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Author: Fabio Martin

Supervisors:

Prof. Dr. Andreas Walter

Chair of Financial Services, Justus Liebig University Giessen

Prof. Dr. Christina E. Bannier

Chair of Banking & Finance, Justus Liebig University Giessen

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Chapter I

The power of ESG transparency: the effect of the new SFDR sustainability labels on mutual funds and individual investors

Coauthors:

Martin G. Becker

Andreas Walter

Relative share:

45%

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The power of ESG transparency: the effect of the new SFDR sustainability labels on mutual funds and individual investors

Abstract

This paper analyses the effect of the Sustainable Finance Disclosure Regulation (SFDR) on mutual funds and individual investors in the EU. First, we study whether affected funds increase their sustainability compared to a control group. Second, we examine if the regulation makes individual investors allocate more capital into more sustainable funds. In a difference-in-differences setting, we analyse the influence of the regulation on ESG fund scores and fund net inflows. Our results show that affected funds increase their sustainability rating after the policy intervention. Additionally, we find that a better ESG label leads to larger fund net inflows.

Keywords: Mutual Fund, ESG, Sustainability Ratings, Fund Flows, Policy Intervention

JEL-Codes: G11, G18, G23

Declarations of interest: none

I.1 Introduction

On the 27th of November 2019, the European Parliament and Council published the Regulation (EU) 2019/2088 on sustainability-related disclosure in the financial services sector (SFDR) being effective as of March 10, 2021. The preamble of the regulation states that to fight climate change “urgent action is needed to mobilise capital not only through public policies but also by the financial services sector”. Introducing this new kind of regulation, the EU tries to change behavior patterns in the financial sector, discouraging greenwashing, and promoting responsible and sustainable investments.

The new policy applies to all European financial market participants (FMPs). These include investment firms, pension providers, and insurance-based investors, as well as qualifying venture capital and social entrepreneurship activities. Besides the increasing reporting duty, one of its main requirements for the FMPs is the classification of ESG-related products and non-ESG products as either article 6, 8 or 9 funds depending on the degree of ESG integration[1]. Here, article 8 comprise those funds that do consider ESG aspects in their investment process but are focused on financial materiality, whereas article 9 products aim to create an environmental and social impact alongside generating a financial return. This can usually be done by aligning the portfolio to the UN Sustainable Development Goals (SDGs) or to the Paris Agreement. More specifically, article 8 applies where "a financial product promotes, among other characteristics, environmental or social characteristics, or a combination of those characteristics, provided that the companies in which the investments are made follow good governance practices" (Regulation (EU) 2019/2088). In contrast, article 9 refers to funds which have generating a real impact as their primary goal alongside a financial return. Finally,

[1]The name of the fund categories refer to the respective articles in the sustainable finance disclosure regulation.

article 6 products are those funds which do not fulfill the requirements to be labeled as article 8 or 9 and thus represent all funds that do not or to a very low degree integrate sustainability in their investment process. Moreover, while article 7 of the SFDR deals with pre-contractual disclosures, it does not constitute it's own classification.

The goal of this paper is to analyze the effect of the policy intervention on achieving the stated goal of fighting climate change by incentivizing FMPs to become more green and by mobilizing capital in the financial services sector. To analyze the extent to which this goal has been accomplished we study both, the demand and supply side. Thus, we examine how mutual fund managers and private customers react to the policy intervention, respectively.

If investors are better informed about the sustainability of funds, this creates an incentive for funds to invest in more sustainable ways (Hartzmark & Sussman (2019)). Firstly, we expect an increase in the sustainability scores of funds that are affected by the intervention compared to the unaffected funds after the public disclosure of the upcoming regulation in December 2019.

Following Mugerman et al. (2022) we use a difference-in-differences methodology as our main identification strategy and divide our sample into two groups. The first one, being the treatment group, contains all European funds that are affected by the regulation. For our control group, we use all U.S. based mutual funds since they are not exposed to the intervention and represent the largest part of mutual funds worldwide. In order to control for potential differences between the treatment and the control group, we use a 1:1 nearest neighbour matching (Ammann et al. (2019) & Bilbao-Terol et al. (2017)). We then estimate if European funds increased their ESG scores relatively to the control group as a result of the SFDR.

The demand side then implies that an increase in transparency and sustainability leads to more inflows towards sustainable funds (Alda (2020), El Ghoul & Karoui (2021)). The disclosure of being an article 6, 8 or 9 fund could directly influence the investment decisions of private customers. Huang et al. (2020) show that funds which are being given some sort of performance label should experience an increase in their inflows due to jumps in reputation. However, this depends on how investment firms promote their labels. Again, we examine this in a difference-in-differences setting to analyze whether the intervention had a significant impact on the fund net inflows within the first four months after March 10, 2021, the day on which the funds label were first publicly disclosed.

Overall, our results are consistent with the literature: For the supply side, we find that the increasing transparency of sustainability enforced by the new regulation incentivize mutual funds to increase their ESG efforts. EU funds, which are affected by the new SFDR rule increased their ESG scores more than funds in the non-EU control group.

For the demand side, our results indicate that the intervention had a statistically significant impact on the fund flows within the first four months after the intervention. Article 8 and 9 funds did see positive net inflows compared with less sustainable EU funds. This is in accordance with El Ghoul & Karoui (2021), Aasheim et al. (2022), Ammann et al. (2019) and Huang et al. (2020) who show that funds which are associated with a higher ESG alignment attract higher inflows from investors.

Our paper makes two contributions to the mutual fund literature. First, we add to the scarce literature of policy interventions and their effect on capital markets. Zhang et al. (2021) examine the impact of the implementation of "Guidelines for Establishing

a Green Financial System" in China and show that afterwards the risk-adjusted return for the highest ESG portfolio nearly doubles.

Second, we contribute to the literature on the relationship between fund flows and sustainability. Ammann et al. (2019) examine the effect of the introduction of Morningstar's Sustainability Rating on mutual fund flows. They find strong evidence that retail investors shift money away from low-rated and into high-rated funds. El Ghoul & Karoui (2021) show that funds which have changed their names to a sustainability-related appellation exhibit larger inflows. Alda (2020) show that a higher ESG screening intensity triggers larger inflows. Ceccarelli et al. (2024) find that active funds which missed a "low carbon designation" label by Morningstar at its release, shifted their holdings towards less carbon-intensive firms. Lastly, Rzeźnik et al. (2021) show that some investors buy assets after a misconceived ESG score upgrade. This is evidence for the fact that it is not the true sustainability that seems to matter but only the ESG label. Therefore, we extend the literature by examining the unique setting of a policy intervention and its effects on mutual funds.

I.2 Data

Our study is based on 9,722 EU mutual funds and 15,896 U.S. funds for the period between September 2019 and June 2021[2]. While we are mostly interested in the effect of the regulation on European mutual funds, the U.S. data is used as a control group lacking the policy intervention. We gather data from the Morningstar database on the portfolio (monthly) ESG scores as well as the (monthly) fund size and the inception date.

[2]In September 2019 Morningstar changed how the sustainability rating is calculated (Ferriani & Natoli (2021)). Rzeźnik et al. (2021) show that investors misconceived the changes in the Morningstar methodology. To ensure our results are not driven by the change in methodology, we exclude data before September 2019.

Following Ammann et al. (2019), we analyze the sustainability of a mutual fund using the Morningstar Sustainability Rating. The Morningstar Sustainability Rating is being calculated based on the individual securities in each fund. In doing so, Morningstar evaluates how well an issuer manages environmental, social and governance risks and opportunities. The rating of the fund is then calculated based on a peer group comparison. It ranks mutual funds on a scale from one (worst) to five (best) within their global category. Further, Morningstar also provides data on each fund's SFDR classification. Here, the funds are either labeled as an article 8 fund, article 9 fund or not classified (i.e., article 6). Similarly to other studies, we retrieve data on our control variables - fund age, fund size, total net asset values and returns - and drop all observations with missing data (e.g. Alda (2020), Barber et al. (2005) and Morey (2002)).
Following Sirri & Tufano (1998) net mutual inflows are calculated as the growth in total assets reduced by the monthly returns as a percentage of total net assets at the beginning of the previous month:

$$Flow_{i,t} = \frac{TNA_{i,t} - TNA_{i,t-1}(1 + R_{i,t})}{TNA_{i,t-1}} \tag{I.1}$$

Whereby $TNA_{i,t}$ indicates the total net assets of a given fund i at the end of month t and $R_{i,t}$ is the return of fund during the month t. Since we are comparing EU to U.S funds as well as fund flows among the different SFDR categories, we create two different samples where the first one contains all U.S and EU and the second one all EU funds that have a SFDR classification in Morningstar. All control variables in both samples and the fund flows are winsorized at the 1% and 99% level.

Finally, we apply the 1:1 nearest-neighbour matching method from Rubin Rubin (1973). This matches funds from our control groups to the treated funds using fund age,

fund size, fund returns and fund net inflows. Non-matched funds from the control group are removed from the sample. This ensures that we avoid any bias from inadequate comparison and improves parametric statistical models (Ammann et al. (2019), Bilbao-Terol et al. (2017) and Joliet & Titova (2018)). Table I.1 offers an overview of the summary statistics. The mean sustainability rating for EU funds in the sample is 0.43 higher than for U.S. funds. Also, as expected, EU funds that are classified as article 9 have the highest sustainability rating while article 6 funds have the lowest one within the EU sample.

Table I.1: **Summary Statistics**. This table reports summary statistics of the monthly portfolio sustainability scores as well as on the different fund characteristic measures. All control variables are winsorized at the 1% and 99% level.

Panel A: EU vs. US						
EU Funds (All)						
	No of Obs	Mean	Median	SD	Min	Max
Sustainability Rating	92,310	3.29	3.00	1.07	1.00	5.00
Fund Age (Months)	92,310	160	145	108	2	439
Fund Size (in Million Euro)	92,310	489	138	1,191	1	30,593
Total Returns (in %)	92,310	1.57	1.89	4.94	-17.33	13.26
Fund Flows (in % of TNA)	92,310	0.22	-0.35	9.52	-30.59	62.01
US Funds (All)						
	No of Obs	Mean	Median	SD	Min	Max
Sustainability Rating	94,173	2.96	3.00	0.98	1.00	5.00
Fund Age (Months)	94,173	147	126	99	2	439
Fund Size (in Million Euro)	94,173	621	295	1,195	1	40,449
Total Returns (in %)	94,173	1.75	2.40	5.78	-17.33	13.26
Fund Flows (in % of TNA)	94,173	-0.35	-0.86	8.97	-30.59	62.01
Panel B: EU						
EU Funds (Article 6)						
Sustainability Rating	32,835	3.12	3.00	1.05	1.00	5.00
Fund Age (Months)	32,835	155	140	106	2	421
Fund Size (in Million Euro)	32,835	500	159	865	1	4,594
Total Returns (in %)	32,835	1.38	1.95	5.58	-22.19	10.18
Fund Flows (in % of TNA)	32,835	0.00	-0.45	9.14	-28.48	53.44
EU Funds (Article 8)						
Sustainability Rating	29,960	3.58	4.00	1.01	1.00	5.00
Fund Age (Months)	29,960	160	140	111	2	421
Fund Size (in Million Euro)	29,960	591	213	931	1	4,594
Total Returns (in %)	29,960	1.51	2.05	5.55	-22.19	10.18
Fund Flows (in % of TNA)	29,960	0.46	-0.22	9.32	-28.48	53.44
EU Funds (Article 9)						
Sustainability Rating	2,799	4.01	4.00	0.89	1.00	5.00
Fund Age (Months)	2,799	138	119	103	4	421
Fund Size (in Million Euro)	2,799	571	265	827	1	4,594
Total Returns (in %)	2,799	1.59	2.21	5.67	-22.19	10.18
Fund Flows (in % of TNA)	2,799	1.96	0.83	11.01	-28.48	53.44

