	(6.140)	(-0.143)	(-3.231)		

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Appendix I.I – continued from previous page

Remark: This table presents the Carhart (1997) four-factor model regressions of value-weighted monthly returns from firm portfolios sorted by their respective *Environment* pillar score in the U.S. in Panel A and the EU in Panel B subdivided into quintiles. Q5 represents the companies with the highest *Environment* pillar scores (top 20%) while Q1 comprises the companies with the lowest *Environment* pillar scores (lowest 20%). Portfolios are reallocated annually. The difference portfolio represents a portfolio that is long Q5 companies and short Q1 companies. Coefficients are estimated according to equation II.3 using standard OLS regressions. Explanatory variables are *RMRF*, *SMB*, *HML* and *MOM*. The intercept (α) measures the abnormal return of the respective portfolio. Descriptions of these variables are provided in Appendix I.A. T-statistics are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix I.J: Four-factor model for the U.S. and EU for the social pillar.

	Panel A: U.S.						
	α	RMRF	SMB	HML	MOM	Obs.	Adj. R^2
Difference PF	-0.467***	-0.036	-0.411***	0.234***	0.065**	180	0.289
(Q5-Q1)	(-3.778)	(-1.000)	(-7.168)	(4.262)	(2.135)		
Q5	0.212***	0.916***	-0.196***	0.104***	0.001	180	0.962
	(3.952)	(59.045)	(-7.879)	(4.365)	(0.068)		
Q4	0.316***	1.008***	-0.063*	-0.045	-0.053***	180	0.940
	(4.105)	(45.360)	(-1.769)	(-1.312)	(-2.779)		
Q3	0.368***	0.967***	0.064	-0.111***	-0.073***	180	0.915
	(4.035)	(36.696)	(1.516)	(-2.743)	(-3.224)		
Q2	0.370***	1.038***	0.144***	-0.063	-0.093***	180	0.906
	(3.450)	(33.487)	(2.882)	(-1.328)	(-3.488)		
Q1	0.679***	0.952***	0.215***	-0.130***	-0.064***	180	0.904
	(6.821)	(33.105)	(4.643)	(-2.933)	(-2.613)		

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Appendix I.J – continued from previous page

	Panel B: EU						
	α	RMRF	SMB	HML	MOM	Obs.	Adj. R^2
Difference PF	-0.515***	-0.080***	-0.548***	0.058	0.171***	180	0.355
(Q5-Q1)	(-3.820)	(-2.729)	(-7.731)	(0.806)	(4.386)		
Q5	0.075	0.975***	-0.308***	0.096***	-0.007	180	0.979
	(1.227)	(74.187)	(-9.645)	(2.951)	(-0.413)		
Q4	0.222**	1.009***	-0.163***	0.116**	-0.092***	180	0.956
	(2.316)	(48.795)	(-3.248)	(2.262)	(-3.342)		
Q3	0.545***	1.056***	0.025	-0.016	-0.187***	180	0.930
	(4.279)	(38.393)	(0.380)	(-0.231)	(-5.097)		
Q2	0.271**	1.055***	0.310***	-0.218***	-0.025	180	0.931
	(2.337)	(42.078)	(5.073)	(-3.520)	(-0.733)		
Q1	0.590***	1.055***	0.240***	0.038	-0.178***	180	0.940
	(4.981)	(41.210)	(3.853)	(0.597)	(-5.208)		

Remark: This table presents the Carhart (1997) four-factor model regressions of value-weighted monthly returns from firm portfolios sorted by their respective *Social* pillar score in the U.S. in Panel A and the EU in Panel B subdivided into quintiles. Q5 represents the companies with the highest *Social* pillar scores (top 20%) while Q1 comprises the companies with the lowest *Social* pillar scores (lowest 20%). Portfolios are reallocated annually. The difference portfolio represents a portfolio that is long Q5 companies and short Q1 companies. Coefficients are estimated according to equation II.3 using standard OLS regressions. Explanatory variables are *RMRF*, *SMB*, *HML* and *MOM*. The intercept (α) measures the abnormal return of the respective portfolio. Descriptions of these variables are provided in Appendix I.A. T-statistics are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix I.K: Four-factor model for the U.S. and EU for the governance pillar.

	Panel A: U.S.						
	α	RMRF	SMB	HML	MOM	Obs.	Adj. R^2
Difference PF	-0.304**	-0.081*	-0.393***	0.298***	0.062*	180	0.256
(Q5-Q1)	(-2.116)	(-1.949)	(-5.889)	(4.666)	(1.750)		
Q5	0.232***	0.900***	-0.272***	0.144***	-0.015	180	0.944
	(3.589)	(48.331)	(-9.095)	(5.026)	(-0.942)		
Q4	0.203**	0.963***	-0.025	-0.049	0.006	180	0.928
	(2.561)	(42.053)	(-0.682)	(-1.389)	(0.330)		
Q3	0.242***	0.988***	0.029	-0.021	-0.045**	180	0.918
	(2.672)	(37.749)	(0.686)	(-0.533)	(-2.013)		
Q2	0.439***	1.043***	0.045	-0.091*	-0.088***	180	0.901
	(4.076)	(33.558)	(0.895)	(-1.909)	(-3.306)		
Q1	0.536***	0.981***	0.121**	-0.154***	-0.077***	180	0.885
	(4.832)	(30.640)	(2.346)	(-3.127)	(-2.816)		

	Panel B: EU						
	α	RMRF	SMB	HML	MOM	Obs.	Adj. R^2
Difference PF	-0.380**	-0.136***	-0.423***	0.195**	-0.046	180	0.162
(Q5-Q1)	(-2.348)	(-3.882)	(-4.973)	(2.248)	(-0.977)		
Q5	0.127*	0.980***	-0.261***	0.108***	-0.100***	180	0.977
	(1.924)	(68.662)	(-7.519)	(3.064)	(-5.221)		
Q4	0.154*	0.979***	-0.109**	-0.007	-0.005	180	0.962
	(1.892)	(55.795)	(-2.561)	(-0.170)	(-0.228)		
Q3	0.200**	0.998***	-0.132***	0.097**	-0.039	180	0.959
	(2.236)	(51.694)	(-2.804)	(2.032)	(-1.510)		
Q2	0.306***	1.037***	-0.058	0.090*	-0.044*	180	0.959
	(3.314)	(51.972)	(-1.203)	(1.827)	(-1.665)		
Q1	0.507***	1.116***	0.162*	-0.086	-0.054	180	0.895
	(3.197)	(32.554)	(1.944)	(-1.018)	(-1.177)		

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Appendix I.K – continued from previous page

Remark: This table presents the Carhart (1997) four-factor model regressions of value-weighted monthly returns from firm portfolios sorted by their respective *Governance* pillar score in the U.S. in Panel A and the EU in Panel B subdivided into quintiles. Q5 represents the companies with the highest *Governance* pillar scores (top 20%) while Q1 comprises the companies with the lowest *Governance* pillar scores (lowest 20%). Portfolios are reallocated annually. The difference portfolio represents a portfolio that is long Q5 companies and short Q1 companies. Coefficients are estimated according to equation II.3 using standard OLS regressions. Explanatory variables are *RMRF*, *SMB*, *HML* and *MOM*. The intercept (α) measures the abnormal return of the respective portfolio. Descriptions of these variables are provided in Appendix I.A. T-statistics are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix II (to Chapter III)

Appendix II.A: ESG effects on credit risk in the U.S.

	(1)	(2)	(3)	(4)	(5)	(6)
	FE	FE	FE	FE	FE	Ordered Probit
	CDS1Y	CDS5Y	DTD	PD1Y	PD5Y	Credit Rating
Environment	-0.0783***	-0.0966***	0.0146***	-0.0012***	-0.0073***	-0.0026
	(0.0252)	(0.0288)	(0.0026)	(0.0004)	(0.0020)	(0.0022)
Social	0.0191	0.0229	-0.0048	0.0003	0.0016	-0.0009
	(0.0317)	(0.0354)	(0.0033)	(0.0005)	(0.0024)	(0.0030)
Governance	-0.0091	0.0000	0.0019	-0.0002	-0.0002	0.0016
	(0.0229)	(0.0228)	(0.0021)	(0.0003)	(0.0015)	(0.0019)
Leverage	9.0510**	18.7930***	-2.3299***	0.1152*	1.3060***	-2.9645***
	(4.5353)	(4.4450)	(0.3450)	(0.0662)	(0.3029)	(0.3133)
Profitability	-34.8997***	-40.1340***	2.5757***	-0.5055***	-2.6508***	4.7203***
	(7.2503)	(6.3257)	(0.4251)	(0.1063)	(0.4100)	(0.5339)
Size	1.7816	-1.1165	0.2766***	0.0272	-0.0830	0.6765***
	(1.5489)	(1.5392)	(0.1005)	(0.0226)	(0.1050)	(0.1046)
Sales growth	3.4342**	2.7457**	-0.2285***	0.0508**	0.1775**	-0.1754**
	(1.6445)	(1.3781)	(0.0613)	(0.0241)	(0.0888)	(0.0737)
Dividend yield	175.5775***	217.9143***	-12.9156***	2.5224***	14.5066***	-1.4238
	(41.9866)	(37.4119)	(2.5490)	(0.6234)	(2.5217)	(2.1502)
Constant	-34.5576	38.8799	1.4221	-0.5285	2.8463	
	(33.6338)	(33.5727)	(2.2149)	(0.4913)	(2.2955)	

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Appendix II.A – continued from previous page

	(1) FE CDS1Y	(2) FE CDS5Y	(3) FE DTD	(4) FE PD1Y	(5) FE PD5Y	(6) Ordered Probit Credit Rating
Firm-year Obs.	11,124	11,124	11,115	11,124	11,124	7,265
Obs.	1,703	1,703	1,703	1,703	1,703	931
(Pseudo) R^2	0.027	0.040	0.037	0.026	0.040	0.487

Remark: This table presents panel estimations of the effects of the three CSR facets *Environment*, *Social*, *Governance* on companies' credit risk in the U.S. Models (1) to (5) employ a fixed-effects panel estimation and model (6) a pooled ordered probit estimation with firm-fixed effects. The dependent variables are the natural logarithm of the one- and five-year *CDS Spread*, the *DTD*, the one- and five-year *Probability of Default (PD)* and the *Credit rating* by Standard & Poor's. Standard errors are clustered on firm level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix II.B: ESG effects on credit risk in the EU.

	(1)	(2)	(3)	(4)	(5)	(6)
	FE	FE	FE	FE	FE	Ordered Probit
	CDS1Y	CDS5Y	DTD	PD1Y	PD5Y	Credit Rating
Environment	-0.0575***	-0.0391***	0.0040*	-0.0922***	-0.3120***	-0.0069**
	(0.0155)	(0.0140)	(0.0024)	(0.0239)	(0.0994)	(0.0032)
Social	-0.0462***	-0.0416***	0.0124***	-0.0743***	-0.3211***	-0.0101***
	(0.0173)	(0.0141)	(0.0027)	(0.0268)	(0.0996)	(0.0034)
Governance	-0.0165	-0.0131	0.0008	-0.0273	-0.0979	0.0037
	(0.0131)	(0.0110)	(0.0022)	(0.0203)	(0.0787)	(0.0023)
Leverage	17.0346***	19.0399***	-4.9871***	25.5742***	136.1211***	-2.8678***
	(3.6498)	(2.9832)	(0.4197)	(5.5376)	(20.3937)	(0.5629)
Profitability	-21.5450***	-22.7715***	3.0836***	-31.7072***	-155.9330***	6.3218***
	(5.7445)	(4.5432)	(0.5350)	(8.7408)	(30.7207)	(1.1991)
Size	3.8574***	2.1147***	0.0839	6.0968***	14.3726**	0.0199
	(0.9606)	(0.8168)	(0.1085)	(1.4724)	(5.6905)	(0.1632)
Sales Growth	-0.1406	-0.2410	-0.0309	-0.1470	-1.2505	0.3342***
	(0.5276)	(0.4687)	(0.0772)	(0.7988)	(3.2378)	(0.0828)
Dividend Yield	19.5754	34.7805***	-10.9189***	26.0048	242.8334***	-3.7213
	(17.1151)	(13.4728)	(1.6690)	(25.9217)	(91.7813)	(2.3641)
Constant	-79.8108***	-37.2003**	6.0577**	-126.1762***	-243.9854*	
	(21.7163)	(18.4516)	(2.4083)	(33.2282)	(128.1087)	
Firm-year Obs.	9,682	9,682	9,584	9,682	9,682	3,733
Obs.	1,246	1,246	1,230	1,246	1,246	422
(Pseudo) R^2	0.032	0.044	0.070	0.031	0.046	0.44

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Appendix II.B – continued from previous page

Remark: This table presents panel estimations of the effects of the three CSR facets *Environment*, *Social*, *Governance* on companies' credit risk in the EU. Models (1) to (5) employ a fixed-effects panel estimation and model (6) a pooled ordered probit estimation with firm-fixed effects. The dependent variables are the natural logarithm of the one- and five-year *CDS Spread*, the *DTD*, the one- and five-year *Probability of Default (PD)* and the *Credit rating* by Standard & Poor's. Standard errors are clustered on firm level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix II.C: ESG effects on lags of S&P's credit ratings.