I.3 The Influence of the EU Directive on Sustainability Scores

First, we examine the introduction of the new SFDR policy and its effect on the sustainability rating of the affected funds by estimating the following model:

$$ESG_{i,t} = \beta_0 * Treated_i + \beta_1 * Post_t + \beta_2 * Treated_i \times Post_t + \beta_3 * Size_{i,t-1} + \beta_4 * Age_{i,t-1} + \beta_5 * Ret_{i,t-1} + \beta_6 * Flow_{i,t-1} + \mu_i \quad \text{(I.2)}$$

where $ESG_{i,t}$ describes the sustainability rating of fund i at month t. The dummy $Treated_i$ equals one if fund i is a EU-based mutual fund and thus affected by the SFDR. The dummy $Post_t$ equals one for all months after November 2019. November 2019 marks the date when the European Commission passed the new regulation. Thus, FMPs had time since 2019 to adjust their portfolios and make them more ESG aligned, whereas customers had no information about the fund labels before March 2021. $Size_{i,t-1}$ are the total net assets of fund i at month $t-1$; $Age_{i,t-1}$ describes the total months between $t-1$ and the inception date of fund i; $Flows_{i,t-1}$ are the flows of fund i at month $t-1$; and $Ret_{i,t-1}$ is the return of fund i and month $t-1$. Our difference-in-differences estimator $Treated_i \times Post_t$ indicates observations for EU funds in the period after the introduction of the SFDR policy. In addition, we use fund fixed effects μ_i to control for any time-invariant effects and estimate our model using fund-clustered standard errors.

Table I.2 reports the results for equation I.2. The interaction term in column (2) shows that the intervention achieved its desired effect. The ESG rating for European mutual funds significantly rose after the announcement of the SFDR regulation relatively to the U.S peers. The average difference in fund ratings between EU and U.S.

funds rose by nearly 0.03 rating grades. This is in accordance with our initial expectations since mutual funds might anticipate higher fund inflows if they are publicly being labeled as a green investment. Hence, EU funds increase their sustainability level more than U.S. funds. Further, column (1) shows that the average EU funds score is 0.313 higher than for US funds while the average base level in the sample is about 2.99.

Table I.2: **The Influence of the EU Directive on Sustainability Scores**. The dummy *Treated* takes the value one for all EU funds and zero otherwise. The dummy *Post* in indicate the time period after November 2019. T-statistics (in parentheses) are based on fund-clustered standard errors. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively. Significance levels are calculated using fund-clustered standard errors.

	(1)	(2)
Dependent Var.	ESG Fund Rating	
Intercept	2.992***	
	(102.00)	
Treated	0.313***	
	(24.52)	
Post	-0.017*	-0.003
	(-1.74)	(-0.48)
Treated x Post	0.019	0.027**
	(1.37)	(2.62)
Controls	Yes	Yes
Fixed Effects (Fund)	No	Yes
R^2 adj.	0.027	0.001
Observations	186,483	186,483

I.4 Impact on Investors

After analyzing the supply side, we now shift our focus onto the demand side. Huang et al. (2020) and Ammann et al. (2019) show that mutual funds with a better rating or label attract more inflows compared to less sustainable funds. Consequently, funds that

received the article 8 or article 9 label should experience higher net inflows compared to article 6 funds. Again, we use the 1:1 nearest-neighbour matching to create three samples: for column (1), we exclude all article 9 funds and match each article 8 fund with the respective article 6 fund; for column (2) we exclude all article 8 funds and match each article 9 fund with the respective article 6 and for column (3) we match all article 8 and 9 funds with article 6 funds. In all specifications, unmatched article 6 funds are removed from the sample. We examine this hypothesis by estimating the following model:

$$Flow_{i,t} = \beta_0 * Treated_i + \beta_1 * Post_t + \beta_2 * Treated_i \times Post_t + \beta_3 * Size_{i,t-1} + \beta_4 * Age_{i,t-1} + \beta_5 * Ret_{i,t-1} + \mu_i \quad \text{(I.3)}$$

with $Flows_{i,t}$ being the net flows of fund i in month t. $Post_t$ now marks the effective date of the intervention, i.e. all observations beginning with March 2021. We use this date since the sustainability labels were not disclosed before March 2021 and thus customers could not take it into account when allocating their money. In columns (1), (2) and (3) the dummy $Treated_i$ takes the value one for all funds classified as article 8, article 9 and article 8 or 9, respectively and zero otherwise. Control variables remain unchanged. We again use fund fixed effects μ_i and fund-clustered standard errors.

Table I.3 displays the results of the difference-in-differences estimation. The interaction term in column (3) shows that funds which were labeled as either article 8 or 9 were able to significantly increase their net fund flows after the intervention. In particular, more sustainable funds are able to generate 0.5 percentage points per month more inflows than less sustainable funds. The significance of the interactions terms in columns (1) and (2) indicate that this result might be largely driven by article 8 funds

given the smaller sample size of article 9 funds. This is in line with the findings of Aasheim et al. (2022) or Ammann et al. (2019) who find an abnormal flows of 1.83% during the first 6 months after the publication of Morningstar sustainability fund ratings. This supports our hypothesis that an increase in transparency and sustainability will lead to more sustainable investments. However, it is not entirely clear how much of the effect can be attributed to increase in transparency or sustainability. Rzeźnik et al. (2021) show that investors care more about the label itself than the actual degree of ESG integration.

Table I.3: **The Influence of the EU Directive on Fund Flows**. In columns (1), (2) and (3) the dummy *Treated* takes the value one for all funds classified as article 8, article 9 and article 8 or 9, respectively and zero otherwise. The dummy *Post* indicates the time period beginning with March 2021. T-statistics (in parentheses) are based on standard errors. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively. Significance levels are calculated using fund-clustered standard errors.

	(1)	(2)	(3)
	Art. 8	Art. 9	Art. 8 & 9
Dependent Variable		Fund Flows	
Post	0.017***	0.019***	0.017***
	(10.56)	(3.57)	(11.09)
Treated x Post	0.005***	0.006	0.005***
	(2.69)	(0.89)	(2.93)
Controls	Yes	Yes	Yes
Fixed Effects (Fund)	Yes	Yes	Yes
R^2 adj.	0.020	0.012	0.018
Observations	60,013	5,581	65,594

I.5 Conclusion

In this paper, we study the impact of the SFDR – a legislation regarding sustainability disclosure for mutual funds – on the sustainability and fund flows of mutual funds. Us-

ing difference-in-differences regressions and 1:1 nearest neighbor matching, we compare funds affected by the legislation (EU-based funds) with unaffected funds (U.S.-based funds). Our results show a significantly higher increase in sustainability ratings for the EU-based funds after the announcement of the SFDR. This shows that, on the fund level, the intervention so far achieved its purpose of moving capital into more sustainable investments. To observe whether the legislation also has an impact on investors we investigated the changes in fund flows of different sustainability classifications introduced by the SFDR. Here, we find that investors appreciate a higher degree of ESG alignment and allocate their capital accordingly. Funds with classifications indicating a more advanced level sustainability integration experience significantly higher net fund flows after the public disclosure of fund labels. Our findings have direct implications for investors and practitioners. First, due to investors investing more in article 8 and article 9 funds, asset manager should increase their sustainability efforts according to article 8 and article 9 of the SFDR. Second, it is likely that the newly introduced labels will increase the threat of a possible ESG overvaluation (Bofinger et al. (2022)). An increasing amount in indications for sustainable investments can potentially lead to even higher investments towards overvalued firms. In summary, our study shows the effectiveness of the newly introduced regulation on sustainability-related disclosures in the financial services sector and points towards the SFDR mobilizing capital towards sustainable investments.

Chapter II

Are sustainability-linked loans designed to effectively incentivize corporate sustainability? A framework for review

Coauthors:

Alix Auzepy

Christina E. Bannier

Relative share:

45%

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Are sustainability-linked loans designed to effectively incentivize corporate sustainability? A framework for review

Abstract

This paper analyzes sustainability-linked loans (SLLs), a new category of debt instrument that incorporates ESG considerations. Using a large sample of loans issued between 2017 and 2022, we assess the design of SLLs by evaluating their key performance indicators (KPIs) using a comprehensive quality score. Our findings suggest that SLLs only partially rely on KPIs that generate credible sustainability incentives. We document that SLL borrowers do not significantly improve their ESG performance post issuance and show that stock markets are rather indifferent to the issuance of SLLs by EU borrowers, while SLL issuance announcements by US borrowers are met with significantly negative abnormal returns by investors. These findings call into question the beneficial sustainability and signaling effects that borrowers may hope to achieve by issuing ESG-linked debt.

Keywords: Sustainability-linked loans, sustainability KPIs, ESG lending, ESG loans, sustainable finance

JEL-Codes: G21, G32, M14

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II.1 Introduction

A recent development in the realm of corporate finance is the emergence of debt instruments that incorporate environmental, social, and governance (ESG) considerations. These instruments serve two primary purposes: procuring capital and fostering corporate sustainability practices. One category of such instruments, sustainability-linked loans (SLLs),[1] is particularly distinct from other emerging instruments such as green bonds, social bonds, and green loans. Unlike these instruments, whose proceeds have to be allocated towards environmentally or socially responsible projects, SLLs are general corporate purpose loans. The issuance of SLLs is therefore not characterized by their use of proceeds, but by the borrower's performance against pre-defined ESG targets.

Achievement of these targets is measured by key performance indicators (KPIs), which typically impact loan pricing in the form of an interest rate discount or premium. The Loan Market Association (LMA), which published the Sustainability-Linked Loan Principles (SLLP) as a set of voluntary guidelines for market practitioners, defines SLLs as "any types of loan instruments and/or contingent facilities for which the economic characteristics can vary depending on whether the borrower achieves ambitious, material and quantifiable pre-determined sustainability performance objectives" (Loan Market Association (2023*b*), p.2). The primary objective of SLLs is therefore to support the borrower's efforts to improve its sustainability profile over the life of the loan (Loan Market Association 2023*b*).

While SLLs have gained increasing popularity, accounting for approximately 10% of the global corporate syndicated loan market in 2021 (Kim et al. 2023), there is still limited understanding of the specific characteristics of the sustainability KPIs that are

[1] SLLs are also sometimes called "ESG-linked loans". We use the terms interchangeably throughout this paper.

included in these contracts. This aspect is particularly relevant when considering that SLLs can be tied to multiple KPIs covering a wide range of ESG issues. At a time when there is growing concern about greenwashing practices (Carrizosa & Ghosh 2022, Kim et al. 2023), it is critical to gain more clarity on whether - and if so, which - KPIs are credible and meaningful for achieving sustainability goals.

This is where our paper seeks to contribute. By providing a detailed analysis of KPI characteristics, we aim to further the discussion on the effectiveness of SLLs in promoting ESG activities beyond "business as usual" (Loan Market Association (2023*a*), p.3). Specifically, we evaluate the design of KPIs in ESG-linked loan contracts along six key dimensions derived from the SLLP. We then use this evaluation as a basis for investigating whether the issuance of SLLs positively incentivizes borrowers to improve their sustainability performance ex-post. In addition, we examine whether SLLs are perceived by the stock market as credible signals of corporate commitment to ESG considerations.

Our study is based on a sample of SLLs extracted from the Refinitiv DealScan database. We focus on borrowers headquartered in the European Union (EU) and the United States (US) for both historical and regulatory reasons. From a historical perspective, the emergence of SLLs, which were virtually non-existent prior to 2017, saw a rapid increase in total issuance volume, rising from over $2 billion in 2017 to more than $310 billion by the end of 2021.[2] This growth trend was particularly pronounced in Western Europe in the early years and later spread to other regions of the world, most notably the United States (Kim et al. 2023). While current regulations do not specifically require companies to report comprehensive information about their credit

[2]Kim et al. (2023) capture a similar trend by documenting a rapid increase in ESG lending activity from 2017 to 2021, with most of the SLL borrowers concentrated in the US and Western European countries.

agreements, the existing regulatory frameworks in both the EU and the US still create important incentives for disclosure. In the EU, for example, large companies are required to disclose environmental and social policies in their non-financial statements. Large US corporations proceed similarly. Such disclosures allow us to obtain detailed information about the issuance of SLLs and the KPIs set forth in those contracts.

In the first part of this paper, we examine whether the design of KPIs creates credible incentives for companies to improve their sustainability practices. We address this question by developing a qualitative scoring methodology along six key dimensions: (1) strategic relevance, (2) materiality, (3) measurability, (4) benchmarking, (5) pricing mechanism, and (6) external review. These dimensions serve as a framework that outlines distinct criteria that, according to the LMA, SLLs should meet in order to be considered credible (Loan Market Association 2023*b*). Our analysis delivers a multi-dimensional KPI score per loan that can be used to assess and compare the quality of the incentives defined in the SLLs. As each dimension captures unique information that contributes to a comprehensive understanding of the KPIs' credibility, our approach is consistent with the recommendations of Edmans (2023) who calls for granular assessments in ESG-related studies.

The results of our KPI analysis suggest that SLLs only partially rely on KPIs that create credible sustainability incentives. In particular, our results show significant variation across the dimensions assessed in our framework. On the positive side, we find that most SLLs include KPIs that are strategically relevant and part of the borrowers' existing sustainability strategies: Only 22% of SLLs feature KPIs that do not match the borrowers' stated sustainability objectives or priorities. This suggests that firms employ SLLs as a holistic approach to further integrate existing ESG considerations into corporate operations. In addition, we observe that the vast majority of SLLs are tied to

measurable and objectively quantifiable KPIs that allow lenders to easily track performance against the selected KPIs.

However, on the negative side, our materiality assessment against the SASB standards shows that 42% of the SLLs in our sample are linked to KPIs that are not financially material. This indicates a misalignment between the sustainability goals that the SLLs seek to achieve and the sustainability considerations that are most likely to impact the company's financial performance. In addition, only 15% of the SLLs in our sample are clearly benchmarked, suggesting a lack of reference points for setting the KPIs. As a result, key stakeholders, including investors, may not be able to objectively assess and compare the level of ambition of the KPIs. Our analysis furthermore reveals mixed results with respect to the pricing mechanism and external review of the KPIs. While 40% of the SLLs in our sample explicitly include a malus system that requires borrowers to pay higher interest rates if they fail to meet their sustainability targets, we find that 17% include only a bonus and no financial penalty. In addition, only half of the SLLs in our sample are linked to KPIs that are subject to external and independent verification at least annually.

Overall, the SLLs in our sample achieve an average KPI score of 3.47 on a scale of 0 to 6, suggesting that these debt instruments are only partially designed to incentivize sustainability efforts by their borrowers. Surprisingly, we observe that the number of KPIs that are included in a loan is negatively associated with this score. While companies may fear that focusing on only a small number of ESG objectives could signal a weaker commitment to sustainability, increasing the number of KPIs actually seems to make such instruments less effective in improving sustainability incentives.

In the second part of our paper, we empirically test whether the issuance of SLLs is associated with a positive ex-post change in borrowers' ESG performance. To do so,

we employ a difference-in-differences design based on a matched sample. To identify the relationship between SLL issuance and ex-post ESG performance, we use a two-way fixed effects (TWFE) estimator that compares SLL issuers to a control group of conventional borrowers before and after the treated firms issued their first SLL. Our analysis relies on several ESG performance metrics obtained from MSCI, including the overall industry-adjusted total ESG scores and environmental, social, and climate change pillar scores. We primarily examine these performance metrics to account for the fact that most KPIs in ESG-linked loan contracts relate to environmental and social issues (58% and 25% of all KPIs in our sample, respectively), while governance-related KPIs make up only 1.35% of our sample. In addition, about 17% of the KPIs in our sample are linked to ESG ratings or similar certifications.

Our results show that the issuance of an SLL does not lead to a significant change in the ex-post ESG performance of the borrower. In other words, we observe neither an improvement nor a deterioration in ESG performance. This holds also when looking at the overall ESG score and the scores of each pillar separately. We repeat our analysis by measuring the weighted group time average treatment effect on the treated (ATT), as proposed by Callaway & Sant'Anna (2021). This procedure allows us to address concerns about the reliability of the TWFE estimator in ordinary least squares (OLS) (de Chaisemartin & D'Haultfœuille 2020, Baker et al. 2022). Once again, the ATT coefficients are statistically insignificant, confirming our earlier findings and suggesting that SLLs are not associated with a subsequent change in the ESG performance of their borrowers. Overall, these results indicate that the issuance of SLLs primarily maintains the current level of ESG performance rather than leading to significant improvements in subsequent years.

In the final part of our paper, we conduct an event study to determine whether equity

investors perceive SLLs as credible signals of corporate commitment to sustainability and, therefore, whether the issuance of such loans is associated with positive stock market reactions. Previous research shows that investors react particularly strongly to the release of environmental and community news (Krüger 2015). In addition, (Flammer 2021) finds that stock market investors respond positively to the issuance of green bonds when such instruments are subject to third-party verification and when the use of proceeds is financially material to the company's operations. Thus, we use variation in KPI quality, as measured by our KPI score, to examine stock market reactions to SLL issuance announcements in relation to specific KPI characteristics, such as materiality and external verification. This approach allows us to gain further insights into the perceived credibility of SLLs.

We find that stock markets are rather indifferent to the issuance of SLLs by EU borrowers. In contrast, investors react cautiously to SLL issuance announcements by US borrowers, especially when such loans include environmental KPIs. More precisely, we document a significant negative market reaction with an average cumulative abnormal return of -0.49% in the event window symmetrically surrounding the announcement date of issuance. In a further analysis, we also find a negative association between a higher number of KPIs and the market response to loan issuance announcement. There are several possible interpretations for these results. For example, the results may reflect growing skepticism, particularly in the US, about the value of integrating ESG factors into investment decisions (see, e.g., Edmans (2023)). In addition, as the selected KPIs in SLLs often fail to address financially material issues, assessing the potential financial benefits of SLLs may be challenging. Finally, investors may also be wary of possible greenwashing practices, which have become increasingly common in recent years (Kim et al. 2023).

Our study builds on and complements the work of other scholars, including Kim et al. (2023), Carrizosa & Ghosh (2022), Du et al. (2023), Caskey (2022), Loumioti & Serafeim (2022),Dursun-de Neef et al. (2023). Collectively, our findings make important contributions to the rapidly growing literature on SLLs. In particular, our paper adds to recent studies that explore the selection and design of sustainability KPIs in ESG-linked loan contracts. Loumioti & Serafeim (2022) investigate KPI materiality and report that most SLLs fail to focus on material ESG features and do not address borrowers' relevant ESG risks. Carrizosa & Ghosh (2022) examine the presence of an external KPI auditor and find that the likelihood of KPIs being monitored and audited is positively associated with the ESG expertise of the lead arranger and the number of KPIs. Kim et al. (2023) and Du et al. (2023) report that SLL borrowers face limited financial penalties for failing to meet their sustainability targets. Although these prior studies have individually explored different aspects of KPI characteristics, our paper stands out as the first attempt to systematically analyze a set of six dimensions (i.e., strategic relevance, materiality, measurability, benchmarking, pricing mechanism and external review) together in a single framework. This framework is based on the SLLP, a set of recommendations for market practitioners developed by the LMA, outlining fundamental characteristics that SLLs should meet in order to provide credible sustainability performance incentives. We show that the six dimensions deliver complementary information and collectively contribute to a comprehensive understanding of the incentive structures (and their current limitations) built into ESG-linked loan contracts.

Our study also sheds new light on the mixed results observed in the existing literature regarding the ability of SLLs to influence corporate sustainability performance. Dursun-de Neef et al. (2023) find that firms improve their overall ESG performance after issuing SLLs by increasing their environmental and governance scores. Kim et al.

(2023) find that borrowers' ESG performance metrics deteriorate after the issuance of low-transparency SLLs. Du et al. (2023) use the ESG scores of different rating agencies (Asset4, RepRisk and S&P) and document that SLL issuance does not result in a significant change in overall ESG performance. We complement this study by providing additional evidence on the lack of a clear relationship between SLL issuance and ex-post ESG performance based on MSCI ratings. We show that SLL issuance does not lead to a significant change, i.e., neither deterioration nor improvement, in borrowers' ESG profiles, as measured by their industry-adjusted, environmental, social and climate scores from MSCI. In addition, our KPI analysis, which highlights the limitations of current SLLs, extends this literature by providing new rationales for the lack of meaningful sustainability improvements in the years following SLL issuance.

Finally, our findings also contribute to the literature on sustainable finance instruments and their signaling function (Flammer 2021). Examining SLLs, Kim et al. (2023) find that stock prices react positively to public announcements of high-transparency SLLs, while Carrizosa & Ghosh (2022) report negative and mostly statistically insignificant reactions to loan announcements. Our study adds to this literature by highlighting marked differences between EU and US borrowers, revealing distinct patterns in stock market reactions across regions. Here as well, the results of our KPI analysis, such as the number of KPIs and the lack of financial materiality, provide additional explanations for the negative market reactions in the US or the absence of market response observed in the EU, respectively. Relatedly, our paper contributes to the growing body of research that questions the value implications of green financial instruments (Kölbel & Lambillon 2022, Aswani & Rajgopal 2022). Specifically, our results add to the study by Aswani & Rajgopal (2022), who find negative or partially insignificant reactions for issuers of green bonds and sustainability-linked bonds. Similar to our analysis of ex-post

ESG performance, their study shows that green bond issuers do not change significantly reduce their greenhouse gas emissions in the years following bond issuance. Overall, our paper provides somewhat sobering evidence on the stock market reactions to the issuance of SLLs and their immediate impact on corporate sustainability.

The remainder of this paper is organized as follows. Section 2 discusses the potential motivations for issuing SLLs. Section 3 describes the data collection procedure and provides descriptive statistics for our sample of SLLs. Section 4 explains our KPI scoring methodology and presents the results of our KPI analysis. Section 5 describes the empirical results. Finally, Section 6 concludes.