	Panel A: U.S.		Panel B: EU	
	(1)	(2)	(3)	(4)
	Credit Rating	Credit Rating	Credit Rating	Credit Rating
Environment (t-1)	-0.0003		-0.0046	
	(0.0021)		(0.0033)	
Environment (t-2)		0.0023		-0.0065**
		(0.0021)		(0.0033)
Social (t-1)	-0.0012		-0.0105***	
	(0.0031)		(0.0035)	
Social (t-2)		-0.0034		-0.0080**
		(0.0033)		(0.0038)
Governance (t-1)	0.0000		0.0034	
	(0.0019)		(0.0023)	
Governance (t-2)		-0.0001		0.0027
		(0.0017)		(0.0024)
Leverage	-3.0144***	-2.9759***	-2.8871***	-2.7243***
	(0.3087)	(0.3218)	(0.5875)	(0.6368)
Profitability	5.3547***	5.3229***	6.5634***	6.6311***
	(0.5948)	(0.6490)	(1.2748)	(1.3731)
Size	0.7425***	0.7411***	0.0211	0.0846
	(0.1161)	(0.1328)	(0.1652)	(0.1752)
Sales growth	-0.1467*	-0.0975	0.3607***	0.3049***
	(0.0825)	(0.0876)	(0.0905)	(0.1097)
Dividend yield	-0.6921	0.3479	-3.8543	-4.3231*
	(2.5268)	(2.7836)	(2.3834)	(2.4631)
Firm-year Obs.	6,681	5,988	3,462	3,183
Obs.	912	860	391	362
Pseudo R^2	0.496	0.508	0.454	0.471

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Appendix II.C – continued from previous page

Remark: This table presents panel estimations of the effects of the first and second lag of the three CSR facets *Environment*, *Social*, *Governance* on companies' credit rating in the U.S. in Panel A and in the EU in Panel B. Models (1) to (4) employ a pooled ordered probit estimation with firm-fixed effects. The dependent variables are the *Credit rating* by Standard & Poor's. Standard errors are clustered on firm level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix III (to Chapter IV)

Appendix III.A: Measuring misvaluation.

Residual income model

Ohlson (1995) defined a measurement that theoretically tries to relate a firm's earnings and book value forecast in consistency with 'clean surplus' accounting to its actual equity market value. The 'residual income model' first aims to identify a true imputed market value of equity V and second tries to estimate the deviation of this value from the actual observed market value of equity P. Hence, it delivers a value of equity misvaluation (P/V). On the foundation of this work among others Lee et al. (1999) and Dong et al. (2006) develop a model that estimates the equity market value of a company based on a prediction of finite future earnings forecasts. Here, the authors applied the following equation to assess the true value (V) of company i's equity:

$$\begin{aligned} V_i(t) = B_i(t) &+ \frac{[f_i^{ROE}(t+1) - r_{e(i)}(t)] * B_i(t)}{1 + r_{e(i)}(t)} + \frac{[f_i^{ROE}(t+2) - r_{e(i)}(t)] * B_i(t+1)}{[1 + r_{e(i)}(t)]^2} \\ &+ \frac{[f_i^{ROE}(t+3) - r_{e(i)}(t)] * B_i(t+2)}{[1 + r_{e(i)}(t)]^2 * r_{e(i)}(t)}, \end{aligned} \tag{A.1}$$

where $f^{ROE}(t+n)$ is the forecasted return on equity for period $t+n$, every period has a length of one year and the last term discounts the period $t+3$ residual income as a perpetuity. Hereby, we follow Lee et al. (1999), D'mello and Shroff (2000), Dong et al. (2006) and Dong et al. (2020) and assume that the expected residual earnings remain constant after year three. The term $B_i(t)$ reflects company i's book value of equity in year t.

The ROE forecast is estimated as follows:

$$f_i^{ROE}(t+1) = \frac{f_i^{EPS}(t+n)}{\bar{B}_i(t+n-1)} \tag{A.2}$$

and $\bar{B}_i(t+n-1)$ is determined by

$$\bar{B}_i(t+n-1) \equiv \frac{B_i(t+n-1) + B_i(t+n-2)}{2}. \tag{A.3}$$

According to Dong et al. (2006), f^{ROE} is required to be less than one. The future book value of equity is then estimated as follows:

$$B_i(t+n) = B_i(t+n-1) + (1-k_i) * f_i^{EPS} * (t+n), \tag{A.4}$$

f^{EPS} reflects company i's forecasted earnings per share in the year $t+n$.[1] k represents the dividend payout ratio of company i and defined as

$$k_i = \frac{D_i(t)}{EPS_i(t)}. \tag{A.5}$$

Here, D stands for the dividend and EPS for the earnings per share of firm i in year t. Following Dong et al. (2020), we delete payout ratios k with values greater than one. According to equation (A.5), companies with negative EPS have a value of $k < 0$. To deal with this issue we follow Lee et al. (1999) and Dong et al. (2006) and approximate the payout ratio by multiplying the value of a company's $Total\ Assets$ with 0.06. In estimating the equity cost of capital $r_e(t)$ we rely on Dong et al. (2006) using the Capital Asset Pricing Model (CAPM) with a beta calibration period of five years prior to the respective true equity value (V) estimation. Resulting estimates of $r_e(t)$ outside of the range of 3% and 30% are winsorized.

Finally, to estimate the misvaluation derived from the residual income model the imputed value is compared to the actual observed value. We apply the following formula:

$$RES_i^{MSV}(t) = \frac{P_i(t)}{V_i(t)}. \tag{A.6}$$

[1] If any of the EPS forecasts are not available, we compute it using the preceding EPS growing with long-term growth rate provided by Refinitiv I/B/E/S data. If the long-term growth rate is also not available, we only rely on the preceding forecasted EPS as a substitute.

The price value $P_i(t)$ is here the market capitalization, i.e. the market value of equity of company i and the term $V_i(t)$ reflects a company's imputed true value.

RRV misvaluation measure

Based on the theoretical approach of Rhodes-Kropf and Viswanathan (2004), Rhodes-Kropf et al. (2005) developed a method that identifies a misvaluation of companies in an M&A context by decomposing the *Market-to-book* ratio into two components:

$$\text{Market-to-book} \equiv \text{Market-to-value} * \text{Value-to-book}, \tag{A.7}$$

where *Market* stands for the observed market value of equity, *Value* reflects an imputed true value of the company and *Book* represents the book value of equity. Hence, the *Market-to-value* variable reflects the misvaluation in a quite similar manner as proposed in the misvaluation approaches of the residual income model (e.g. Ohlson, 1995; Lee et al., 1999; Dong et al., 2006).

Rhodes-Kropf et al. (2005) base their estimation of the true market value of equity on the relation between *Market* and *Book* value. The authors argue that drivers of this specific relation can differ with regards to the respective industry and comprise the companies' leverage (LEV) and its net income (NI). The resulting formula is shown below:

$$\begin{aligned} M_i(t) = \alpha_{0j}(t) + \alpha_{1j}(t) * B_i(t) + \alpha_{2j}(t) * ln[(NI)_i^+(t)] + \alpha_{3j}(t) * I_{(<0)} * ln[(NI)_i^+(t)] \\ + \alpha_{4j}(t) * LEV_i(t) + \epsilon_i(t). \end{aligned} \tag{A.8}$$

The formula shows that in theory the market value M of company i at time t depends on several accounting figures, i.e. its book value of equity B, its net income NI and its leverage LEV. As the formula takes the natural logarithm of the absolute value of net income into account, the dummy variable I is introduced to deal with negative values of a NI. Additionally, the relationship is influenced by industry specific effects. Therefore, the values of α_0, α_1, α_2, α_3 and α_4 differ depending on the respective industry j of company i.

We apply the approach of Rhodes-Kropf et al. (2005) and perform industry-wise regressions based on the Fama-French 12 industry classification to estimate the industry-specific α_{0-4} values. Computing the industry-based true value V of company i in a specific year, we use the following model:

$$V(B_i(t), NI_i(t), LEV_i(t); \bar{\alpha}_{0j}, \bar{\alpha}_{1j}, \bar{\alpha}_{2j}, \bar{\alpha}_{3j}, \bar{\alpha}_{4j}) = \bar{\alpha}_{0j} + \bar{\alpha}_{1j} * B_i(t) + \bar{\alpha}_{2j} * ln[(NI)_i^+(t)] + \bar{\alpha}_{3j} * I_{(<0)} * ln[(NI)_i^+(t)] + \bar{\alpha}_{4j} * LEV_i(t). \tag{A.9}$$

Here, the derivation of the imputed true value V of company i in year t results from an addition of the industry-specific $\bar{\alpha}_{0j}$ and the multiplied industry-specific $\bar{\alpha}_{1-4j}$ values by the respective values of company i's B, NI and LEV. The resulting imputed true market value of equity V of company i is then compared to the observed market value of equity M and the respective deviation is expressed as its misvaluation.

$$RRV_i^{MSV}(t) = \frac{M_i(t)}{V_i(t)}. \tag{A.10}$$

Hence, a high value of $RRV_i^{MSV}(t)$ denotes an overvaluation and a respectively low value reflects an undervaluation of company i in year t. Rhodes-Kropf et al. (2005) find that this measure explains between 80% to 94% of the within-industry variation in firm values.

Appendix III.B: Counts and weights per category to calculate the *ESG score* by Refinitiv (2020).

Pillar	Category	Indicators in scoring	Weights
Environmental	Resource use	20	11%
	Emissions	22	12%
	Innovation	19	11%
Social	Workforce	29	16%
	Human rights	8	4.50%
	Community	14	8%
	Product responsibility	12	7%
Governance	Management	34	19%
	Shareholders	12	7%
	CSR strategy	8	4.50%
Total		178	100%

Remark: This table reports counts and weights per category used by Refinitiv to calculate the overall *ESG score*. Each category consists of a different number of measures (indicators). The count of measures per category determines the weight of the respective category. Thus, categories that contain multiple issues like Management (composition, diversity, independence, compensation, etc.) will have higher weight than lighter categories such as Human Rights (Refinitiv, 2020).

Appendix III.C: The moderating role of information asymmetry — full sample.

	(1) RES^{MSV}	(2) RES^{MSV}	(3) RES^{MSV}	(4) RES^{MSV}	(5) RRV^{MSV}	(6) RRV^{MSV}	(7) RRV^{MSV}	(8) RRV^{MSV}
L.dep. var.	-0.0126	0.0182	0.0192	0.0181	0.0290	0.0478	0.0542*	0.0536*
	(0.0217)	(0.0207)	(0.0204)	(0.0202)	(0.0302)	(0.0308)	(0.0316)	(0.0315)
L.ESG score	0.0370***	0.0320***	0.0308***	0.0324***	0.00303***	0.00314***	0.00223**	0.00238***
	(0.00464)	(0.00363)	(0.00377)	(0.00351)	(0.00101)	(0.000961)	(0.000880)	(0.000860)
Bid-Ask-spread	5.374***				0.192			
	(1.498)				(0.262)			
L.ESG*Bid-Ask	-0.0623***				-0.00276			
	(0.0231)				(0.00465)			
Illiquidity		-0.000550				0.00438**		
		(0.000694)				(0.00217)		
L.ESG*Illiquidity		1.53e-05				-0.000120**		
		(1.86e-05)				(5.96e-05)		
Forecast σ			-0.257				-0.132	
			(0.660)				(0.127)	
L.ESG*Forecast σ			0.00630				0.00278	
			(0.0110)				(0.00267)	
Forecast error				0.0134*				0.00153
				(0.00780)				(0.00158)
L.ESG*Forecast error				-0.000159				8.51e-06

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	(1) RES^{MSV}	(2) RES^{MSV}	(3) RES^{MSV}	(4) RES^{MSV}	(5) RRV^{MSV}	(6) RRV^{MSV}	(7) RRV^{MSV}	(8) RRV^{MSV}
				(0.000127)				(3.18e-05)
Profitability	-4.542***	-4.774***	-4.164***	-3.916***	-0.758***	-0.779***	-0.597***	-0.482**
	(1.008)	(1.010)	(0.910)	(0.912)	(0.232)	(0.224)	(0.228)	(0.226)
CapEx	16.04***	15.05***	13.91***	13.87***	0.756	0.616	0.454	0.469
	(2.257)	(2.259)	(2.058)	(2.077)	(0.530)	(0.500)	(0.444)	(0.441)
Analyst coverage	0.0169	0.0192	0.0196*	0.0188	-0.00163	-0.00247	-0.00227	-0.00208
	(0.0124)	(0.0119)	(0.0117)	(0.0117)	(0.00255)	(0.00235)	(0.00257)	(0.00252)
σ	-0.499***	-0.380***	-0.380***	-0.394***	-0.0448***	-0.0351**	-0.0279*	-0.0387**
	(0.0538)	(0.0531)	(0.0505)	(0.0508)	(0.0155)	(0.0169)	(0.0165)	(0.0154)
Leverage	-4.453***	-4.400***	-4.142***	-4.184***	0.764***	0.750***	0.833***	0.846***
	(0.667)	(0.644)	(0.632)	(0.630)	(0.159)	(0.152)	(0.154)	(0.160)
Market-to-book	0.0982***	0.0978***	0.0926***	0.0942***	0.166***	0.165***	0.164***	0.163***
	(0.0169)	(0.0165)	(0.0160)	(0.0164)	(0.00685)	(0.00670)	(0.00665)	(0.00678)
Constant	4.654***	4.699***	4.515***	4.435***	0.300**	0.276**	0.231*	0.212*
	(0.562)	(0.508)	(0.503)	(0.491)	(0.129)	(0.125)	(0.126)	(0.126)
Firm-year obs.	5,803	5,982	6,211	6,214	7,281	7,593	7,759	7,816
R^2	0.111	0.085	0.083	0.089	0.435	0.442	0.434	0.436
Obs.	1,046	1,047	1,085	1,089	1,274	1,274	1,283	1,308

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Appendix III.C – continued from previous page

Remark: This table presents the fixed-effects estimations of the effects of a company's lagged *ESG score* on its respective misvaluation for the full sample including information asymmetry proxies. The dependent variables are the residual income misvaluation measure RES^{MSV} according to Ohlson (1995) in models (1) to (4) as well as the Rhodes-Kropf et al. (2005) misvaluation measure RRV^{MSV} in models (5) to (8). The information asymmetry proxies are the *Bid-ask spread* in models (1) and (5), the *Illiquidity* in models (2) and (6), the *Forecast* σ in models (3) and (7) as well as the *Forecast error* in models (4) and (8). Standard errors are clustered at firm-level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix III.D: Descriptive statistics of index additions and deletions of firms to/from the sustainability index MSCI KLD 400 Social.