II.2 Background

At first glance, it may seem surprising that companies would choose to issue SLLs over conventional loans. Not only can SLLs result in higher interest rates if certain sustainability targets are not met, but they also come with additional administrative and compliance constraints. By including ESG considerations in their loan agreements, companies explicitly commit to targets for which they can be held accountable and for which they are financially liable (Kim et al. 2023). Nevertheless, SLLs are becoming increasingly popular (Du et al. 2023). So what are the motivations for firms to issue them?

One potential motivation for firms to issue SLLs may be the need to strengthen their sustainability strategy. SLLs allow firms to take a holistic approach to sustainability objectives by embedding existing ESG considerations into an important aspect of their business: their financing. SLLs may serve as an additional mechanism to ensure that strategic sustainability considerations are actually implemented within the company.

In doing so, SLLs also enable companies to receive advice and regularly engage with their lenders on sustainability issues. From the lenders' perspective, the issuance of SLLs may also be motivated by the need to mitigate financial and reputational risks associated with any poor sustainability practices by their borrowers Kim et al. (2023). As borrowers are encouraged to seek external, independent advice on the selection of KPIs prior to signing (Loan Market Association (2023*b*)), the process of issuing an SLL may also reinforce and lend further credibility to the company's overall sustainability strategy.

By requiring lenders to sign off on KPIs, SLLs may demonstrate lenders' confidence in their borrowers' strategic ESG commitments (Kim et al. (2023)). Therefore, another possible motivation for issuing SLLs may be an attempt to signal commitment to sustainability issues to a broader group of stakeholders in response to growing investor demand and public scrutiny (Krueger et al. 2020, Flammer 2021, Ilhan et al. 2023). Because investors often do not have sufficient information to assess a company's commitment to ESG goals, this information asymmetry creates a need for companies to differentiate themselves from their peers by signaling their strategy in a credible way (Flammer 2021). SLLs may therefore serve as signaling tools, for example, by being mentioned in media press releases or by encouraging borrowers to regularly disclose their progress toward specific ESG goals in their annual reports. In this way, SLLs allow to increase the visibility of borrowers' ESG commitments.

In addition, SLLs represent a particularly attractive financing instrument for companies that were previously excluded from sustainable lending due to the nature of their core activities and wish to enter this space (Kim et al. 2023). In particular, the absence of requirements on the use of proceeds ensures that SLLs are not limited to firms with specific environmental and climate-friendly projects. Thus, unlike green loans or green

bonds, SLLs can be used in a wider range of industries and for a broad variety of purposes. By design, these loans offer a high degree of flexibility, allowing borrowers and lenders to tailor the KPIs to the specific situation of the company (Dursun-de Neef et al. 2023).

Finally, financial discounts may also motivate the issuance of SLLs. In the case of conventional loans, borrowers typically pay a spread in addition to a benchmark (e.g., Euro Interbank Offered Rate, Euribor) based on various measures of a borrower's credit risk, such as credit rating. In the case of SLLs, this spread is adjusted by a pre-defined amount to reflect a borrower's progress, assessed on an annual basis, against one or more sustainability KPIs (Loumioti & Serafeim 2022). For example, a loan may be priced at 175 basis points (bps) over Euribor, with this spread reduced by 5 bps if the borrower meets its sustainability target in a given year. The pricing mechanism of SLLs can include not only financial rewards but also penalties for not meeting the targets. Appendix II.9 includes a detailed example of such pricing mechanism. While Kim et al. (2023) show that the initial spreads at which SLLs are issued are no different from those of conventional loans, borrowers may still have an incentive to issue SLLs because of the financial rewards that can be earned by meeting their sustainability targets over the life of the loan.

Despite these motivations, SLLs also carry risks for both borrowers and lenders. In particular, the emerging literature on SLLs already suggests that such loans can be misused for greenwashing purposes and frequently serve to showcase an empty emphasis on ESG to stakeholders (Kim et al. 2023). Moreover, despite the appeal of potential margin discounts, initial evidence on the pricing of SLLs indicates that the size of these discounts to borrowers is limited (Du et al. 2023). These observations make an analysis of the sustainability KPIs at the core of SLLs even more crucial.

II.3 Loan data and sample

II.3.1 SLL data

We obtain our data from the Refinitiv Dealscan database by extracting loans originated between 2017 and 2022 that are labeled as "sustainability-linked loans". Refinitiv Dealscan assigns this specific label based on loan characteristics gathered from loan agreements, corporate press releases, business press articles, and discussions with borrowers and lenders. We also exclude from our database all SLLs that do not have an announcement date and a closing date. The loan announcement date is critical for our analysis of market reactions, and the financial close date ensures that the transaction was successfully completed. In total, we identify 595 ESG-linked loans issued to listed borrowers in the EU and the US over the sample period from 2017 to 2022.

Table II.1 shows the time series of SLL issuance for our sample. SLL issuance totals $755 billion over the sample period, growing from $2 billion in 2017 to approximately $248 billion in 2022. In terms of issuance volume, the US surpasses the EU in 2021 and shows a comparable, slight downward trend in 2022.

Table II.1: **Issuance of sustainability-linked loans over time**. This table reports the total issuance amount and number of SLLs issued to borrowers headquartered in the European Union and the United States. The sample consists of 595 loans issued between 2017 and 2022.

	European Union		United States		Total	
Year	Number of SLLs	Volume (in Mio. $)	Number of SLLs	Volume (in Mio. $)	Number of SLLs	Volume (in Mio. $)
2017	4	2,176.24	0	0	4	2,176.24
2018	19	23,318.04	2	3,050.00	21	26,368.04
2019	60	61,249.63	4	7,025.36	64	68,274.99
2020	71	84,737.86	5	11,730.80	76	96,468.66
2021	135	141,462.22	76	172,776.84	211	314,239.06
2022	154	123,862.07	65	123,765.92	219	247,627.99
Total	443	436,806.06	152	318,348.92	595	755,154.98

Table II.2 shows the country distribution of the SLLs in our sample. The largest issuer of SLLs are the US (25.63%), followed by France (15.29%) and Spain (14.29%), which is similar to what has been documented in previous literature on ESG lending (Kim et al. 2023, Dursun-de Neef et al. 2023).

Table II.2: **Sustainability-linked loans by country**. This table reports the total issuance amount and number of SLLs categorized by borrowers' country of incorporation. The percentage of SLLs for each country is calculated as the ratio of the number of SLLs per country to the total number of SLLs in our sample. The sample consists of 595 loans issued between 2017 and 2022.

Country	Number of SLLs	Percentage of SLLs	SLL Volume (in Mio. $)
United States	152	25.55%	318,348.92
France	91	15.29%	137,569.37
Spain	85	14.29%	57,111.15
Italy	68	11.43%	73,281.31
Germany	42	7.06%	66,835.80
Finland	40	6.72%	14,325.55
Netherlands	29	4.87%	22,836.00
Sweden	21	3.53%	18,051.81
Belgium	18	3.03%	7,600.47
Denmark	13	2.18%	14,513.09
Ireland	12	2.02%	11,028.35
Austria	6	1.01%	2,750.90
Greece	5	0.84%	628.19
Portugal	5	0.84%	4,004.31
Luxembourg	4	0.67%	6,937.70
Poland	3	0.50%	1,189.39
Estonia	1	0.17%	142.66
Total	595	100.00%	757,154.98

Table II.3 provides an overview of SLLs by sector, as defined by the Thomson Reuters Business Classification (TRBC). We find that most SLLs were issued by firms operating in the industrials (17.82%) and utilities (15.46%) sectors, while firms in the healthcare (4.03%) and financials (2.69%) sectors issued the lowest number of loans and the lowest total volume.

Table II.3: **Sustainability-linked loans by sector**. This table reports the number of SLLs and total issuance amount by sector of the borrowers. Sectors are defined using Thomson Reuters Business Classification (TRBC). Percentage of SLLs is the ratio of the number of SLLs in each sector to the total number of SLLs in our sample. The sample consists of 595 loans issued between 2017 and 2022.

Sector	Number of SLLs	Percentage of SLLs	SLL Volume (in Mio. $)
Industrials	106	17.82%	124,093.55
Utilities	92	15.46%	127,140.83
Real Estate	85	14.29%	103,166.27
Consumer Cyclicals	84	14.12%	89,574.33
Basic Materials	75	12.61%	69,331.60
Technology	46	7.73%	94,092.35
Consumer Non-Cyclicals	36	6.05%	35,219.64
Energy	31	5.21%	45,337.04
Healthcare	24	4.03%	33,065.02
Financials	16	2.69%	29,715.46
Total	595	100.00%	757,154.98

Overall, we observe a broad diversification of SLL issuance across sectors. Compared to green loans, SLLs are not concentrated in the energy and utilities sectors (Dursun-de Neef et al. 2023), but are also widespread in the industrials (17.82%), real estate (14.29%), consumer cyclicals (14.12%) and basic materials (12.61%) sectors. In addition, we note regional differences within our sample. For example, the majority (58.82%) of SLLs issued by firms in the real estate sector are loans to US borrowers. US firms also account for a large share of SLLs in the financials (37.50%) and technology (33%) sectors. In contrast, EU borrowers account for the largest share of loans to the utilities (80.43%) and industrials (79.30%) sectors. These regional differences in SLL lending may be due to varying regulatory frameworks and market conditions between the EU and the US.

As shown in Table II.4, approximately 86% of SLLs in our sample are general corporate purpose loans, which is consistent with the notion that these loans can be used

for a wide range of corporate purposes, without a pre-specified use of proceeds. Because SLLs can be tailored to different corporate needs and strategies, they represent a flexible and particularly attractive tool for companies looking to enter the sustainable finance market.

Table II.4: **Sustainability-linked loans by use of proceeds**. This table reports the breakdown of SLLs by the use of proceeds. The percentage of SLLs for each category is calculated as the ratio of the number of SLLs by use of proceeds to the total number of SLLs in our sample. Use of proceeds are extracted from the Refinitiv database. The sample consists of 595 loans issued between 2017 and 2022.

Use of proceeds	Number of SLLs	Percentage of SLLs
General corporate purpose	512	86.05%
Refinancing	22	3.70%
Working capital	21	3.53%
Acquisition finance	13	2.18%
Capital expenditures	13	2.18%
Real estate/Property acquisition	5	0.84%
Ship financing	5	0.84%
Leveraged buyout	1	0.17%
Management buyout	1	0.17%
Project finance	1	0.17%
Aircraft financing	1	0.17%
Total	595	100.00%

II.3.2 KPI data

Since Refinitiv DealScan does not include detailed data on KPI characteristics, we manually collect such data from company websites, annual reports, stand-alone ESG reports, integrated reports, general registration documents, company presentations and press releases from both borrowers and lenders. Since there is no standardized reporting system for SLLs, most of this data is selectively disclosed by borrowers and lenders. For US companies, we also look for credit-related information in the 8-K and 10-K filings in the SEC's Electronic Data Gathering, Analysis, and Retrieval (EDGAR) system. In rarer

cases, we obtain data from financial news reports. We then classify each loan in our sample according to the level of information available on its underlying KPIs. Loans with information on their main sustainability objectives and KPIs are classified as "with KPI information". In total, our sample of SLLs contains 364 loans with KPI information, representing slightly more than 61% of the original SLL sample.

Table II.5 shows that the total number of KPIs per SLL ranges from 1 to 5, although most loans in our sample contain between 1 and 3 KPIs. Specifically, almost 36% of SLLs are tied to only 1 KPI, while around 56% of SLLs in our sample include 2 or 3 KPIs. Only less than 9% of the SLLs in the sample have 4 or more KPIs. From a regional perspective, we identify KPI information for 281 out of 443 SLLs (63.43%) issued to EU borrowers. For the US sample, we are able to collect KPI information for 83 out of 152 SLLs (54.61%). These observations suggest that EU borrowers are more likely to disclose information about the characteristics of their loans than their US counterparts. We also observe sector-specific disclosure characteristics. For example, we find that SLLs issued by firms in the utilities sector account for the largest share (16%) of loans with KPI information, while SLLs issued by firms in the real estate sector represent a large share (18%) of SLLs without KPI information. One possible explanation for this difference is the level of regulatory oversight in the utilities sector, where firms are subject to strict environmental regulation and therefore more likely to disclose sustainability-related information as part of their annual reports and in loan agreements.

Table II.5: **Number of KPIs per sustainability-linked loan**. This table reports the distribution of SLLs by the number of KPIs per loan. The percentage of SLLs is calculated as the ratio of the number of SLLs in each category of KPIs per loan to the total number of SLLs in the sample. The sample consists of 364 SLLs with KPI information issued between 2017 and 2022.

Number of KPIs	Number of SLLs	Percentage of SLLs
1	131	35.99%
2	121	33.24%
3	84	23.08%
4	26	7.14%
5	2	0.55%
	$\sum$ 364	$\sum$ 100.00%

Our analysis shows considerable heterogeneity in the thematic focus of the underlying KPIs among the SLLs in our sample, suggesting that borrowers customize and tailor KPIs to meet their specific sustainability objectives. In addition, it is important to note that SLLs may be linked to multiple KPIs, and each KPI may cover different ESG dimensions. To ensure a granular analysis of the KPIs, we have grouped them into a total of 18 different categories based on four thematic pillars: environmental, social, governance, and ESG.[3]

Table II.6 provides an overview of the distribution of KPIs within the clusters. With respect to the overarching pillars, we find that more than half of the KPIs in our loan sample (58.43%) belong to the environmental pillar. In contrast, the social pillar accounts for about 24% of all KPIs identified in the SLLs in our sample, and the governance pillar accounts for less than 2% of the KPIs in our sample. Finally, we find that ESG ratings and ESG certifications are also commonly used in SLLs, accounting for about 17% of the KPIs in our sample. Overall, this distribution of KPIs suggests that borrowers place more emphasis on environmental aspects than on social or governance

[3] An overview of the pillars, including a summary description of the KPIs included in each category, is provided in table II.17 in the Appendix.

aspects when determining their KPIs. One possible explanation for this observation could be that investors (including lenders), regulators, and society place a high value on environmental responsibility (see, e.g., Ilhan et al. (2023), Krueger et al. (2020)). As a result, companies may have stronger external incentives to set environmental KPIs.

Table II.6: **Distribution of KPIs within sustainability pillars**. This table shows the distribution of KPIs (in absolute and percentage terms) within the environmental, social, governance pillars. In addition, the table presents the distribution of KPIs linked to ESG ratings or similar certifications. The sample consists of 741 KPIs in 364 SLLs issued between 2017 and 2022.

Category	Number of KPIs	Percentage of KPIs
Environmental	**433**	**58.43%**
Greenhouse gas emissions	247	33.33%
Renewable energy	55	7.42%
Energy consumption and efficiency	35	4.72%
Circular economy	24	3.24%
Waste reduction and elimination	21	2.83%
Water consumption	19	2.56%
Use of sustainable resources	18	2.43%
Environmentally sustainable investments	9	1.21%
Biodiversity	5	0.67%
Social	**176**	**23.75%**
Employee diversity and gender equality	63	8.50%
Employee health and safety	45	6.07%
Sustainable products and customer benefits	26	3.51%
Social responsibility and community engagement	18	2.43%
Diverse and sustainable supply chain	13	1.75%
Employee training	11	1.48%
Governance	**10**	**1.35%**
Business ethics	10	1.35%
ESG	**122**	**16.46%**
ESG rating	70	9.45%
Other ESG assessment or certification	52	7.02%
	$\sum$ 741	$\sum$ 100.00%

Within these pillars, about one-third of all KPIs fall into the category of greenhouse gas emissions, suggesting that a significant proportion of KPIs are aimed at reducing such emissions, which is consistent with the analyses of Carrizosa & Ghosh (2022) and

Loumioti & Serafeim (2022). In addition, a significant proportion of the KPIs fall into the category of ESG ratings. We find that SLLs are linked to up to three ESG ratings from three different rating agencies, although most SLLs have only one ESG rating as a main KPI. However, if we look at the trend in the use of ESG ratings as KPIs, we find a steady decline over the period of our sample. This trend may be due to the lack of transparent methodology underlying ESG ratings (Berg, Kölbel & Rigobon 2022). In addition, the LMA recommends that borrowers explain why a particular ESG rating best reflects the ESG challenges of their core business when using it as a KPI (Loan Market Association 2023*a*). Overall, such developments are likely to encourage the use of individual and company-specific KPIs in the future.

Table II.7 provides an overview of the distribution of KPIs across sectors. The utilities sector has the highest proportion of environmental KPIs (19.17%), followed closely by the industrials and consumer cyclicals sectors, which account for 16.86% and 14.55% of all environmental KPIs, respectively. Overall, the distribution of environmental KPIs suggests that they are widely used across various sectors. Social KPIs are prevalent in SLLs issued to firms in the industrials (21.02%) and technology (17.05%) sectors, while the majority of KPIs covering ratings or similar certifications can be found in the real estate (23.77%) and industrials (18.85%) sectors. In contrast, KPIs covering corporate governance factors are concentrated in only three main sectors, namely financials (40%), utilities (40%) and energy (20%).

Table II.7: **Distribution of KPIs within sectors**. This table shows the distribution of environmental, social, governance, and ESG KPIs (absolute and percentage terms) within each sector in our sample. ESG KPIs are tied to ESG ratings or similar certifications. The sample consists of 741 KPIs in 364 SLLs issued between 2017 and 2022.

Sector	Environment	Social	Governance	ESG
Basic Materials	12.93%	10.23%	0.00%	16.39%
Consumer Cyclicals	14.55%	15.91%	0.00%	11.48%
Consumer Non-Cyclicals	8.78%	6.25%	0.00%	7.38%
Energy	4.16%	3.41%	20.00%	3.28%
Financials	1.39%	4.55%	40.00%	1.64%
Healthcare	2.31%	6.25%	0.00%	2.46%
Industrials	16.86%	21.02%	0.00%	18.85%
Real Estate	10.16%	3.41%	0.00%	23.77%
Technology	9.70%	17.05%	0.00%	5.74%
Utilities	19.17%	11.93%	40.00%	9.02%
	$\sum$ 100.00%	$\sum$ 100.00%	$\sum$ 100.00%	$\sum$ 100.00%

II.4 The design of SLLs

II.4.1 Scoring methodology

In recent years, academics and practitioners have raised concerns about greenwashing practices observed in SLL transactions.[4] Greenwashing is particularly likely when KPIs are not material and central to the borrower's business, when they are not sufficiently ambitious or meaningful, and when the borrower's performance is inaccurately or inadequately measured, benchmarked, and monitored (Loan Market Association 2023*a*). Given their critical role in incentivizing corporate sustainability efforts, we begin our analysis by shedding light on the characteristics and quality of the KPIs in our sample. To this end, we evaluate each SLL individually and measure KPI quality by developing a scoring system based on the SLLP (Loan Market Association 2023*b*). The SLLP pro-

[4]For example, the oilfield services company Schlumberger signed an SLL in 2021 before it had even established official sustainability KPIs (International Financing Review 2021).

vide a framework for the key characteristics that SLLs and their associated KPIs should meet in order to credibly and effectively incentivize ESG performance. In line with the SLLP, we develop six scoring dimensions to assess the quality of KPIs. They are summarized in Table II.8.

Table II.8: **KPI score dimensions**. This table shows the six main dimensions on which our score for measuring the quality of SLL KPIs is based. Strategic relevance refers to the relevance of the KPIs to the borrower's strategy and sustainability objectives. Materiality assesses whether the KPIs address financially material issues based on the SASB Materiality Map. Measurability assesses whether the KPIs are measurable or quantifiable on a transparent methodological basis. Benchmarking examines whether the KPIs are benchmarked against relevant standards or targets. Pricing mechanism refers to the existence of a bonus and malus system related to interest rate adjustments. External review refers to an external independent verification of performance against the KPIs.

	Score dimensions
1	Strategic relevance
2	Materiality
3	Measurability
4	Benchmarking
5	Pricing mechanism
6	External review

To calculate a score for each SLL based on the dimensions described, each dimension is assigned a value of 0, 0.5, or 1 depending on the degree of fulfillment. Thus, the maximum score per SLL is 6 points if all dimensions score fully. The KPIs are considered at the loan level. An overview of examples of KPIs that have been assigned a value of 1 in a particular dimension can be found in Appendix II.8.

The first dimension assesses whether the KPIs are relevant to the borrower's strategy (Loan Market Association 2023*b*). To satisfy the first dimension, a KPI must either be an integral part of a clearly defined sustainability strategy, or represent an important

sustainability objective set by the company prior to the loan issuance. KPIs are assigned a value of 0 if they are not in line with the borrower's official sustainability goals. In addition, KPIs are assigned a value of 0 if there is no public information on the borrower's sustainability goals. Consequently, companies without a sustainability strategy cannot receive a full score in this dimension. This is consistent with the following principle: "A SLL could be made theoretically to any borrower, but will be best suited to those that already have a sustainability strategy in place." (Loan Market Association (2023*a*), p.4). However, it is important to note that this does not disadvantage companies with low ESG ratings. These companies may already have a sustainability strategy or be actively developing one to improve their ESG performance. This dimension therefore assesses the strategic relevance of KPIs included in SLLs, regardless of the company's ESG performance. In contrast, KPIs are assigned a value of 0.5 if they are only partially aligned with the borrower's sustainability strategy. Finally, KPIs are assigned a value of 1 if they are fully aligned with the borrower's publicly disclosed key sustainability objectives.

The second dimension of the score examines whether the KPIs are material and address financially relevant sustainability challenges in the industry in which the company operates. For example, a company may choose to reduce its scope 1 emissions as part of its SLL, even though these emissions are not a material part of its total emissions because it operates in an industry that primarily generates scope 3 emissions. In accordance with the LMA guidance (Loan Market Association 2023*a*), we consider whether KPIs cover material issues by applying the materiality standards developed by the Sustainability Accounting Standards Board (SASB). In total, the SASB standards provide industry-specific standards for 77 different industries, enabling a comprehensive assessment of sustainability issues (e.g., diversity and inclusion or water management) for

both green and brown industries. For each industry, SASB ranks sustainability issues by level of interest, such as the number of mentions in media reports and 10-Ks (Grewal et al. 2016). In addition, SASB assesses whether the management (or potential mismanagement) of these issues may affect a company's valuation or its operational or financial performance (Sustainability Accounting Standards Board 2017). From an investor's perspective, these standards represent the relative priority of sustainability issues for each industry, allowing different KPIs to be compared and contrasted across industries. The SASB standards are increasingly used in academic research to assess the materiality of sustainability issues (see, for example, Khan et al. (2016), Grewal et al. (2016)). KPIs are assigned a value of 0 if they do not address material sustainability issues as defined by SASB. If the KPIs only partially address material topics, they receive a score of 0.5. KPIs that are tied to ESG ratings represent a special case. If KPIs in the form of ESG ratings appear individually within an SLL, rather than in combination with other individual and company-specific KPIs, they can only receive a score of 0, as it is not possible to assess the consistency of an ESG rating with this dimension.