	MSCI KLD 400 Social	
	(1)	(2)
	RES^{MSV}	RRV^{MSV}
Index Additions	219	252
Index Deletions	130	149

Remark: This table reports counts of relevant index additions and deletions to the MSCI KLD 400 Social index over the sample period from 2006 to 2017. Due to data availability of misvaluation measures different numbers of constituency changes occur. The relevant index changes can be referred from the columns (1) and (2) for the RES^{MSV} and RRV^{MSV}, respectively.

Appendix IV (to Chapter VI)

Appendix IV.A: Fixed-effects estimation of pillar categories effects on equity risk with lagged dependent variable.

	(1)	(2)	(3)	(4)	(5)	(6)
	σ	σ_ϵ	VaR	CVaR	LPM(0,2)	LPM(0,3)
L.dep. var.	0.334***	0.333***	0.329***	0.252***	0.287***	0.182***
	(0.0103)	(0.0123)	(0.0102)	(0.0112)	(0.0108)	(0.0125)
Environmental Categories						
Resource Use	0.0418	0.0490	0.0820	0.0801	0.0305	0.0367
	(0.0769)	(0.0609)	(0.131)	(0.181)	(0.0745)	(0.105)
Innovation	-0.203***	-0.143***	-0.404***	-0.427***	-0.181***	-0.159**
	(0.0536)	(0.0395)	(0.0944)	(0.126)	(0.0526)	(0.0728)
Emission	0.0198	-0.0327	0.0683	0.0960	0.0534	0.0857
	(0.0778)	(0.0601)	(0.133)	(0.182)	(0.0766)	(0.107)
Social Categories						
Workforce	-0.0389	-0.00172	-0.122	-0.109	-0.0360	-0.0116
	(0.0910)	(0.0707)	(0.157)	(0.214)	(0.0900)	(0.123)
Human Rights	-0.221***	-0.106***	-0.389***	-0.439***	-0.197***	-0.197***
	(0.0493)	(0.0380)	(0.0857)	(0.119)	(0.0502)	(0.0730)
Community	-0.191***	-0.119***	-0.344***	-0.463***	-0.194***	-0.276***
	(0.0575)	(0.0443)	(0.103)	(0.137)	(0.0579)	(0.0798)
Product Responsibility	-0.0680	-0.0398	-0.128	-0.0362	-0.0269	0.0332
	(0.0557)	(0.0420)	(0.0976)	(0.132)	(0.0549)	(0.0752)
Governance Categories						
Management	-0.0662	-0.0550	-0.162*	-0.140	-0.0567	-0.0341
	(0.0527)	(0.0388)	(0.0917)	(0.126)	(0.0528)	(0.0750)

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Appendix IV.A – continued from previous page

	(1)	(2)	(3)	(4)	(5)	(6)
	σ	σ_ϵ	VaR	CVaR	LPM(0,2)	LPM(0,3)
Shareholder	0.0256	0.0108	0.0363	0.0668	0.0235	0.0517
	(0.0502)	(0.0383)	(0.0856)	(0.120)	(0.0510)	(0.0727)
CSR Strategy	-0.248***	-0.165***	-0.446***	-0.491***	-0.224***	-0.241***
	(0.0676)	(0.0519)	(0.119)	(0.160)	(0.0678)	(0.0925)
Firm-year Obs.	6,911	6,911	6,911	6,911	6,911	6,911
Obs.	744	744	744	744	744	744
R^2	0.148	0.150	0.147	0.086	0.106	0.047
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Remark: This table presents the fixed-effects estimation of the effects of the *ESG pillar categories* on companies' equity risk in the EU. The dependent variables are the stock volatility σ in model (1), idiosyncratic risk σ_ϵ in model (2), *VaR* in model (3), *CVaR* in model (4) as well as the second and third order lower partial moments *LPM(0,2)* in model (5) and *LPM(0,3)* in model (6). *L.dep. var.* denotes the lagged value of the respective dependent variable. Standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix V (to Chapter VII)

Appendix V.A: Logistic regressions of gender-dependent appointments in German firms using propensity scoring with nearest-neighbor and stratified matching.

	Nearest-neighbor matching			Stratified matching		
	(1)	(2)	(3)	(4)	(5)	(6)
RAR	0.601			0.561		
	(0.596)			(0.452)		
ROE		0.973			0.754	
		(1.324)			(1.096)	
ROA			1.718			-1.681
			(4.452)			(3.795)
Company age	-0.00398	-0.00306	-0.0032	-0.000841	-0.000577	-0.00101
	(0.00424)	(0.00406)	(0.0041)	(0.00369)	(0.00381)	(0.00372)
No. of employees	1.03E-06	1.34E-06	1.43E-06	1.44E-06	1.74E-06	1.70E-06
	(1.67E-06)	(1.54E-06)	(1.54E-06)	(1.32E-06)	(1.24E-06)	(1.25E-06)
Revenue	-4.01E-06	-5.02E-06	-4.53E-06	6.60E-07	9.46E-08	2.86E-08
	(7.02E-06)	(6.92E-06)	(6.90E-06)	(5.60E-06)	(5.38E-06)	(5.21E-06)
Taking-office-date	2.90E-05	2.55E-05	3.13E-05	0.000486*	0.000498*	0.000527*
	(0.000313)	(0.000317)	(0.000313)	(0.000285)	(0.000289)	(0.000302)
Leverage	0.0238	0.0183	0.0204	-0.00323	-0.00719	-0.00955
	(0.0383)	(0.0348)	(0.0372)	(0.0137)	(0.0149)	(0.0147)
PPE	1.289	1.331	1.326	-0.046	-0.24	-0.278
	(1.631)	(1.631)	(1.656)	(1.371)	(1.394)	(1.356)
Constant	-0.466	-0.615	-0.699	-10.96**	-11.27**	-11.61**
	(6.033)	(6.072)	(6.014)	(5.336)	(5.375)	(5.605)

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Appendix V.A – continued from previous page

	Nearest-neighbor matching			Stratified matching		
	(1)	(2)	(3)	(4)	(5)	(6)
Observations	84	84	84	222	222	222
R^2	0.0271	0.021	0.0176	0.0374	0.0322	0.0311
χ^2	3.689	2.902	2.549	7.007	6.785	5.55

Remark: This table presents logistic regressions of female board member appointments in German firms on pre-appointment firm performance. Models (1) to (3) analyze samples derived from propensity scoring with nearest-neighbor matching, models (4) to (6) use samples derived from stratified matching. *Taking-office-date* is a numerical variable where January 1, 1900 takes the value 1. Standard errors are clustered on the firm level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix V.B: First-stage IV regression for German firms.

	Female
Company Age	-0.0003073**
	(0.000142)
Leverage	-0.001474
	(0.0013676)
PPE	-0.0368505
	(0.0603793)
Company Age (centered)	-0.0043879
	(0.0028281)
Leverage (centered)	-0.0288475
	(0.0282193)
PPE (centered)	-0.546542
	(0.9968378)
Constant	0.1242443***
	(0.0221472)
Observations	12,600
Heteroscedasticity tests:	
Breusch-Pagan	233.21
p-value	0
White	439.53
p-value	0
Underidentification test:	
Kleibergen-Paap rk LM statistic	2.9
p-value	0.4077
Weak identification test:	
Cragg-Donald Wald F statistic[a]	405.21

Remark: This table shows the first-stage results of the IV regression for German firms, in which *female* is instrumented following Lewbel (2012). Standard errors are clustered on the firm level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

[a] Stock-Yogo weak ID test critical values for one endogenous regressor and three excluded instruments: 5% maximal IV relative bias 13.91; 10% maximal IV relative bias 9.08; 20% maximal IV relative bias 6.46; 30% maximal IV relative bias 5.39; 10% maximal IV size 22.30; 15% maximal IV size 12.83; 20% maximal IV size 9.54; 25% maximal IV size 7.80.

Appendix V.C: Panel-regression of market-based returns in German firms using propensity scoring with nearest-neighbor and stratified matching.

	Nearest-neighbor matching		Stratified matching	
	(1)	(2)	(3)	(4)
	Panel RE	Pooled FE	Panel RE	Pooled FE
Female	0.0991	-0.253***	0.0843	-0.0771**
	(0.0915)	(0.0527)	(0.0637)	(0.0349)
Time	-0.00398	-0.00398	-0.00188	-0.00188
	(0.00342)	(0.00349)	(0.0016)	(0.00164)
Female*Time	0.00293	0.00293	0.00265	0.00265
	(0.00413)	(0.00422)	(0.00274)	(0.0028)
Company age	0.000870*	0.00295***	0.000003	-0.00184***
	(0.000445)	(0)	(0.000307)	(0.000006)
Leverage	-0.00447***	-0.0128***	-0.00421***	-0.00142***
	(0.0013)	(0)	(0.000588)	(0.0000009)
PPE	-0.00458	-96.11***	-0.227**	-0.0102***
	(0.118)	(0.000006)	(0.0978)	(0.000309)
Constant	-0.162	0.445***	0.0118	0.0795***
	(0.101)	(0.0436)	(0.0491)	(0.0205)
Observations	2,016	2,016	5,328	5,328
# appointments	84		222	
R^2 within	0.0164	0.65	0.0061	0.652
R^2 between	0.0974	0.65	0.0864	0.652
R^2 overall	0.0686	0.635	0.0583	0.636

Remark: This table presents panel estimates of the effects of new board members' gender and time on pre-appointment performance of German firms. Models (1) and (2) analyze samples derived from propensity scoring with nearest-neighbor matching, models (3) and (4) use samples derived from stratified matching. The dependent variable is *risk-adjusted stock returns (RAR)*. Coefficients are estimated using random effects (RE) GLS estimation (models (1) and (3)) and pooled OLS with observation fixed effects (FE; models (2) and (4)). *Female* is a dummy variable *Time* is measured in months. Standard errors are clustered on the firm level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix V.D: Panel-regression of accounting-based returns in German firms using propensity scoring with nearest-neighbor and stratified matching.

	Nearest-neighbor matching				Stratified matching			
	Panel RE		Pooled FE		Panel RE		Pooled FE	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ROA	ROE	ROA	ROE	ROA	ROE	ROA	ROE
Female	-0.00469	-0.0512	-0.00366	-0.135***	-0.0146***	-0.0572**	-0.0686***	-0.349***
	(0.016)	(0.038)	(0.0137)	(0.0429)	(0.00551)	(0.0246)	(0.00496)	(0.0299)
Time	-0.00424	-0.0181	-0.00424	-0.0181	-0.000806	-0.00267	-0.000806	-0.00267
	(0.00511)	(0.0144)	(0.0062)	(0.0175)	(0.00124)	(0.00558)	(0.00151)	(0.00681)
Female*Time	0.00319	0.0301*	0.00319	0.0301	0.00373*	0.0262**	0.00373	0.0262*
	(0.00566)	(0.0177)	(0.00687)	(0.0215)	(0.00203)	(0.0122)	(0.00248)	(0.0149)
Company age	-3.47E-05	-2.65E-05	0.000385***	0.00141***	-5.56E-05	-0.000223	5.39e-4***	-0.00615***
	(0.00011)	(0.000382)	(0)	(0)	(7.04E-05)	(0.000217)	(0)	(0)
Leverage	-0.00116**	-0.000391	-0.000716***	-0.00436***	-0.000759***	-0.000746	1.61e-05***	0.00866***
	(0.00054)	(0.00078)	(0)	(0)	(0.000249)	(0.000464)	(0)	(0)
PPE	0.0346	0.0586	-8.313***	-49.12***	0.00839	-0.034	-0.441***	-196.4***
	(0.0308)	(0.0785)	(3.4E-09)	(1.99E-08)	(0.022)	(0.0514)	(2.1E-09)	(0.000000599)
Constant	0.0522**	0.142**	0.0288**	0.369***	0.0501***	0.143***	0.0801***	0.835***
	(0.0214)	(0.0607)	(0.0124)	(0.035)	(0.0105)	(0.0284)	(0.00302)	(0.0136)
Observations	252	252	252	252	666	666	666	666
# appointments	84	84			222	222		
R^2 within	0.0101	0.0237	0.793	0.761	0.00561	0.0114	0.879	0.727
R^2 between	0.077	0.00655			0.0948	0.0209		
R^2 overall	0.063	0.0108			0.084	0.0183		

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Appendix V.D – continued from previous page

Remark: This table presents panel estimates of the effects of new board members' gender and time on pre-appointment performance in German firms. Models (1) to (4) analyze samples derived from propensity scoring with nearest-neighbor matching, models (5) to (8) use samples derived from stratified matching. The dependent variables are *ROA* and *ROE*. Coefficients are estimated using random effects (RE) GLS estimation and pooled OLS with observation fixed effects (FE). *Female* is a dummy variable. *Time* is measured in months. Standard errors are clustered on the firm level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix V.E: Short-term market reaction to new board appointments in German firms (propensity scoring with nearest-neighbor matching).