The third dimension examines whether the KPIs are measurable or quantifiable. To satisfy this dimension, the KPIs must be specific (e.g., expressed with a clear numerical value) and target sustainability aspects that can be objectively quantified (Loan Market Association 2023*a*). In particular, the SLLP recommends specifying the applicable scope of KPIs as well as their calculation method (Loan Market Association 2023*a*). An example of a KPI that would not receive a full score on this dimension is a social impact KPI defined as "the number of people positively impacted by the company" and measured "in good faith".

While the third dimension assesses the ability to objectively quantify and measure a borrower's performance, the fourth dimension involves verifying that a KPI is bench-

marked against an external reference, which is an important feature to facilitate an assessment of the overall level of ambition. The SLLP recommend a range of benchmarking approaches, including the use of industry initiatives and standards, science-based scenarios, and country targets (Loan Market Association 2023*b*). Therefore, KPIs that are explicitly linked to a benchmark, such as the Science Based Targets initiative, receive a value of 1. In addition, it is important to note that all KPIs in our sample that meet this fourth dimension also fulfill the third dimension and are therefore measurable. However, measurability alone is no guarantee that a KPI is benchmarked.

The pricing mechanism in terms of interest rate adjustments is assessed in the fifth dimension. A key feature of SLLs is that the margin can be reduced if the borrower meets its sustainability targets as measured by pre-defined KPIs. SLLs can also be designed to require the borrower to pay higher interest rates if it fails to meet its sustainability targets. To address this fifth dimension, SLL margin adjustments should explicitly include not only a bonus (i.e., margin reduction) but also a malus (i.e., margin premium). With a malus system, borrowers demonstrate an even stronger commitment to their sustainability objectives by facing the possibility of paying higher interest rates. In general, penalties have been shown to be more effective incentives than rewards (Andreoni et al. 2003). Since KPIs linked only to a bonus system create weaker incentives, they are given a score of 0.5, while a neutral bracket in which no margin adjustment applies does not create a credible incentive and is given a score of 0. In addition, KPIs receive a score of 0 if no bonus or malus system is clearly mentioned. As the SLLP point out, transparency is "of particular value in this market" (Loan Market Association (2023*b*), p.4), and borrowers are therefore encouraged to publicly report information on such loan characteristics.

Although we consider the design of the pricing mechanism, we do not assess the

actual level of interest rate adjustments in basis points (bps) as this information is often confidential and data for most SLLs in our sample is lacking.[5] We assume that the larger the adjustment in basis points, the greater the incentive for borrowers to meet their sustainability targets. A few cases in our sample suggest that such adjustments are often limited to 5 basis points. In rare cases, they can reach up to 10 basis points. This is consistent with Du et al. (2023), who conclude that the size of margin discounts is not economically large enough to make loan spreads of SLLs significantly lower than those of non-SLLs. Overall, the potential benefit to borrowers so far appears to be economically small (Du et al. 2023).

The final dimension assesses whether the KPIs are subject to independent third-party verification. According to the SLLP, borrowers should have an independent and external review of their performance against each sustainability objective at least once a year. To be credible, this review should be conducted by a qualified external verifier, such as an auditor, by way of limited or reasonable assurance, or a rating agency (Loan Market Association 2023*b*). For example, if the KPIs are linked to ESG ratings, they receive a score of 1 as external rating agencies monitor and review these ratings at least annually. However, if there is only a one-time certification of progress, or if only one of several underlying KPIs is subject to an explicit external review, such as a reasonable assurance review, the dimension is only partially met.

Table II.9 shows the pairwise correlations between all six dimensions of our KPI score. The highest correlation is between strategic relevance and materiality (0.53), indicating a moderate relationship. However, all other correlations are weak, underscoring the importance of including all six dimensions in our KPI analysis. In particular,

[5]This is particularly the case for EU SLLs. In contrast, 8-K forms tend to include information on the actual amount of interest rate adjustments.

we find that strategic relevance has a modest positive correlation with measurability (0.040), while it is negatively correlated with benchmarking, pricing mechanism, and external review. Although one might expect measurability to be positively correlated with both benchmarking and external audit, the corresponding pairwise correlations between measurability and external audit (0.072) and between measurability and benchmarking (0.088) are rather weak. In addition, we find that the pricing mechanism is only weakly correlated with the other five dimensions. Overall, the correlation matrix suggests that each of these dimensions captures unique and different information and together contribute to a comprehensive understanding of the KPIs.

Table II.9: **Correlations between KPI score dimensions.** This table presents the pairwise correlation coefficients between the dimensions of our KPI score. The sample consists of 364 SLLs issued between 2017 and 2022.

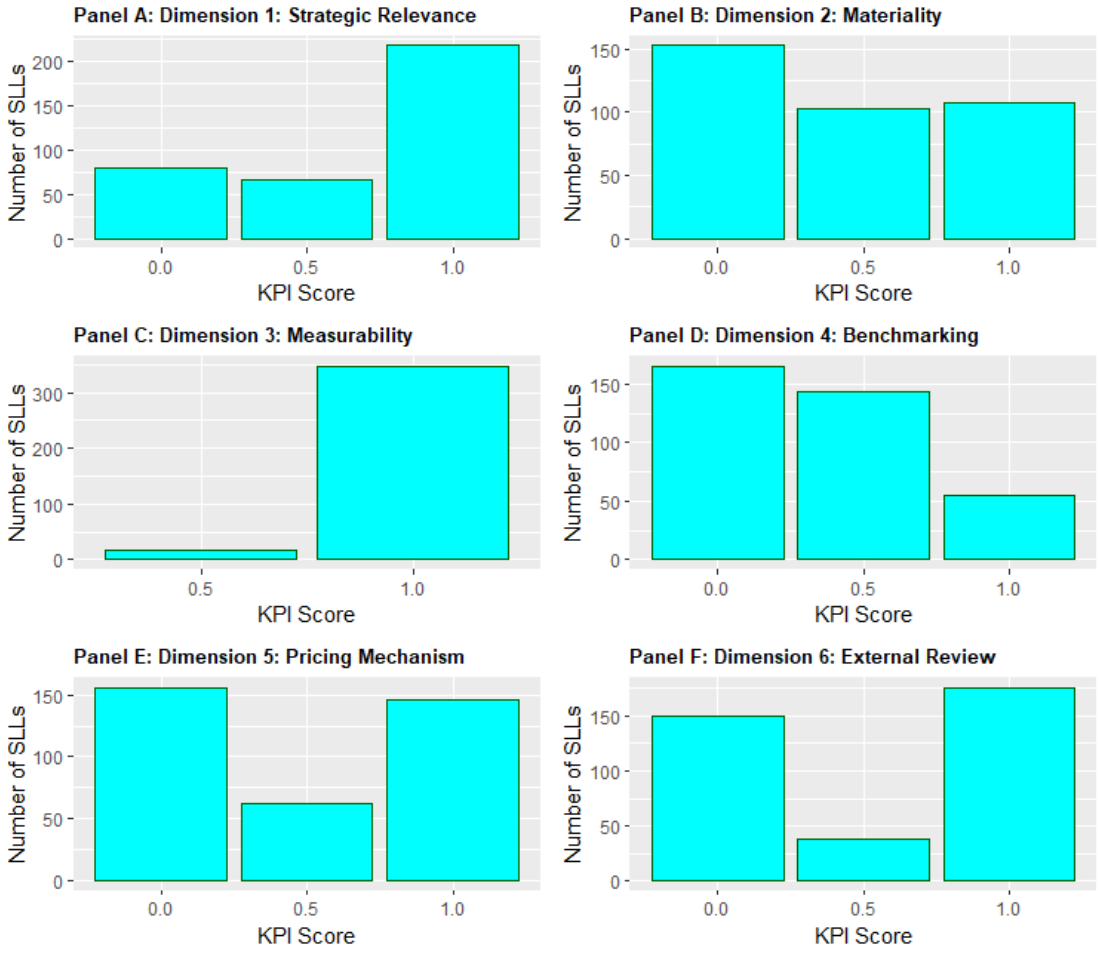
Score Dimension	Score Dimension					
	(1) Strategic Relevance	(2) Materiality	(3) Measurability	(4) Benchmarking	(5) Pricing Mechanism	(6) External Review
(1) Strategic Relevance	1.000					
(2) Materiality	0.530	1.000				
(3) Measurability	0.040	-0.002	1.000			
(4) Benchmarking	-0.187	-0.177	0.088	1.000		
(5) Pricing Mechanism	-0.063	0.032	-0.007	0.021	1.000	
(6) External Review	-0.359	-0.104	0.072	0.231	0.143	1.000

II.4.2 Score results and distribution

Figure II.1 shows the distribution of KPI scores for each score dimension. Overall, the results show significant differences between the various dimensions. Panel A presents the results for the assessment of the strategic relevance of the KPIs. We find that 218 out of 364 SLLs (60% of our sample with KPI information) are structured around KPIs that are explicitly part of an existing strategy. The majority of borrowers refer to the objectives associated with the KPIs in their reference documents such as annual or sus-

tainability reports. On the other hand, 22% of the SLLs in the sample have KPIs that do not align with the borrowers' stated sustainability goals or priorities. In addition, a few companies do not explicitly reference a sustainability strategy in their reporting. In general, the results suggest that borrowers are using SLLs as a means to further embed existing sustainability goals in their organizations.

Figure II.1: **Assessment of KPI score per dimension.** This figure shows the frequency of loans with specific KPI scores on each scoring dimension. Dimension 1 (strategic relevance) refers to the relevance of the KPIs to the borrower's strategy and sustainability objectives. Dimension 2 (materiality) assesses whether the KPIs address financially material issues based on the SASB Materiality Map. Dimension 3 (measurability) assesses whether the KPIs are measurable or quantifiable on a transparent methodological basis. Dimension 4 (benchmarking) examines whether the KPIs are benchmarked against relevant standards or targets. Dimension 5 (pricing mechanism) refers to the existence of a bonus and malus system related to interest rate adjustments. Dimension 6 (external review) refers to an external independent verification of performance against the KPIs. The sample includes a total of 364 SLLs with KPI information. Each loan is given a score of either 0, 0.5 or 1 in each of the six dimensions.



Panel B shows the results of the materiality assessment using the SASB standards.

We find that 108 SLLs, or 42% of our sample, are tied to sustainability goals that are not financially material, while 30% of SLLs fully meet this criterion and 28% are only partially tied to material KPIs. This finding is consistent with Loumioti & Serafeim (2022), who report that only about half of the SLLs in their sample include material KPIs. Given that the goal of the SASB Materiality Map is to highlight the sustainability issues that are most likely to impact the company's financial performance, this suggests that a large portion of the KPIs in ESG-linked loan agreements do not target improvements in the sustainability areas that are most important to investors.