	Declining performance over...				Period of economic instability	
	(1)	(2)	(3)	(4)	(5)	(6)
	24 months	12 months	6 months	3 months	Q3/07 - Q1/10	Sep15/08 - Q4/09
Female	-0.00407	3.46E-05	0.0135	0.00968	0.00427	0.00639
	(0.00952)	(0.01)	(0.0118)	(0.011)	(0.00803)	(0.00759)
Decl. perf.	-0.0250**	-0.0365***	-0.0186*	-0.018		
	(0.0105)	(0.00824)	(0.0101)	(0.0113)		
Female*Decl. perf.	0.0381***	0.0279**	0.00497	0.0111		
	(0.0136)	(0.0129)	(0.0153)	(0.0154)		
Eco. instability					-0.014	-0.0290**
					(0.0121)	(0.0128)
Female*Eco. inst.					0.0451**	0.0660***
					(0.0189)	(0.0247)
Company age	-5.02E-05	-6.20E-05	-6.57E-05	-6.50E-05	-7.45E-05	-8.98E-05
	(6.35E-05)	(6.28E-05)	(6.80E-05)	(7.02E-05)	(6.81E-05)	(6.85E-05)
No. of employees	1.68E-09	-7.37E-09	9.34E-09	8.61E-09	1.55E-08	8.30E-09
	(2.28E-08)	(2.98E-08)	(2.64E-08)	(2.82E-08)	(2.15E-08)	(2.14E-08)
Revenues	-1.95E-08	-4.58E-08	-7.50E-08	-7.71E-08	-4.42E-08	-4.21E-08
	(8.75E-08)	(1.13E-07)	(1.04E-07)	(1.02E-07)	(8.73E-08)	(8.37E-08)
Leverage	0.000154	0.000212	9.33E-05	8.24E-05	2.83E-05	-2.80E-05
	(0.000422)	(0.000445)	(0.00044)	(0.000467)	(0.000344)	(0.000383)
PPE	-0.0351	-0.0335	-0.0338	-0.0337	-0.0511**	-0.0551**
	(0.0222)	(0.022)	(0.0217)	(0.0212)	(0.0208)	(0.0236)
Constant	0.0149	0.0228**	0.0137	0.0131	0.012	0.0144
	(0.0101)	(0.0107)	(0.011)	(0.0105)	(0.0102)	(0.0107)
Observations	83	83	83	83	83	83
R^2	0.182	0.249	0.159	0.141	0.186	0.196

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Appendix V.E – continued from previous page

Remark: This table presents OLS estimates of the effects of new board members' gender and of multiple dummies for precarious firm situations on the market response to the announcement of a new board member appointment. The dependent variable is the accumulated *daily risk-adjusted stock return* over the three day window surrounding the announcement date (i.e., press release date). *Female* is a dummy variable. *Declining firm performance* in model (1) is a dummy variable that takes the value 1 if the accumulated monthly stock-market return over the 24 months (12 months for model (2), 6 months for model (3) and 3 months for model (4)) is negative and zero otherwise. *Economic instability* in models (5) and (6) is a dummy variable that takes the value 1 if the announcement occurs between Q3 2007 and Q1 2010 (September 15, 2008 and Q4 2009) and zero otherwise. Standard errors are clustered on the firm level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix V.F: Short-term market reaction to new board member appointments in German firms (propensity scoring with stratified matching).

	Declining performance over...				Period of economic instability	
	(1)	(2)	(3)	(4)	(5)	(6)
	24 months	12 months	6 months	3 months	Q3/07 - Q1/10	Sep15/08 - Q4/09
Female	-4.35E-05	0.00804	0.011	0.0132	0.00378	0.00542
	(0.00658)	(0.00883)	(0.0116)	(0.00972)	(0.00547)	(0.00522)
Decl. perf.	-0.00487	-0.000873	-0.00674	0.00158		
	(0.00704)	(0.00657)	(0.00759)	(0.00709)		
Female*Decl. perf.	0.0139	-0.00492	-0.00633	-0.0146		
	(0.0144)	(0.00972)	(0.0119)	(0.0111)		
Eco. instability					0.00425	0.0163
					(0.00842)	(0.016)
Female*Eco. inst.					0.0205	0.0168
					(0.0257)	(0.0391)
Company age	-5.29E-05	-5.69E-05	-5.87E-05	-5.47E-05	-4.52E-05	-3.35E-05
	(6.32E-05)	(6.46E-05)	(6.08E-05)	(6.52E-05)	(5.78E-05)	(5.14E-05)
No. of employees	1.97E-09	(0)	1.10E-09	-2.65E-10	2.20E-10	9.60E-10
	(2.24E-08)	(2.40E-08)	(2.30E-08)	(2.57E-08)	(2.64E-08)	(2.47E-08)
Revenues	-1.09e-07**	-1.10e-07*	-1.15e-07*	-1.07e-07*	-1.06e-07*	-1.09e-07**
	(5.22E-08)	(5.84E-08)	(5.90E-08)	(5.99E-08)	(5.54E-08)	(5.36E-08)
Leverage	-0.000139	-0.000165	-0.000115	-0.000184	-0.000179	-0.000179
	(0.000169)	(0.000159)	(0.000163)	(0.000145)	(0.000132)	(0.000134)
PPE	-0.0277	-0.0275	-0.022	-0.0268	-0.0292*	-0.0298*
	(0.0209)	(0.02)	(0.0217)	(0.0197)	(0.0166)	(0.0171)
Constant	0.0146	0.0134	0.0147	0.0121	0.0113	0.00952
	(0.00966)	(0.00968)	(0.0099)	(0.00986)	(0.00895)	(0.00792)
Observations	218	218	218	218	218	218
R^2	0.043	0.039	0.047	0.042	0.047	0.062

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Appendix V.F – continued from previous page

Remark: This table presents OLS estimates of the effects of new board members' gender and of multiple dummies for precarious firm situations on the market response to the announcement of a new board member appointment. The dependent variable is the accumulated *daily risk-adjusted stock return* over the three day window surrounding the announcement date (i.e., press release date). *Female* is a dummy variable. *Declining firm performance* in model (1) is a dummy variable that takes the value 1 if the accumulated monthly stock-market return over the 24 months (12 months for model (2), 6 months for model (3) and 3 months for model (4)) is negative and zero otherwise. *Economic instability* in models (5) and (6) is a dummy variable that takes the value 1 if the announcement occurs between Q3 2007 and Q1 2010 (September 15, 2008 and Q4 2009) and zero otherwise. Standard errors are clustered on the firm level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Bibliography

Aarts, H., P. M. Gollwitzer, and R. R. Hassin (2004): "Goal Contagion: Perceiving Is for Pursuing," *Journal of Personality and Social Psychology*, 87, 23–37.

Adams, R. B. (2017): "Boards, and the Directors Who Sit on Them," in *The Handbook of the Economics of Corporate Governance*, Elsevier, 291–382.

Adams, R. B. and D. Ferreira (2009): "Women in the boardroom and their impact on governance and performance," *Journal of Financial Economics*, 94, 291–309.

Adams, R. B., S. Gray, and J. Nowland (2012): "Does Gender Matter in the Boardroom? Evidence from the Market Reaction to Mandatory New Director Announcements," *SSRN Electronic Journal*.

Adams, S. M., A. Gupta, and J. D. Leeth (2009): "Are Female Executives Over-represented in Precarious Leadership Positions?" *British Journal of Management*, 20, 1–12.

Aguilera, R. V. and G. Jackson (2003): "The Cross-National Diversity of Corporate Governance: Dimensions and Determinants," *Academy of Management Review*, 28, 447–465.

Aguilera, R. V., C. A. Williams, J. M. Conley, and D. E. Rupp (2006): "Corporate Governance and Social Responsibility: a comparative analysis of the UK and the US," *Corporate Governance: An International Review*, 14, 147–158.

Albuquerque, R., Y. Koskinen, S. Yang, and C. Zhang (2020): "Resiliency of Environmental and Social Stocks: An Analysis of the Exogenous COVID-19 Market Crash," *The Review of Corporate Finance Studies*, 9, 593–621.

Albuquerque, R., Y. Koskinen, and C. Zhang (2019): "Corporate social responsibility and firm risk: Theory and empirical evidence," *Management Science*, 65, 4451–4469.

Alok, S., N. Kumar, and R. Wermers (2020): "Do Fund Managers Misestimate Climatic Disaster Risk," *The Review of Financial Studies*, 33, 1146–1183.

Amihud, Y. (2002): "Illiquidity and stock returns: cross-section and time-series effects," *Journal of Financial Markets*, 5, 31–56.

Anand, R. and M.-F. Winters (2008): "A Retrospective View of Corporate Diversity Training From 1964 to the Present," *Academy of Management Learning & Education*, 7, 356–372.

Angrist, J. D. and J.-S. Pischke (2009): *Mostly Harmless Econometrics — An Empricist's Companion*, Princeton University Press.

Anthony, J. H. and K. Ramesh (1992): "Association between accounting performance measures and stock prices: A test of the life cycle hypothesis," *Journal of Accounting and Economics*, 15, 203–227.

Antonakis, J., S. Bendahan, P. Jacquart, and R. Lalive (2010): "On making causal claims: A review and recommendations," *The Leadership Quarterly*, 21, 1086–1120.

Arellano, M. and S. Bond (1991): "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations," *Review of Economic Studies*, 58, 277–297.

Arellano, M. and O. Bover (1995): "Another look at the instrumental variable estimation of error-components models," *Journal of Econometrics*, 68, 29–51.

AURELI, S., E. MAGNAGHI, AND F. SALVATORI (2018): "The Transposition of the Non-Financial Reporting Directive in the UK, France and Italy," *Symphonya. Emerging Issues in Management*, 48–67.

AVRAMOV, D., S. CHENG, AND A. HAMEED (2020): "Mutual Funds and Mispriced Stocks," *Management Science*, 66, 2372–2395.

BACHARACH, S. B. (1989): "Organizational Theories: Some Criteria for Evaluation," *Academy of Management Review*, 14, 496–515.

BAE, K.-H., S. E. GHOUL, O. GUEDHAMI, C. C. KWOK, AND Y. ZHENG (2019): "Does corporate social responsibility reduce the costs of high leverage? Evidence from capital structure and product market interactions," *Journal of Banking & Finance*, 100, 135–150.

BAJIC, S. AND B. YURTOGLU (2018): "Which aspects of CSR predict firm market value?" *Journal of Capital Markets Studies*, 2, 50–69.

BAKER, M. AND J. WURGLER (2006): "Investor Sentiment and the Cross-Section of Stock Returns," *The Journal of Finance*, 61, 1645–1680.

BANNIER, C. E., Y. BOFINGER, AND B. ROCK (2021): "Doing Safe by Doing Good: Non-Financial Reporting and the Risk Effects of Corporate Social Responsibility," *SSRN Electronic Journal*.

BARBER, B. M., A. MORSE, AND A. YASUDA (2021): "Impact investing," *Journal of Financial Economics*, 139, 162–185.

BARNEA, A. AND A. RUBIN (2010): "Corporate Social Responsibility as a Conflict Between Shareholders," *Journal of Business Ethics*, 97, 71–86.

BAWA, V. S. (1975): "Optimal rules for ordering uncertain prospects," *Journal of Financial Economics*, 2, 95–121.

BECCHETTI, L., R. CICIRETTI, AND A. GIOVANNELLI (2013): "Corporate social responsibility and earnings forecasting unbiasedness," *Journal of Banking & Finance*, 37, 3654–3668.

BENESCH, C., S. LORETZ, D. STADELMANN, AND T. THOMAS (2019): "Media coverage and immigration worries: Econometric evidence," *Journal of Economic Behavior & Organization*, 160, 52–67.

BENLEMLIH, M., A. SHAUKAT, Y. QIU, AND G. TROJANOWSKI (2016): "Environmental and Social Disclosures and Firm Risk," *Journal of Business Ethics*, 152, 613–626.

BERG, F., J. KOELBEL, AND R. RIGOBON (2020): "Aggregate Confusion: The Divergence of ESG Ratings," *SSRN Electronic Journal*.

BERMAN, S. L., A. C. WICKS, S. KOTHA, AND T. M. JONES (1999): "Does Stakeholder Orientation Matter? The Relationship Between Stakeholder Management Models and Firm Financial Performance," *Academy of Management Journal*, 42, 488–506.

BIALKOWSKI, J. AND L. T. STARKS (2016): *SRI Funds: Investor Demand, Exogenous Shocks and ESG Profiles*, Working Paper.

BILANDZIC, H., A. KALCH, AND J. SOENTGEN (2017): "Effects of Goal Framing and Emotions on Perceived Threat and Willingness to Sacrifice for Climate Change," *Science Communication*, 39, 466–491.

BLACKROCK (2020): "Blackrock's 2020 Letter to Clients," https://www.blackrock.com/corporate/investor-relations/2020-blackrock-client-letter, written by Larry Fink — Chairman and CEO, retrieved on 8-12-2021.

BLUNDELL, R. AND S. BOND (1998): "Initial conditions and moment restrictions in dynamic panel data models," *Journal of Econometrics*, 87, 115–143.

Bofinger, Y., K. J. Heyden, and B. Rock (2021): "Corporate Social Responsibility and Market Efficiency: Evidence from ESG and Misvaluation Measures," *SSRN Electronic Journal*.

Boivie, S., S. D. Graffin, A. G. Oliver, and M. C. Withers (2016): "Come Aboard! Exploring the Effects of Directorships in the Executive Labor Market," *Academy of Management Journal*, 59, 1681–1706.

Bollen, N. P. (2007): "Mutual fund attributes and investor behavior," *Journal of Financial and Quantitative Analysis*, 42, 683–708.

Borenstein, M., L. V. Hedges, J. P. T. Higgins, and H. R. Rothstein (2009): *Introduction to Meta-Analysis*, John Wiley & Sons, Ltd.

Bouslah, K., L. Kryzanowski, and B. M'Zali (2013): "The impact of the dimensions of social performance on firm risk," *Journal of Banking & Finance*, 37, 1258–1273.

Boyd, K. S. (2008): "Glass Ceiling," in *Encyclopedia of Race, Ethnicity, and Society*, SAGE Publications, Inc, 549–552.

Brady, D., K. Isaacs, M. Reeves, R. Burroway, and M. Reynolds (2011): "Sector, size, stability, and scandal: Explaining the presence of female executives in Fortune 500 firms," *Gender in Management: An International Journal*, 26, 84–105.

Brailsford, T. J., B. R. Oliver, and S. L. H. Pua (2002): "On the relation between ownership structure and capital structure," *Accounting and Finance*, 42, 1–26.

Brammer, S. J. and S. Pavelin (2006): "Corporate Reputation and Social Performance: The Importance of Fit," *Journal of Management Studies*, 43, 435–455.

Breuer, W., T. Müller, D. Rosenbach, and A. Salzmann (2018): "Corporate social responsibility, investor protection, and cost of equity: A cross-country comparison," *Journal of Banking & Finance*, 96, 34–55.

BRINKHUIS, E. AND B. SCHOLTENS (2018): "Investor response to appointment of female CEOs and CFOs," *The Leadership Quarterly*, 29, 423–441.

BRØGGER, A. C. S. AND A. KRONIES (2021): "Skills and Sentiment in Sustainable Investing," *SSRN Electronic Journal*.

BRUCKMÜLLER, S. AND N. R. BRANSCOMBE (2010): "The glass cliff: When and why women are selected as leaders in crisis contexts," *British Journal of Social Psychology*, 49, 433–451.

BRUCKMÜLLER, S., M. K. RYAN, F. RINK, AND S. A. HASLAM (2014): "Beyond the Glass Ceiling: The Glass Cliff and Its Lessons for Organizational Policy," *Social Issues and Policy Review*, 8, 202–232.

BRUNA, M. G., R. DANG, M.-J. SCOTTO, AND A. AMMARI (2019): "Does board gender diversity affect firm risk-taking? Evidence from the French stock market," *Journal of Management and Governance*, 23, 915–938.

BYUN, S. K. AND J.-M. OH (2018): "Local corporate social responsibility, media coverage, and shareholder value," *Journal of Banking & Finance*, 87, 68–86.

CAHAN, S. F., C. D. VILLIERS, D. C. JETER, V. NAIKER, AND C. J. V. STADEN (2016): "Are CSR Disclosures Value Relevant? Cross-Country Evidence," *European Accounting Review*, 25, 579–611.

CALLEN, J. L., J. LIVNAT, AND D. SEGAL (2009): "The Impact of Earnings on the Pricing of Credit Default Swaps," *The Accounting Review*, 84, 1363–1394.

CAMPBELL, J. Y., A. W. LO, AND A. C. MACKINLAY (1997): *The Econometrics of Financial Markets*, Princeton University Press.

CAO, J., H. LIANG, AND X. ZHAN (2019): "Peer Effects of Corporate Social Responsibility," *Management Science*, 65, 5487–5503.

CAO, J., S. TITMAN, X. ZHAN, AND W. E. ZHANG (2021): "ESG Preference, Institutional Trading, and Stock Return Patterns," *SSRN Electronic Journal*.

Capon, N., J. U. Farley, and S. Hoenig (1990): "Determinants of Financial Performance: a Meta-Analysis," *Management Science*, 36, 1143–1159.

Carhart, M. M. (1997): "On Persistence in Mutual Fund Performance," *The Journal of Finance*, 52, 57–82.

Carli, L. and A. Eagly (2011): "Gender and leadership," in *The SAGE Handbook of Leadership*, SAGE Publications Ltd, 103–117.

Carmeli, A., G. Gilat, and D. A. Waldman (2007): "The Role of Perceived Organizational Performance in Organizational Identification, Adjustment and Job Performance," *Journal of Management Studies*, 44, 972–992.

Cesario, J., K. S. Corker, and S. Jelinek (2013): "A self-regulatory framework for message framing," *Journal of Experimental Social Psychology*, 49, 238–249.

Chakraborty, A., M. P. Singh, and M. Roy (2017): "A study of goal frames shaping pro-environmental behaviour in university students," *International Journal of Sustainability in Higher Education*, 18, 1291–1310.

Cheng, B., I. Ioannou, and G. Serafeim (2013): "Corporate social responsibility and access to finance," *Strategic Management Journal*, 35, 1–23.

Choi, D., Z. Gao, and W. Jiang (2020): "Attention to Global Warming," *The Review of Financial Studies*, 33, 1112–1145.

Christensen, H. B., L. Hail, and C. Leuz (2018): "Economic Analysis of Widespread Adoption of CSR and Sustainability Reporting Standards," *SSRN Electronic Journal*.

——— (2021): "Mandatory CSR and sustainability reporting: economic analysis and literature review," *Review of Accounting Studies*, forthcoming.

Cook, A. and C. Glass (2013a): "Above the glass ceiling: When are women and racial/ethnic minorities promoted to CEO?" *Strategic Management Journal*, 35, 1080–1089.

——— (2013b): "Women and Top Leadership Positions: Towards an Institutional Analysis," *Gender, Work & Organization*, 21, 91–103.

Cooper, M. J., H. Gulen, and M. J. Schill (2008): "Asset Growth and the Cross-Section of Stock Returns," *The Journal of Finance*, 63, 1609–1651.

Cormier, D. and I. M. Gordon (2001): "An examination of social and environmental reporting strategies," *Accounting, Auditing & Accountability Journal*, 14, 587–617.

Costa, D. L. and M. E. Kahn (2013): "Energy Conservation "Nudges" and Environmentalist Ideology: Evidence from a Randomized Residential Electricity Field Experiment," *Journal of the European Economic Association*, 11, 680–702.

Coughlan, A. T. and R. M. Schmidt (1985): "Executive compensation, management turnover, and firm performance," *Journal of Accounting and Economics*, 7, 43–66.

CRI (2021): "Credit Research Initiative of the National University of Singapore," https://nuscri.org/en/, retrieved on 9-06-2021.

Cronqvist, H., F. Heyman, M. Nilsson, H. Svaleryd, and J. Vlachos (2009): "Do Entrenched Managers Pay Their Workers More?" *The Journal of Finance*, 64, 309–339.

Cui, J., H. Jo, and H. Na (2018): "Does Corporate Social Responsibility Affect Information Asymmetry?" *Journal of Business Ethics*, 148, 549–572.

Da, Z., J. Engelberg, and P. Gao (2014): "The Sum of All FEARS Investor Sentiment and Asset Prices," *The Review of Financial Studies*, 28, 1–32.

Dahya, J., J. J. McConnell, and N. G. Travlos (2002): "The Cadbury Committee, Corporate Performance, and Top Management Turnover," *The Journal of Finance*, 57, 461–483.

Davies, P. and K. Hopt (2013): "Corporate Boards in Europe — Accountability and Convergence," *The American Journal of Comparative Law*, 61, 301–375.

DeFond, M., M. Hung, and R. Trezevant (2007): "Investor protection and the information content of annual earnings announcements: International evidence," *Journal of Accounting and Economics*, 43, 37–67.

Deloitte (2017): "Women in the boardroom (5th ed.)," https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Risk/Womenintheboardroomaglobalperspectivefifthedition.pdf, retrieved on 8-11-2021.

Deng, X., J. koo Kang, and B. S. Low (2013): "Corporate social responsibility and stakeholder value maximization: Evidence from mergers," *Journal of Financial Economics*, 110, 87–109.

Desender, K. and M. Epure (2015): "Corporate Governance and Corporate Social Performance: Boards, Ownership and Institutions," *Academy of Management Proceedings*, 2015, 16433.

Deutsche Börse (2018): "Historical index compositions of the equity and strategy indices of Deutsche Börse, Version 8.9," Tech. rep.

Dhaliwal, D. S., O. Z. Li, A. Tsang, and Y. G. Yang (2011): "Voluntary Nonfinancial Disclosure and the Cost of Equity Capital: The Initiation of Corporate Social Responsibility Reporting," *The Accounting Review*, 86, 59–100.

Diamond, A. and J. S. Sekhon (2013): "Genetic Matching for Estimating Causal Effects: A General Multivariate Matching Method for Achieving Balance in Observational Studies," *Review of Economics and Statistics*, 95, 932–945.

Diemont, D., K. Moore, and A. Soppe (2016): "The Downside of Being Responsible: Corporate Social Responsibility and Tail Risk," *Journal of Business Ethics*, 137, 213–229.

Dimson, E., O. Karakaş, and X. Li (2015): "Active ownership," *The Review of Financial Studies*, 28, 3225–3268.

D'mello, R. and P. K. Shroff (2000): "Equity Undervaluation and Decisions Related to Repurchase Tender Offers: An Empirical Investigation," *The Journal of Finance*, 55, 2399–2424.

Dong, M., D. Hirshleifer, S. Richardson, and S. H. Teoh (2006): "Does Investor Misvaluation Drive the Takeover Market?" *The Journal of Finance*, 61, 725–762.

Dong, M., D. Hirshleifer, and S. H. Teoh (2020): "Misvaluation and Corporate Inventiveness," *Journal of Financial and Quantitative Analysis*, 1–29.

Dorfleitner, G., J. Grebler, and S. Utz (2020): "The impact of corporate social and environmental performance on credit rating prediction: North America versus Europe," *The Journal of Risk*, 22, 1–33.

Dorfleitner, G., G. Halbritter, and M. Nguyen (2015): "Measuring the level and risk of corporate responsibility – An empirical comparison of different ESG rating approaches," *Journal of Asset Management*, 16, 450–466.

Dorfleitner, G., S. Utz, and M. Wimmer (2018): "Patience pays off – corporate social responsibility and long-term stock returns," *Journal of Sustainable Finance & Investment*, 8, 132–157.

Doukas, J. A., C. F. Kim, and C. Pantzalis (2010): "Arbitrage Risk and Stock Mispricing," *Journal of Financial and Quantitative Analysis*, 45, 907–934.

Drumwright, M. E. (1994): "Socially responsible organizational buying: environmental concern as a noneconomic buying criterion," *Journal of Marketing*, 58, 1–19.

Eagly, A. H. and S. J. Karau (1991): "Gender and the emergence of leaders: A meta-analysis." *Journal of Personality and Social Psychology*, 60, 685–710.

——— (2002): "Role congruity theory of prejudice toward female leaders." *Psychological Review*, 109, 573–598.

Eccles, R. G., M. D. Kastrapeli, and S. J. Potter (2017): "How to Integrate ESG into Investment Decision-Making: Results of a Global Survey of Institutional Investors," *Journal of Applied Corporate Finance*, 29, 125–133.

Edmans, A., L. Li, and C. Zhang (2020): "Employee Satisfaction, Labor Market Flexibility, and Stock Returns Around the World," *SSRN Electronic Journal*.

Eisdorfer, A., A. Goyal, and A. Zhdanov (2019): "Equity Misvaluation and Default Options," *The Journal of Finance*, 74, 845–898.

Eisfeldt, A. L. and C. M. Kuhnen (2013): "CEO turnover in a competitive assignment framework," *Journal of Financial Economics*, 109, 351–372.

Elsaid, E. and N. D. Ursel (2017): "Re-examining the Glass Cliff Hypothesis using Survival Analysis: The Case of Female CEO Tenure," *British Journal of Management*, 29, 156–170.

Engle, R. F., S. Giglio, B. Kelly, H. Lee, and J. Stroebel (2020): "Hedging Climate Change News," *The Review of Financial Studies*, 33, 1184–1216.

Etienne, J. (2011): "Compliance Theory: A Goal Framing Approach," *Law & Policy*, 33, 305–333.