Turning to the third dimension of our score, our results in Panel C show that 95% of SLLs are tied to measurable and quantifiable metrics. Perhaps not surprisingly, this suggests that most of the SLLs in our sample are based on goals that include a specific and objectively quantifiable metric that allows lenders to track performance against the pre-defined goals. On the other hand, only 17 SLLs (4%) in our sample are tied to KPIs whose measurability is subject to interpretation, such as the number of people positively impacted by the business and measured "in good faith". Since lenders must approve the selected KPIs, setting targets that are not measurable would not only make it difficult to evaluate performance, but could also damage the lenders' reputation. Measurable KPIs are therefore critical to ensuring the integrity of SLLs and mitigating reputational risks for lenders.

In contrast, the results in Panel D show that only 55 SLLs, or 15% of the sample, contain a clear reference to a benchmark, while 144 loans (35%) are partially benchmarked and 165 (45%) contain no form of benchmark. The lack of benchmarks for the selected KPIs makes it difficult to compare and contrast their level of ambition. Even ESG ratings, which can be considered a form of benchmark as they are based on a standardized scale, tend to differ from each other, limiting their comparability (Berg, Kölbel

& Rigobon 2022). However, this may also be due to a lack of appropriate benchmarks, especially since many of the industry standards, science-based targets, or other proxies proposed by the LMA (Loan Market Association 2023*a*) primarily address the environmental dimension and do not necessarily serve as appropriate benchmarks for social and governance KPIs.

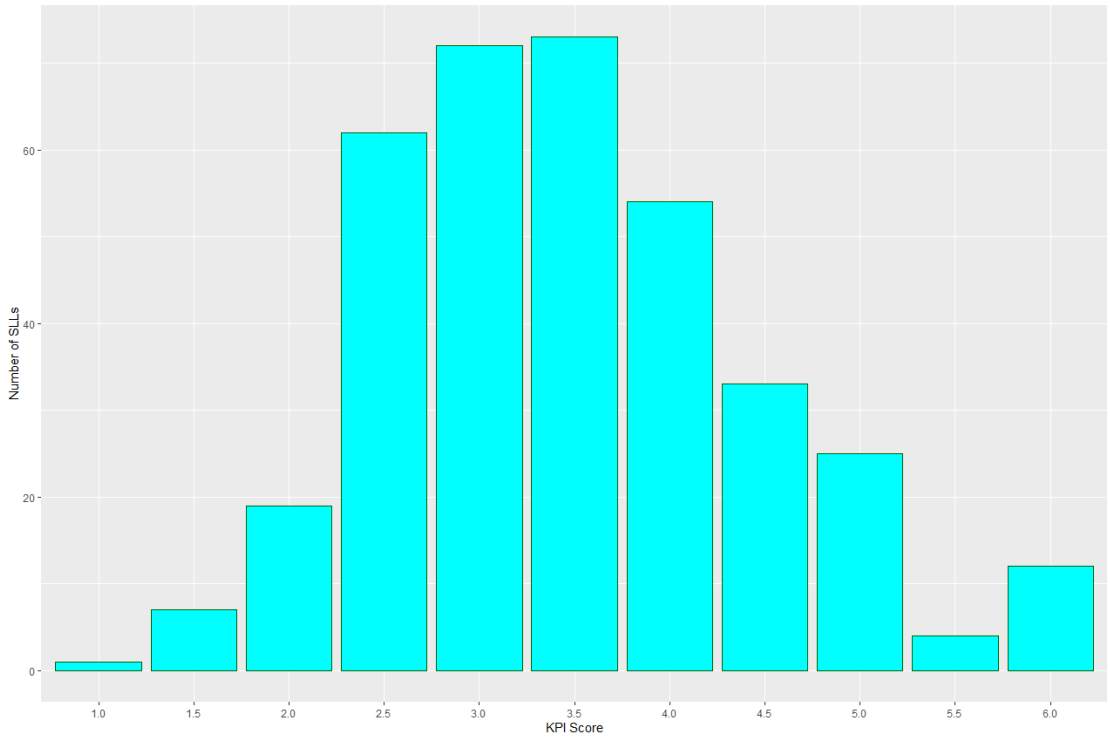
Panel E shows the results for the fifth dimension, which relates to the pricing mechanism. We find that about 40% of SLLs include a malus mechanism that requires borrowers to pay higher interest rates if they do not meet their sustainability targets. In comparison, 17% of SLLs include only a bonus mechanism, suggesting that borrowers can benefit from a lower interest rate if they meet their targets, but do not have to pay a financial penalty if they do not. This finding is consistent with Carrizosa & Ghosh (2022), who report for their sample that most ESG-linked loan contracts include interest rate reductions in response to positive sustainability performance, but only half of the contracts include interest rate increases when performance is negative. In our case, 156 out of 364 SLLs, or 42% of the sample, indicate that the loan margin is linked to sustainability KPIs, but do not provide further details. While the exact amount of the adjustment in basis points can be considered confidential, it is noteworthy that SLLs tend to exhibit limited disclosure of bonus and/or malus provisions.

Finally, we find mixed results with respect to the annual external review of the selected KPIs, as shown in Panel F. We report that almost half (48%) of the SLLs in our sample are tied to KPIs that are subject to explicit external review at least once a year, which is consistent with previous literature on SLLs (Carrizosa & Ghosh 2022). In these cases, the independent third party is explicitly mentioned in the documentation and/or the KPIs are part of annual reporting subject to limited or reasonable assurance. In addition, KPIs linked to ESG ratings are, by their nature, also subject to annual re-

view. However, we also note that 150 SLLs (41%) do not satisfy this fifth dimension. In particular, many borrowers do not specifically mention a mandated third party and/or do not report on their performance against the KPIs in the years following issuance by including performance review information in the form of limited or reasonable assurance audits. This suggests that the disclosures of SLL borrowers are often insufficient to meaningfully review and assess performance against targets.

In a next step, we examine the distribution of the KPI score across our sample. Figure II.2 shows the overall KPI score distribution. This distribution follows a Gaussian-like bell curve, which validates our methodology as we expect data points near the mean to have a higher frequency than those farther from the mean. The average KPI score in our sample is 3.47 and the median is 3.50, and while there is no loan that achieved the lowest possible score of 0, only 11 loans achieve a maximum score of 6 points. The majority of loans in our sample have a score of 3.5 or less, suggesting that these loans are only partially designed to incentivize sustainability efforts by their borrowers.

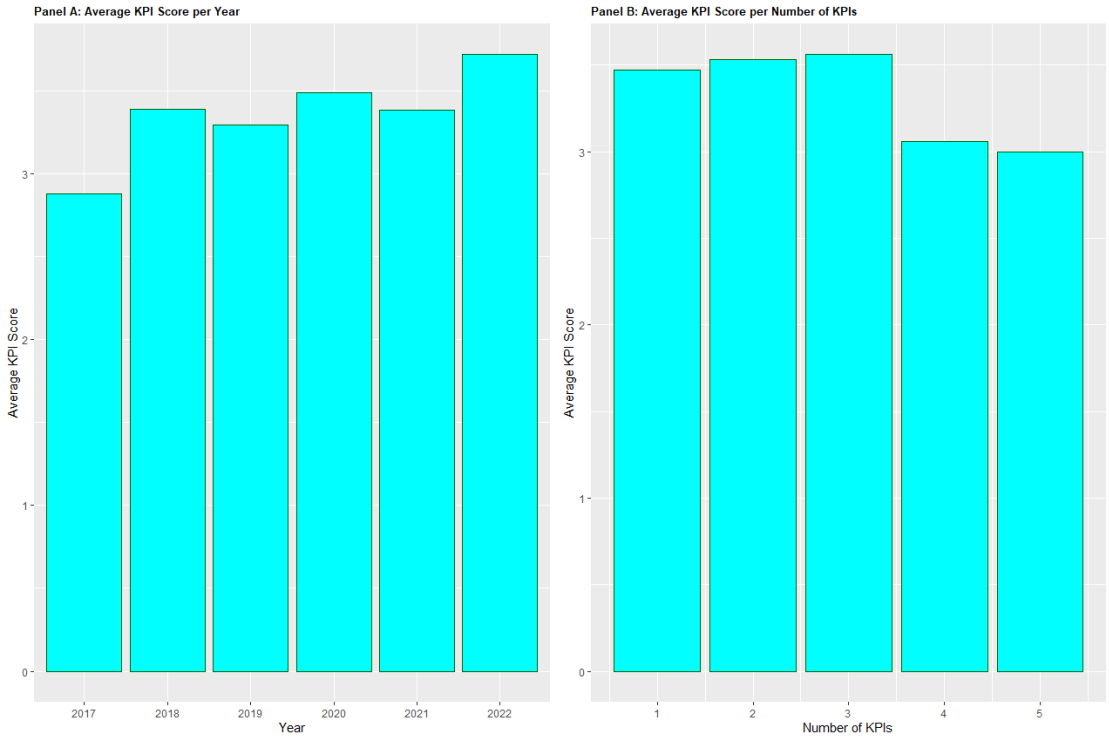
Figure II.2: **Number of SLLs by KPI score.** This figure shows the distribution of the total KPI score. The total KPI score for each loan is the sum of the individual scores for the six dimensions. The sample consists of 364 SLLs issued between 2017 and 2022.



Panel A in Figure II.3 shows the evolution of the average KPI score over time. The score improves over time, starting with an average of 2.88 in 2017 and increasing to 3.71 in 2022, suggesting that SLLs are becoming more stringent in terms of their ESG incentives. However, it is also important to note that the number of SLLs has increased over time, so the higher overall average at the end of our sample period could also be due to a larger sample size. We also find in Panel B that a higher number of KPIs per SLL does not necessarily lead to a higher KPI score. While focusing on a limited number of sustainability targets may prevent SLL borrowers from meeting the needs and interests of all their stakeholders, simply multiplying KPIs also seems to make such instruments less effective in strengthening sustainability incentives. This "multitasking

problem" (Bebchuk & Tallarita 2022), which has also been documented in the earlier literature on ESG-based compensation, further corroborates the challenges companies face in identifying and defining value-relevant and measurable metrics.

Figure II.3: **Average KPI score per year and number of KPIs.** Panel A shows the average total KPI score per year. Panel B presents the average total KPI score per number of KPIs included in an SLL. The sample consists of 364 SLLs issued between 2017 and 2022.



II.5 Empirical results

II.5.1 Firm-level data and matching procedure

Our prior KPI analysis provides insights into the design of SLLs and casts doubt on their effectiveness in incentivizing corporate sustainability efforts. In this section, we explore this question further by empirically examining how firms' ESG performance, measured by their different ESG scores, evolves following the issuance of SLLs. Following Kim et al. (2023), we contrast changes in the ESG ratings of SLL borrowers and a set of control firms that also borrowed over the same period but not through SLLs.