Eugster, F. (2020): "Endogeneity and the Dynamics of Voluntary Disclosure Quality: Is there Really an Effect on the Cost of Equity Capital?" *Contemporary Accounting Research*, 37, 2590–2614.

European Commission (2011): "A renewed EU strategy 2011-14 for Corporate Social Responsibility," https://www.europarl.europa.eu/meetdocs/2009_2014/documents/com/com_com(2011)0681_/com_com(2011)0681_en.pdf, retrieved on 4-8-2021.

——— (2018): "Commission action plan on financing sustainable growth," https://ec.europa.eu/info/publications/sustainable-finance-renewed-strategy_en, retrieved on 4-8-2021.

——— (2021): "Sustainable Development," https://ec.europa.eu/environment/eussd/, retrieved on 4-8-2021.

European Confederation of Directors' Associations (2014): *Director's note: One-tier versus two-tier board system*, Brussels.

European Union (2014): "Directive 2014/95/EU of the European parliament and of the council of 22 October 2014 amending directive 2013/34/EU as regards disclosure of non-financial and diversity information by certain large undertakings and groups," Official Journal of the European Union, 15.

Fabozzi, F. J., K. Ma, and B. J. Oliphant (2008): "Sin Stock Returns," *The Journal of Portfolio Management*, 35, 82–94.

Faccio, M., M.-T. Marchica, and R. Mura (2016): "CEO gender, corporate risk-taking, and the efficiency of capital allocation," *Journal of Corporate Finance*, 39, 193–209.

Fama, E. F. (1970): "Efficient Capital Markets: A Review of Theory and Empirical Work," *The Journal of Finance*, 25, 383–417.

Fama, E. F., L. Fisher, M. C. Jensen, and R. Roll (1969): "The Adjustment of Stock Prices to New Information," *International Economic Review*, 10, 1–21.

Fama, E. F. and K. R. French (1993): "Common risk factors in the returns on stocks and bonds," *Journal of Financial Economics*, 33, 3–56.

——— (2015): "A five-factor asset pricing model," *Journal of Financial Economics*, 116, 1–22.

Fernandez-Mateo, I. and R. M. Fernandez (2016): "Bending the Pipeline? Executive Search and Gender Inequality in Hiring for Top Management Jobs," *Management Science*, 62, 3636–3655.

Ferrell, A., H. Liang, and L. Renneboog (2016): "Socially responsible firms," *Journal of Financial Economics*, 122, 585–606.

FISHBURN, P. C. (1977): "Mean-Risk Analysis with Risk Associated with Below-Target Returns," *American Economic Review*, 67, 116–126.

FLAMMER, C. (2021): "Corporate green bonds," *Journal of Financial Economics*, forthcoming.

FOSS, N. J. AND S. LINDENBERG (2013): "Microfoundations for Strategy: A Goal-Framing Perspective on the Drivers of Value Creation," *Academy of Management Perspectives*, 27, 85–102.

FRANCIS, B., I. HASAN, AND Q. WU (2012): "The Impact of CFO Gender on Bank Loan Contracting," *Journal of Accounting, Auditing & Finance*, 28, 53–78.

FREEMAN, R. (1984): *Strategic Management: A Stakeholder Approach*, Business and Public Policy Series, Pitman.

FRENCH, K. R. (2008): "Presidential address: The cost of active investing," *The Journal of Finance*, 63, 1537–1573.

FRICK, B. AND E. LEHMANN (2005): "Corporate Governance in Germany: Ownership, Codetermination and Firm Performance in a Stakeholder Economy," in *Corporate Governance and Labour Management*, Oxford University Press, 122–147.

FRIEDE, G., T. BUSCH, AND A. BASSEN (2015): "ESG and financial performance: aggregated evidence from more than 2000 empirical studies," *Journal of Sustainable Finance & Investment*, 5, 210–233.

FRIEDMAN, M. (1970): "The social responsibility of business is to increase its profits," *The New York Times Magazine*, September 13.

FU, F., L. LIN, AND M. S. OFFICER (2013): "Acquisitions driven by stock overvaluation: Are they good deals?" *Journal of Financial Economics*, 109, 24–39.

FU, R., A. KRAFT, AND H. ZHANG (2012): "Financial reporting frequency, information asymmetry, and the cost of equity," *Journal of Accounting and Economics*, 54, 132–149.

Furst, S. A. and M. Reeves (2008): "Queens of the hill: Creative destruction and the emergence of executive leadership of women," *The Leadership Quarterly*, 19, 372–384.

Galema, R., A. Plantinga, and B. Scholtens (2008): "The stocks at stake: Return and risk in socially responsible investment," *Journal of Banking & Finance*, 32, 2646–2654.

Gan, J. (2007): "Collateral, debt capacity, and corporate investment: Evidence from a natural experiment," *Journal of Financial Economics*, 85, 709–734.

Gartzia, L., M. K. Ryan, N. Balluerka, and A. Aritzeta (2012): "Think crisis-think female: Further evidence," *European Journal of Work and Organizational Psychology*, 21, 603–628.

Ghoul, S. E., O. Guedhami, C. C. Kwok, and D. R. Mishra (2011): "Does corporate social responsibility affect the cost of capital?" *Journal of Banking & Finance*, 35, 2388–2406.

Ghoul, S. E. and A. Karoui (2017): "Does corporate social responsibility affect mutual fund performance and flows?" *Journal of Banking & Finance*, 77, 53–63.

Giuli, A. D. and L. Kostovetsky (2014): "Are red or blue companies more likely to go green? Politics and corporate social responsibility," *Journal of Financial Economics*, 111, 158–180.

Glass, C. and A. Cook (2016): "Leading at the top: Understanding women's challenges above the glass ceiling," *The Leadership Quarterly*, 27, 51–63.

Glück, M., B. Hübel, and H. Scholz (2020): "Currency Conversion of Fama-French Factors: How and Why," *The Journal of Portfolio Management*, 47, 157–175.

Godfrey, P. (2005): "The relationship between corporate philanthropy and shareholder wealth: A risk management perspective," *Academy of Management Review*, 30, 777–798.

GODFREY, P. C., C. B. MERRILL, AND J. M. HANSEN (2009): "The relationship between corporate social responsibility and shareholder value: an empirical test of the risk management hypothesis," *Strategic Management Journal*, 30, 425–445.

GOMPERS, P., J. ISHII, AND A. METRICK (2003): "Corporate Governance and Equity Prices," *The Quarterly Journal of Economics*, 118, 107–156.

GÖRGEN, M., A. JACOB, M. NERLINGER, R. RIORDAN, M. ROHLEDER, AND M. WILKENS (2020): "Carbon Risk," *SSRN Electronic Journal*.

GORTON, G. AND F. A. SCHMID (2004): "Capital, Labor, and the Firm: A Study of German Codetermination," *Journal of the European Economic Association*, 2, 863–905.

GRANGER, C. W. J. (1969): "Investigating Causal Relations by Econometric Models and Cross-spectral Methods," *Econometrica*, 37, 424–438.

GREENWOOD, R. AND D. SCHARFSTEIN (2013): "The growth of finance," *Journal of Economic Perspectives*, 27, 3–28.

GREWAL, J., E. J. RIEDL, AND G. SERAFEIM (2019): "Market Reaction to Mandatory Nonfinancial Disclosure," *Management Science*, 65, 3061–3084.

GROMET, D. M., H. KUNREUTHER, AND R. P. LARRICK (2013): "Political ideology affects energy-efficiency attitudes and choices," *Proceedings of the National Academy of Sciences*, 110, 9314–9319.

GROSVOLD, J., B. RAYTON, AND S. BRAMMER (2016): "Women on Corporate Boards," *Business & Society*, 55, 1157–1196.

GSIA (2018): "Global Sustainable Investment Review," http://www.gsi-alliance.org/wp-content/uploads/2019/03/GSIR_Review2018.3.28.pdf, retrieved on 8-11-2021.

GUO, S. AND M. W. FRASER (2014): *Propensity Score Analysis: Statistical Methods and Applications*, SAGE PUBN.

GUTSCHE, G. AND A. ZIEGLER (2019): "Which private investors are willing to pay for sustainable investments? Empirical evidence from stated choice experiments," *Journal of Banking & Finance*, 102, 193–214.

HAIL, L. AND C. LEUZ (2006): "International Differences in the Cost of Equity Capital: Do Legal Institutions and Securities Regulation Matter?" *Journal of Accounting Research*, 44, 485–531.

HALEY, U. C. V. (1991): "Corporate Contributions As Managerial Masques: Reframing Corporate Contributions As Strategies to Influence Society," *Journal of Management Studies*, 28, 485–510.

HAMEED, I. AND K. KHAN (2020): "An extension of the goal-framing theory to predict consumer's sustainable behavior for home appliances," *Energy Efficiency*, 13, 1441–1455.

HARRIS, M. AND A. RAVIV (1991): "The theory of capital structure," *The Journal of Finance*, 46, 297–355.

HARTZMARK, S. M. AND A. B. SUSSMAN (2019): "Do Investors Value Sustainability? A Natural Experiment Examining Ranking and Fund Flows," *The Journal of Finance*, 74, 2789–2837.

HASLAM, S. A., M. K. RYAN, C. KULICH, G. TROJANOWSKI, AND C. ATKINS (2009): "Investing with Prejudice: the Relationship Between Women's Presence on Company Boards and Objective and Subjective Measures of Company Performance," *British Journal of Management*, 21, 484–497.

HASS, N. (2012): "Marissa Mayer stares down 'glass cliff' at Yahoo. Retrieved from The Daily Beast," https://www.thedailybeast.com/marissa-mayer-stares-down-glass-cliff-at-yahoo, retrieved on 8-11-2021.

HAUSMAN, J. A. (1978): "Specification Tests in Econometrics," *Econometrica*, 46, 1251–1271.

HAVERCROFT, I. AND A. REISBERG (2014): "Directors' Duties Under the UK Companies Act 2006 and the Impact of the Company's Operations on the Environment," *SSRN Electronic Journal*.

HAWN, O. AND I. IOANNOU (2016): "Mind the gap: The interplay between external and internal actions in the case of corporate social responsibility," *Strategic Management Journal*, 37, 2569–2588.

HEILMAN, M. E. (2001): "Description and Prescription: How Gender Stereotypes Prevent Women's Ascent Up the Organizational Ladder," *Journal of Social Issues*, 57, 657–674.

HERTZEL, M. G. AND Z. LI (2010): "Behavioral and Rational Explanations of Stock Price Performance around SEOs: Evidence from a Decomposition of Market-to-Book Ratios," *Journal of Financial and Quantitative Analysis*, 45, 935–958.

HILL, A. (2016): "'Glass cliffs' and the female leaders who are set up to fail. Retrieved from Financial Times," http://www.ft.com/cms/s/0/e2dcb1ca-49bf-11e6-b387-64ab0a67014c.html#axzz4G4h5wL5M, retrieved on 8-11-2021.

HOEPNER, A. G. (2017): "Corporate Social Responsibility and Investment Portfolio Diversification," *SSRN Electronic Journal*.

HOEPNER, A. G. F., I. OIKONOMOU, Z. SAUTNER, L. T. STARKS, AND X. ZHOU (2021): "ESG Shareholder Engagement and Downside Risk," *SSRN Electronic Journal*.

HOFSTEDE, G. (1980): *Culture's consequences: international differences in work-related values*, Beverly Hills: Sage Publications.

HOLST, E. AND A. KIRSCH (2015): "Weiterhin kaum Frauen in den Vorständen großer Unternehmen: Auch Aufsichtsräte bleiben Männerdomänen," *DIW Wochenbericht*, 82, 47–60.

HONG, H. AND M. KACPERCZYK (2009): "The price of sin: The effects of social norms on markets," *Journal of Financial Economics*, 93, 15–36.

HONG, H. AND I. LISKOVICH (2015): "Crime, Punishment and the Halo Effect of Corporate Social Responsibility," *National Bureau of Economic Research, Working Paper 21215.*

HUANG, J. AND D. J. KISGEN (2013): "Gender and corporate finance: Are male executives overconfident relative to female executives?" *Journal of Financial Economics*, 108, 822–839.

HWANG, L.-S. AND W.-J. LEE (2013): "Stock Return Predictability of Residual-Income-Based Valuation: Risk or Mispricing?" *Abacus*, 49, 219–241.

ILHAN, E., Z. SAUTNER, AND G. VILKOV (2020): "Carbon Tail Risk," *The Review of Financial Studies*, 34, 1540–1571.

INVESTMENT COMPANY INSTITUTE (2019): "2019 Investment Company Fact Book," https://static1.squarespace.com/static/5e8caf92b8db4c263792e656/t/5e93358651cce06b0fbd2feb/1586705819270/ICI+2019.pdf, retrieved on 8-12-2021.

IOANNOU, I. AND G. SERAFEIM (2012): "What drives corporate social performance? The role of nation-level institutions," *Journal of International Business Studies*, 43, 834–864.

——— (2014): "The impact of corporate social responsibility on investment recommendations: Analysts' perceptions and shifting institutional logics," *Strategic Management Journal*, 36, 1053–1081.

JACKSON, G., J. BARTOSCH, E. AVETISYAN, D. KINDERMAN, AND J. S. KNUDSEN (2020): "Mandatory Non-financial Disclosure and Its Influence on CSR: An International Comparison," *Journal of Business Ethics*, 162, 323–342.

JAGANNATHAN, R., A. RAVIKUMAR, AND M. SAMMON (2017): "Environmental, Social, and Governance Criteria: Why Investors are Paying Attention," *National Bureau of Economic Research, Working Paper 24063.*

Jain, A., P. K. Jain, and Z. Rezaee (2016): "Value-Relevance of Corporate Social Responsibility: Evidence from Short Selling," *Journal of Management Accounting Research*, 28, 29–52.

Jalalzai, F. (2008): "Women Rule: Shattering the Executive Glass Ceiling," *Politics & Gender*, 4, 205–231.

Jegadeesh, N. and S. Titman (1993): "Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency," *The Journal of Finance*, 48, 65–91.

Jiang, H. and L. Zheng (2018): "Active Fundamental Performance," *The Review of Financial Studies*, 31, 4688–4719.

Jo, H. and H. Na (2012): "Does CSR Reduce Firm Risk? Evidence from Controversial Industry Sectors," *Journal of Business Ethics*, 110, 441–456.

Jorion, P. (2007): *Financial risk manager handbook*, John Wiley & Sons.

Judge, E. (2003): "Women on board: Help or hindrance?" http://www.thetimes.co.uk/tto/business/article2102633.ece, retrieved on 8-11-2021.

Kahle, K. M. and R. M. Stulz (2013): "Access to capital, investment, and the financial crisis," *Journal of Financial Economics*, 110, 280–299.

Keizer, K., S. Lindenberg, and L. Steg (2008): "The Spreading of Disorder," *Science*, 322, 1681–1685.

Khan, M., G. Serafeim, and A. Yoon (2016): "Corporate Sustainability: First Evidence on Materiality," *The Accounting Review*, 91, 1697–1724.

Kim, Y., H. Li, and S. Li (2014): "Corporate social responsibility and stock price crash risk," *Journal of Banking & Finance*, 43, 1–13.

Kirsch, A. (2018): "The gender composition of corporate boards: A review and research agenda," *The Leadership Quarterly*, 29, 346–364.

Klein, J. and N. Dawar (2004): "Corporate social responsibility and consumers' attributions and brand evaluations in a product–harm crisis," *International Journal of research in Marketing*, 21, 203–217.

Koenig, A. M., A. H. Eagly, A. A. Mitchell, and T. Ristikari (2011): "Are leader stereotypes masculine? A meta-analysis of three research paradigms." *Psychological Bulletin*, 137, 616–642.

Köppel, P., J. Yan, and J. Lüdicke (2007): "Cultural Diversity Management in Deutschland hinkt hinterher [Cultural Diversity Management is lagging behind in Germany]," https://www.bertelsmann-stiftung.de/fileadmin/files/BSt/Presse/imported/downloads/xcms_bst_dms_23804_23805_2.pdf, retrieved on 8-11-2021.

Kothari, S. and J. B. Warner (2007): "Econometrics of Event Studies," in *Handbook of Empirical Corporate Finance*, Elsevier, 3–36.

Krishnaswami, S. and V. Subramaniam (1999): "Information asymmetry, valuation, and the corporate spin-off decision," *Journal of Financial Economics*, 53, 73–112.

Krismann, C. (2005): *Encyclopedia of American women in business: from colonial times to the present*, Westport, Conn: Greenwood Press.

Kulich, C., V. Iacoviello, and F. Lorenzi-Cioldi (2018): "Solving the crisis: When agency is the preferred leadership for implementing change," *The Leadership Quarterly*, 29, 295–308.

Kulich, C., F. Lorenzi-Cioldi, V. Iacoviello, K. Faniko, and M. K. Ryan (2015): "Signaling change during a crisis: Refining conditions for the glass cliff," *Journal of Experimental Social Psychology*, 61, 96–103.

Kulich, C. and M. K. Ryan (2017): "The Glass Cliff," *Oxford Research Encyclopedia of Business and Management [Internet]*, 1–34.

KULICH, C., M. K. RYAN, AND S. A. HASLAM (2014): "The Political Glass Cliff: Understanding How Seat Selection Contributes to the Underperformance of Ethnic Minority Candidates," *Political Research Quarterly*, 67, 84–95.

LA PORTA, R., F. LOPEZ-DE-SILANES, AND A. SHLEIFER (1999): "Corporate Ownership Around the World," *The Journal of Finance*, 54, 471–517.

LA PORTA, R., F. LOPEZ-DE-SILANES, AND A. SHLEIFER (2006): "What Works in Securities Laws?" *The Journal of Finance*, 61, 1–32.

LA PORTA, R., F. LOPEZ-DE-SILANES, A. SHLEIFER, AND R. VISHNY (2000): "Investor protection and corporate governance," *Journal of Financial Economics*, 58, 3–27.

LA PORTA, R., F. LOPEZ-DE-SILANES, A. SHLEIFER, AND R. W. VISHNY (1998): "Law and Finance," *Journal of Political Economy*, 106, 1113–1155.

LASSITER, G. D., A. L. GEERS, P. J. MUNHALL, R. J. PLOUTZ-SNYDER, AND D. L. BREITENBECHER (2002): "Illusory Causation: Why It Occurs," *Psychological Science*, 13, 299–305.

LEE, C. M. C., J. MYERS, AND B. SWAMINATHAN (1999): "What is the Intrinsic Value of the Dow?" *The Journal of Finance*, 54, 1693–1741.

LEE, P. M. AND E. H. JAMES (2007): "She'-e-os: gender effects and investor reactions to the announcements of top executive appointments," *Strategic Management Journal*, 28, 227–241.

LEUZ, C., D. NANDA, AND P. D. WYSOCKI (2003): "Earnings management and investor protection: an international comparison," *Journal of Financial Economics*, 69, 505–527.

LEVI, M., K. LI, AND F. ZHANG (2014): "Director gender and mergers and acquisitions," *Journal of Corporate Finance*, 28, 185–200.

LEWBEL, A. (2012): "Using Heteroscedasticity to Identify and Estimate Mismeasured and Endogenous Regressor Models," *Journal of Business & Economic Statistics*, 30, 67–80.

LI, F. (2016): "Endogeneity in CEO power: A survey and experiment," *Investment Analysts Journal*, 45, 149–162.

LI, M. (2012): "Using the Propensity Score Method to Estimate Causal Effects," *Organizational Research Methods*, 16, 188–226.

LIANG, H. AND L. RENNEBOOG (2017): "On the Foundations of Corporate Social Responsibility," *The Journal of Finance*, 72, 853–910.

LINDENBERG, S. (1993): "Framing, Empirical Evidence, and Applications," *Jahrbuch für Neue Politische Ökonomie*, 11–38.

——— (2000): "The Extension of Rationality: Framing versus Cognitive Rationality," in *L'Acteur et ses raisons, Mélanges en l'honneur de Raymond Boudon*, PUF Paris, 168–204.

——— (2003): "The Cognitive Side of Governance," in *The Governance of Relations in Markets and Organizations*, Emerald (MCB UP), 47–76.

LINDENBERG, S. AND N. J. FOSS (2011): "Managing Joint Production Motivation: The Role of Goal Framing and Governance Mechanisms," *Academy of Management Review*, 36, 500–525.

LINDENBERG, S. AND L. STEG (2007): "Normative, Gain and Hedonic Goal Frames Guiding Environmental Behavior," *Journal of Social Issues*, 63, 117–137.

LINS, K. V., H. SERVAES, AND A. TAMAYO (2017): "Social Capital, Trust, and Firm Performance: The Value of Corporate Social Responsibility during the Financial Crisis," *The Journal of Finance*, 72, 1785–1824.

LINTNER, J. (1965): "The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets," *The Review of Economics and Statistics*, 47, 13–37.

LIPKUS, I. M. (2007): "Numeric, Verbal, and Visual Formats of Conveying Health Risks: Suggested Best Practices and Future Recommendations," *Medical Decision Making*, 27, 696–713.

LÖFFLER, G. (2004): "An anatomy of rating through the cycle," *Journal of Banking & Finance*, 28, 695–720.

——— (2005): "Avoiding the rating bounce: why rating agencies are slow to react to new information," *Journal of Economic Behavior & Organization*, 56, 365–381.

LOPATTA, K., F. BUCHHOLZ, AND T. KASPEREIT (2015): "Asymmetric Information and Corporate Social Responsibility," *Business & Society*, 55, 458–488.

LORD, R. G., D. J. BROWN, J. L. HARVEY, AND R. J. HALL (2001): "Contextual constraints on prototype generation and their multilevel consequences for leadership perceptions," *The Leadership Quarterly*, 12, 311–338.

LOUGHRAN, T. AND J. R. RITTER (1995): "The New Issues Puzzle," *The Journal of Finance*, 50, 23–51.

LU, W. L. AND M. E. TAYLOR (2015): "Which Factors Moderate the Relationship between Sustainability Performance and Financial Performance? A Meta-Analysis Study," *Journal of International Accounting Research*, 15, 1–15.

LUO, X. AND C. BHATTACHARYA (2009): "The Debate over Doing Good: Corporate Social Performance, Strategic Marketing Levers, and Firm-Idiosyncratic Risk," *Journal of Marketing*, 73, 198–213.

MACKINLAY, A. C. (1997): "Event Studies in Economics and Finance," *Journal of Economic Literature*, 35, 13–39.

MARGOLIS, J. D., H. A. ELFENBEIN, AND J. P. WALSH (2009): "Does it Pay to Be Good...And Does it Matter? A Meta-Analysis of the Relationship between Corporate Social and Financial Performance," *Harvard Business School*.

MARTELL, R. F., C. PARKER, C. G. EMRICH, AND M. S. CRAWFORD (1998): "Sex Stereotyping in the Executive Suite: "Much Ado About Something"," *Journal of Social Behavior and Personality*, 13, 127–138.

MATTEN, D. AND J. MOON (2008): ""Implicit" and "Explicit" CSR: A Conceptual Framework for a Comparative Understanding of Corporate Social Responsibility," *Academy of Management Review*, 33, 404–424.

MAURY, B. (2006): "Corporate Performance, Corporate Governance and Top Executive Turnover in Finland," *European Financial Management*, 12, 221–248.

MCGREGOR, J. (2016): "Congratulations, Theresa May. Now mind that 'glass cliff'," https://www.washingtonpost.com/news/on-leadership/wp/2016/07/12/congratulations-theresa-may-now-mind-that-glass20cliff/?utm_term=.f920e3be3cd5, retrieved on 8-11-2021.

MCWILLIAMS, A. AND D. SIEGEL (2000): "Corporate social responsibility and financial performance: correlation or misspecification?" *Strategic Management Journal*, 21, 603–609.

MEBANE, W. R. AND J. S. SEKHON (1998): "R-GENetic Optimization Using Derivatives (RGENOUD)," http://sekhon.berkeley.edu/rgenoud/, retrieved on 8-11-2021.

——— (2011): "Genetic Optimization Using Derivatives: ThergenoudPackage forR," *Journal of Statistical Software*, 42.

MONTI, A., P. PATTITONI, B. PETRACCI, AND O. RANDL (2018): "Does Corporate Social Responsibility Impact Risk?" *SSRN Electronic Journal*.

MSCI (2015): *MSCI ESG KLD STATS: 1991-2014 DATA SETS – Methodology*, Report.

Mulcahy, M. and C. Linehan (2013): "Females and Precarious Board Positions: Further Evidence of the Glass Cliff," *British Journal of Management*, 25, 425–438.

Myers, S. C. (2001): "Capital Structure," *Journal of Economic Perspectives*, 15, 81–102.

Nekhili, M., H. Nagati, T. Chtioui, and A. Nekhili (2017): "Gender-diverse board and the relevance of voluntary CSR reporting," *International Review of Financial Analysis*, 50, 81–100.

Nguyen, P.-A., A. Kecskés, and S. Mansi (2020): "Does corporate social responsibility create shareholder value? The importance of long-term investors," *Journal of Banking & Finance*, 112, 105217.

Nickell, S. (1981): "Biases in Dynamic Models with Fixed Effects," *Econometrica*, 49, 1417–1426.

Nisbett, R. E. and T. D. Wilson (1977): "The halo effect: evidence for unconscious alteration of judgments." *Journal of Personality and Social Psychology*, 35, 250–256.

Ohlson, J. A. (1995): "Earnings, Book Values, and Dividends in Equity Valuation," *Contemporary Accounting Research*, 11, 661–687.

Oikonomou, I., C. Brooks, and S. Pavelin (2012): "The Impact of Corporate Social Performance on Financial Risk and Utility: A Longitudinal Analysis," *Financial Management*, 41, 483–515.

——— (2014): "The Effects of Corporate Social Performance on the Cost of Corporate Debt and Credit Ratings," *Financial Review*, 49, 49–75.

Organization for Economic Cooperation and Development (2017): "Educational attainment and labour-force status: ELS - Population who attained tertiary education, by sex and age group," Tech. rep., London: Office for National Statistics.

Oyserman, D., H. M. Coon, and M. Kemmelmeier (2002): "Rethinking individualism and collectivism: Evaluation of theoretical assumptions and meta-analyses." *Psychological Bulletin*, 128, 3–72.

PageGroup (2014): "Diversity Management Survey," http://www.michaelpage.de/sites/michaelpage.de/files/PageGroup_DIVERSITY_MANAGEMENT_SURVEY.pdf, retrieved on 8-11-2021.

Post, C. and K. Byron (2015): "Women on Boards and Firm Financial Performance: A Meta-Analysis," *Academy of Management Journal*, 58, 1546–1571.

Preis, T., H. S. Moat, and H. E. Stanley (2013): "Quantifying Trading Behavior in Financial Markets Using Google Trends," *Scientific Reports*, 3, 1–6.

Refinitiv (2020): *Environmental, Social and Governance (ESG) Scores from Refinitiv*, Report.

Renneboog, L., J. T. Horst, and C. Zhang (2008): "Socially responsible investments: Institutional aspects, performance, and investor behavior," *Journal of Banking & Finance*, 32, 1723–1742.

Rhodes-Kropf, M., D. T. Robinson, and S. Viswanathan (2005): "Valuation waves and merger activity: The empirical evidence," *Journal of Financial Economics*, 77, 561–603.

Rhodes-Kropf, M. and S. Viswanathan (2004): "Market Valuation and Merger Waves," *The Journal of Finance*, 59, 2685–2718.

Riedl, A. and P. Smeets (2017): "Why Do Investors Hold Socially Responsible Mutual Funds?" *The Journal of Finance*, 72, 2505–2550.

Roberts, J. and A. Markley (2011): "CSR: New EU Strategy Threatens U.S. and European Companies," Web Memo No. 3419, The Heritage Foundation.

Roberts, M. R. and T. M. Whited (2013): "Endogeneity in Empirical Corporate Finance," in *Handbook of the Economics of Finance*, Elsevier, 493–572.

Roodman, D. (2009): "How to do Xtabond2: An Introduction to Difference and System GMM in Stata," *The Stata Journal: Promoting communications on statistics and Stata*, 9, 86–136.

Rosenbaum, P. R. and D. B. Rubin (1983): "The central role of the propensity score in observational studies for causal effects," *Biometrika*, 70, 41–55.

Rossi, F. and M. A. Harjoto (2020): "Corporate non-financial disclosure, firm value, risk, and agency costs: evidence from Italian listed companies," *Review of Managerial Science*, 14, 1149–1181.

Ryan, M. K. and S. A. Haslam (2005): "The Glass Cliff: Evidence that Women are Over-Represented in Precarious Leadership Positions," *British Journal of Management*, 16, 81–90.

Ryan, M. K., S. A. Haslam, M. D. Hersby, and R. Bongiorno (2011): "Think crisis-think female: The glass cliff and contextual variation in the think manager-think male stereotype." *Journal of Applied Psychology*, 96, 470–484.

Ryan, M. K., S. A. Haslam, and C. Kulich (2010): "Politics and the Glass Cliff: Evidence that Women are Preferentially Selected to Contest Hard-to-Win Seats," *Psychology of Women Quarterly*, 34, 56–64.

Ryan, M. K., S. A. Haslam, T. Morgenroth, F. Rink, J. Stoker, and K. Peters (2016): "Getting on top of the glass cliff: Reviewing a decade of evidence, explanations, and impact," *The Leadership Quarterly*, 27, 446–455.

Salama, A., K. Anderson, and J. Toms (2011): "Does community and environmental responsibility affect firm risk? Evidence from UK panel data 1994-2006," *Business Ethics: A European Review*, 20, 192–204.

Santen, B. and H. Donker (2009): "Board diversity in the perspective of financial distress: Empirical evidence from the Netherlands," *Corporate Board role duties and composition*, 5, 23–35.

Sassen, R., A.-K. Hinze, and I. Hardeck (2016): "Impact of ESG factors on firm risk in Europe," *Journal of business economics*, 86, 867–904.

Schein, V. E. (1973): "The relationship between sex role stereotypes and requisite management characteristics." *Journal of Applied Psychology*, 57, 95–100.

——— (2001): "A Global Look at Psychological Barriers to Women's Progress in Management," *Journal of Social Issues*, 57, 675–688.

Schein, V. E., R. Mueller, T. Lituchy, and J. Liu (1996): "Think manager—think male: a global phenomenon?" *Journal of Organizational Behavior*, 17, 33–41.

Sekhon, J. S. (2011): "Multivariate and Propensity Score Matching Software with Automated Balance Optimization: TheMatchingPackage forR," *Journal of Statistical Software*, 42.

——— (2015): "Package "Matching"," https://cran.r-project.org/web/packages/Matching/Matching.pdf, retrieved on 8-11-2021.

Semadeni, M., M. C. Withers, and S. T. Certo (2013): "The perils of endogeneity and instrumental variables in strategy research: Understanding through simulations," *Strategic Management Journal*, 35, 1070–1079.

Sen, S. and C. B. Bhattacharya (2001): "Does doing good always lead to doing better? Consumer reactions to corporate social responsibility," *Journal of marketing Research*, 38, 225–243.

Serafeim, G. (2020): "Public Sentiment and the Price of Corporate Sustainability," *Financial Analysts Journal*, 76, 26–46.

Sharfman, M. P. and C. S. Fernando (2008): "Environmental risk management and the cost of capital," *Strategic Management Journal*, 29, 569–592.

Sharpe, W. F. (1964): "Capital asset prices: A theory of market equilibrium under conditions of risk," *The Journal of Finance*, 19, 425–442.

Siew, R. Y. J., M. C. A. Balatbat, and D. G. Carmichael (2016): "The impact of ESG disclosures and institutional ownership on market information asymmetry," *Asia-Pacific Journal of Accounting & Economics*, 23, 432–448.

Silber, W. (2005): "What happened to liquidity when world war I shut the NYSE?" *Journal of Financial Economics*, 78, 685–701.

Soppe, A., M. Schauten, J. Soppe, and U. Kaymak (2011): "Corporate Social Responsibility Reputation (CSRR): Do Companies Comply with Their Raised CSR Expectations?" *Corporate Reputation Review*, 14, 300–323.

Stambaugh, R. F., J. Yu, and Y. Yuan (2012): "The short of it: Investor sentiment and anomalies," *Journal of Financial Economics*, 104, 288–302.

——— (2015): "Arbitrage Asymmetry and the Idiosyncratic Volatility Puzzle," *The Journal of Finance*, 70, 1903–1948.

Starks, L. T., P. Venkat, and Q. Zhu (2020): "Corporate ESG Profiles and Investor Horizons," *SSRN Electronic Journal*.

Staw, B. M., L. E. Sandelands, and J. E. Dutton (1981): "Threat Rigidity Effects in Organizational Behavior: A Multilevel Analysis," *Administrative Science Quarterly*, 26, 501–524.

Stellner, C., C. Klein, and B. Zwergel (2015): "Corporate social responsibility and Eurozone corporate bonds: The moderating role of country sustainability," *Journal of Banking & Finance*, 59, 538–549.

Stolowy, H. and L. Paugam (2018): "The expansion of non-financial reporting: an exploratory study," *Accounting and Business Research*, 48, 525–548.

Stössel, R. and A. Meier (2015): "Framing Effects and Risk Perception: Testing Graphical Representations of Risk for the KIID," *SSRN Electronic Journal*.

Sun, S. L., J. Zhu, and K. Ye (2014): "Board Openness During an Economic Crisis," *Journal of Business Ethics*, 129, 363–377.

Tanaka, T. (2014): "Gender diversity in the boards and the pricing of publicly traded corporate debt: evidence from Japan," *Applied Financial Economics*, 24, 247–258.

Thomson Reuters (2012): *Thomson Reuters Business Classification*, Report.

Thorndike, E. L. (1920): "A constant error in psychological ratings," *Journal of Applied Psychology*, 4, 25–29.

Titman, S. and R. Wessels (1988): "The Determinants of Capital Structure Choice," *The Journal of Finance*, 43, 1–19.

United Nations (2016): "UN Global Compact-Accenture CEO study," https://www.unglobalcompact.org/library/4331, retrieved on 8-11-2021.

——— (2019): "UN Global Compact-Accenture CEO Study," https://www.accenture.com/_acnmedia/PDF-109/Accenture-UNGC-CEO-Study.pdf, retrieved on 8-11-2021.

USSIF (2019): "2018 Global Sustainable Investment Review," http://www.gsi-alliance.org/wp-content/uploads/2019/03/GSIR_Review2018.3.28.pdf, retrieved on 8-11-2021.

USSIF (2020): "Report on US Sustainable and Impact Investing Trends," https://www.ussif.org/files/Trends%20Report%202020%20Executive%20Summary.pdf, retrieved on 8-11-2021.

van Ours, J. C. and M. A. van Tuijl (2015): "In-season head-coach dismissals and the performance of professional football teams," *Economic Inquiry*, 54, 591–604.

Van Vugt, M. and B. R. Spisak (2008): "Sex Differences in the Emergence of Leadership During Competitions Within and Between Groups," *Psychological Science*, 19, 854–858.

Velte, P. (2018): "Appointing female CEOs in risky and precarious firm circumstances: A review of the glass cliff phenomenon," *Corporate Ownership and Control*, 15, 33–43.

VERBEETEN, F. H., R. GAMERSCHLAG, AND K. MÖLLER (2016): "Are CSR disclosures relevant for investors? Empirical evidence from Germany," *Management Decision*, 54, 1359–1382.

VLAEV, I., N. CHATER, AND N. STEWART (2009): "Dimensionality of Risk Perception: Factors Affecting Consumer Understanding and Evaluation of Financial Risk," *Journal of Behavioral Finance*, 10, 158–181.

WAECHTER, C. (2017): "Frauen bekommen erst dann Macht, wenn der Karren im Dreck steckt," http://www.jetzt.de/politik/in-der-krise-wird-andrea-nahles-maechtigste-frau-der-spd, retrieved on 8-11-2021.

WHELAN, T., U. ATZ, T. VAN HOLT, AND C. CLARK (2021): *ESG and Financial Performance: Uncovering the Relationship by Aggregating Evidence from 1,000 Plus Studies Published between 2015 – 2020*, Center for Sustainable Business Report.

WIMMER, M. (2013): "ESG-persistence in Socially Responsible Mutual Funds," *Journal of Management and Sustainability*, 3, 9–15.

WINDMEIJER, F. (2005): "A finite sample correction for the variance of linear efficient two-step GMM estimators," *Journal of Econometrics*, 126, 25–51.

WINTOKI, M. B., J. S. LINCK, AND J. M. NETTER (2012): "Endogeneity and the dynamics of internal corporate governance," *Journal of Financial Economics*, 105, 581–606.

WITHISUPHAKORN, P. AND P. JIRAPORN (2017): "CEO age and CEO gender: Are female CEOs older than their male counterparts?" *Finance Research Letters*, 22, 129–135.

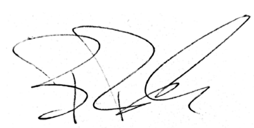
WORLD BANK (2018): *GDP data*, Report.

YU, J. AND Y. YUAN (2011): "Investor sentiment and the mean-variance relation," *Journal of Financial Economics*, 100, 367–381.

Zou, Z., Y. Wu, Q. Zhu, and S. Yang (2018): "Do Female Executives Prioritize Corporate Social Responsibility?" *Emerging Markets Finance and Trade*, 54, 2965–2981.

Affidavit

Ich erkläre hiermit, dass ich die vorgelegten und nachfolgend aufgelisteten Aufsätze selbstständig und nur mit den Hilfen angefertigt habe, die im jeweiligen Aufsatz angegeben oder zusätzlich in der nachfolgenden Liste aufgeführt sind. In der Zusammenarbeit mit den angeführten Koautoren war ich mindestens anteilig beteiligt. Bei den von mir durchgeführten und in den Aufsätzen erwähnten Untersuchungen habe ich die Grundsätze guter wissenschaftlicher Praxis, wie sie in der Satzung der Justus-Liebig-Universität Gießen zur Sicherung guter wissenschaftlicher Praxis niedergelegt sind, eingehalten.



Björn Rock, 10. September 2021

Submitted Papers:

1. Bannier, C. E., Bofinger, Y. and Rock, B. (2021). *Doing safe by doing good: Non-financial reporting and the risk effects of corporate social responsibility.* Working Paper.

2. Bannier, C. E., Bofinger, Y. and Rock, B. (2022). Corporate Social Responsibility and Credit Risk. *Finance Research Letters*, Volume 44, 102052.
DOI: https://doi.org/10.1016/j.frl.2021.102052

3. Bofinger, Y., Heyden, K. J. and Rock, B. (2022). Corporate social responsibility

and market efficiency: Evidence from ESG and misvaluation measures. *Journal of Banking & Finance*, Volume 134, 106322.
DOI: https://doi.org/10.1016/j.jbankfin.2021.106322

4. Bofinger, Y., Heyden K. J. and Rock, B. and Bannier, C. E. (2021). The sustainability trap: Active fund managers between ESG investing and fund overpricing. *Finance Research Letters*, forthcoming.
DOI: https://doi.org/10.1016/j.frl.2021.102160

5. Bannier, C. E., Bofinger, Y. and Rock, B. (2021). *Zooming in on CSR: Which aspects of CSR are relevant for companies' equity risk?*. Working Paper.

6. Bechtoldt, M. N., Bannier, C. E. and Rock, B. (2019). The glass-cliff myth? — Evidence from Germany and the U.K. *The Leadership Quarterly*, 30(3):273-297.
DOI: https://doi.org/10.1016/j.leaqua.2018.11.004