As there could be structural differences between SLL borrowers and other firms, we apply the 1:1 nearest-neighbor matching method following Rubin (1973) to find comparable firms to SLL borrowers as control firms and run the regressions on this matched sample. To examine the development of firms' ESG performance following the issuance of SLLs, we match the SLL borrowers in our sample with conventional borrowers based on one-year lagged values for profitability, leverage, size, book-to-market ratio, ESG score as well as industry and region. To ensure a comprehensive dataset for conventional borrowers, we retrieve data from Refinitiv Dealscan's database. SLL borrowers and conventional borrowers are matched in the years of loan origination. For example, firms that concluded an SLL in 2019 are matched with firms that obtained a conventional loan in 2019. In the context of this study, we define a conventional borrower as a firm that acquired a loan in a specific year but did not issue any SLL throughout the sample period. We perform the matching without replacement so that each control firm is unique, and drop unmatched firms from our sample to avoid any bias from inadequate comparison.

As shown in Table II.10, treated and control firms display differences before match-

ing. We observe that SLLs are generally issued by firms that exhibit above-average ESG performance and have significantly higher ex-ante ESG scores than borrowers of conventional loans. In addition, SLL borrowers are typically characterized by larger company sizes, higher book-to-market ratios, and lower levels of leverage and profitability. Our matching procedure results in 187 unique SLL borrowers and 225 unique matched peers and significantly reduces the observed differences between treated and control firms.[6]

[6]The mean values correspond to the time of matching. Although they represent a large fraction of SLL borrowers, firms that issued a SLL in 2022 were not matched, as their ex-post ESG performance, e.g. in year 2023, cannot yet be assessed.

Table II.10: **Differences between treatment and control firms.** This table reports the differences in firm characteristics between SLL borrowers (treated) and conventional borrowers (control) before and after matching. We match SLL borrowers with conventional borrowers based on lagged (1 year) values for profitability, leverage, size, book-to-market ratio, ESG rating as well as industry and region. Control firms are matched to borrower firms using 1:1 nearest-neighbor matching method following Rubin (1973). We match each borrower on the year prior to the issuance of SLL without replacement and drop non-matched firms from our sample.

	Pre-Matching				Post-Matching			
Panel A: Sample sizes								
N firms	274	1,683			187	225		
Panel B: Control Variables								
	Mean SLL borrowers	Mean conv. borrowers	Difference	t-stat	Mean SLL borrowers	Mean conv. borrowers	Difference	t-stat
Leverage	0.334	0.535	-0.201	-0.999	0.326	0.314	0.012	0.848
Book to market	0.760	0.594	0.166	1.840	0.601	0.585	0.016	0.457
Size	22.871	22.107	0.764***	7.960	23.300	23.400	-0.100	-0.757
Profitability	3.825	5.745	-1.920***	-5.470	3.930	4.000	-0.070	-0.172
ESG Score	6.500	4.901	1.599***	11.300	6.670	6.110	0.560***	2.840

Table II.11 presents the key ESG and financial data for the matched sample of treated and control firms. Panel A reports the descriptive statistics of the overall ESG score, its three main pillars, and the climate score. We obtain the ESG scores from the MSCI database to capture borrowers' ESG performance before and after loan origination. To be included in the sample, we require at least one year of MSCI ESG score in each of the pre- and post-issuance periods.

In our analyses, we use different types of ESG data, including industry-adjusted scores, environmental and social pillar scores, and climate change scores. These scores capture sustainability aspects that also play a key role in the selection of KPIs in ESG-linked loan agreements. In particular, the industry-adjusted scores allow us to consider the importance of environmental, social, and governance performance indicators for different industries and borrowers. Environmental and social pillar scores are calculated based on the weighted average of key aspects such as carbon emissions, biodiversity and land use, raw material sourcing, health, and safety of employees within each pillar. The climate change score falls under the environmental category and assesses a company's exposure to climate change and its efforts to manage that exposure.

MSCI rates firms' ESG performance on a scale of 0 to 10, with 10 representing the highest performance. Such ratings are updated at least annually. Ongoing or structural controversies lead to score deductions. For the purpose of our analyses, MSCI ratings offer several advantages over other data providers. First, MSCI is the largest provider of ESG ratings globally, resulting in broader coverage of companies relative to other providers, as reported in previous studies (Eccles & Stroehle 2018, Pástor et al. 2022). In addition, MSCI ESG ratings are of significant importance in the context of US ESG fund holdings, as shown in recent research (Berg, Heeb & Kölbel 2022). Given their influential role in the market, investors are therefore more likely to react to fluctuations

in these specific ratings. Finally, while ESG ratings from other providers such as Asset4 appear to have been subject to backward revisions (Berg et al. 2020), there is currently no evidence that this is also the case for MSCI ESG ratings.

As shown in Table II.11, the average SLL borrower in our matched sample has an overall ESG score of 6.48. We also present summary statistics for the ESG data of the EU and US subsamples. The average SLL borrower in the EU has a higher overall ESG score of 6.89, indicating particularly strong environmental and corporate governance performance. In contrast, the average SLL borrower in the US scores a comparatively lower overall ESG score of 5.43, indicating weaker performance on environmental, social and governance aspects compared to their European counterparts.

Table II.11: **Summary statistics (matched sample)**. This table reports the summary statistics for ESG and financial data employed in our sample of SLL borrowers (treated) and conventional borrowers (control). Panel A reports the ESG data for treated and control firms. The ESG data is provided for the whole sample as well as for the EU and US samples separately. The *ESG score*, the *climate score* as well as the *environmental-, social- and governance-score* are taken from MSCI. Panel B reports the firm-level financial data for the treated and control firms. *Firm size* is defined as the natural logarithm of the firm's total assets, *leverage* is measured as the firm's total liabilities divided by total assets, *profitability* is the firm's net income prior to financing costs divided by total assets and *book-to-market ratio* is a company's book value per share divided by its stock price. Our total sample contains a total of 2,884 firm-year observations. The firm-level controls are winsorized at 1% and 99%.

	SLL Borrowers (Treated)					Conventional Borrowers (Control)				
	N	Mean	Std. dev.	Min.	Max.	N	Mean	Std. dev.	Min.	Max.
Panel A: ESG Data										
ESG score	1,217	6.476	2.137	0.000	10.000	1,427	6.093	2.057	0.000	10.000
E score	1,246	6.021	2.061	0.000	10.000	1,459	5.917	2.102	0.100	10.000
S score	1,246	4.959	1.800	0.000	10.000	1,459	4.847	1.730	0.000	10.000
G score	1,246	5.951	1.377	0.300	9.400	1,459	5.637	1.298	0.800	9.500
Climate score	1,063	7.512	2.658	0.000	10.000	1,244	7.485	2.357	0.000	10.000
EU Sample										
ESG score	870	6.894	1.966	0.000	10.000	795	6.541	1.931	0.000	10.000
E score	892	6.101	2.127	0.000	10.000	818	5.869	2.146	0.700	10.000
S score	892	5.125	1.680	0.000	10.000	818	5.114	1.705	0.000	10.000
G score	892	6.135	1.411	0.300	9.400	818	5.935	1.335	0.800	9.500
Climate score	762	7.504	2.792	0.000	10.000	698	7.538	2.255	0.000	10.000
US Sample										
ESG score	347	5.429	2.191	0.300	10.000	632	5.530	2.057	0.000	10.000
E score	354	5.820	1.873	1.600	10.000	641	5.978	2.045	0.100	10.000
S score	354	4.542	2.015	0.000	10.000	641	4.505	1.703	0.000	9.800
G score	354	5.488	1.170	1.200	8.000	641	5.256	1.142	1.900	8.400
Climate score	301	7.534	2.286	0.000	10.000	546	7.417	2.481	0.000	10.000
Panel B: Financial Data										
Size	1,296	23.243	1.453	18.971	27.570	1,547	23.389	1.659	18.606	27.696
Leverage	1,294	0.302	0.143	0.000	0.706	1,545	0.305	0.167	0.000	0.805
Profitability	1,216	0.051	0.051	-0.160	0.374	1,416	0.047	0.056	-0.358	0.458
Book to market	1,280	0.630	0.518	0.006	6.330	1,526	0.622	0.561	0.004	8.265

As other factors may influence the development of ESG performance subsequent to the issuance of ESG-linked loans, we control for several measures of financial performance by including firm-specific variables obtained from Refinitiv. Specifically, we account for *firm size*, defined as the natural logarithm of the firm's total assets, and *leverage*, measured as the firm's total liabilities divided by total assets. We also account

for *profitability*, calculated by dividing the firm's net income prior to financing costs by total assets. Finally, we incorporate the *book-to-market ratio*, calculated by dividing a company's book value per share by its stock price. To eliminate outliers, we winsorize firm-level control variables at the 1st and 99th percentiles. As shown in Table II.11, the average SLL borrower in our sample has a size of $23.24 billion in total assets (log-transformed values are shown), a mean profitability (ROA) of around 5%, a mean leverage ratio of 0.30 and a book-to-market ratio of 0.63. Our total sample contains a total of 2,884 firm-year observations.

II.5.2 SLL issuance and ex-post ESG performance

To determine the relationship between SLL issuance and ex-post ESG performance, we use a two-way fixed effects (TWFE) model to estimate our difference-in-differences design. Using this approach, we examine treated firms that issued SLLs and compare them to a control group of firms that took conventional loans both before and after the treated firms issued an SLL for the first time. Specifically, we estimate the following model:

$$\begin{aligned}\text{ESG Score}_{i,t} = \beta_1 \text{Post Loan Issuance}_{i,t} + \beta_2 \text{SLL Borrower}_i + \\ \beta_3 \text{SLL Borrower}_i \times \text{Post Loan Issuance}_{i,t} + \chi_t + \iota_{in} + \rho_c + \epsilon_{it} \quad \text{(II.1)}\end{aligned}$$

where $ESG\,Score_{i,t}$ is the ESG score of borrower i in time period t. $\text{SLL Borrower}_{i,t}$ is an indicator variable that equals 1 if borrower i received an SLL at least once in the sample period, and 0 otherwise. $\text{Post Loan Issuance}_{i,t}$ is an indicator variable equal to 1 for years after the year of first loan issuance, and 0 otherwise. The model accounts

for year (χ_t), industry (ι_{in}) and country (ρ_c) fixed effects. To ensure that our results are not sensitive to different permutations of fixed effects, we also include firm, industry-by-year and country-by-year fixed effects in several specifications. ϵ_{it} is the error term. All standard errors are clustered at the firm level. We also estimate our model at the firm-year level in further specifications.

Table II.12 presents the results for the matched sample of treated and control firms for equation II.1. Specifications (1) - (3) rely on the whole sample, specifications (4) - (6) are based on all SLLs with at least one environmental KPI, specifications (7) - (9) consist of all issued SLLs with at least one social KPI, specifications (10) - (12) rely on all SLLs with at least one CO2-related KPI and specifications (13) - (15) comprise all SLLs with a high KPI score of at least 3.5.

Table II.12: **ESG performance following the issuance of sustainability-linked loans (matched sample)**. This table presents firm ESG performance after the issuance of SLLs using quasi difference-in-differences panel regressions on the matched sample. We match borrowers to their control firms in the year prior the issuance. ESG Borrower$_i$ is a firm-invariant indicator variable equal to one if the borrower obtains a sustainability-linked loan during the full sample period and zero otherwise, Post Loan Issuance$_t$ an indicator variable equal to one for the years after the loan issuance and zero otherwise and ESG Borrower$_i$× Post Loan Issuance$_t$ denotes their interaction. The dependent variable is either the overall ESG score, the environmental score, the social score or the climate score of the borrower in a given year. The final sample consists of 2,637 firm-year observations. We also run the regression on different subsamples. Specifications (1) - (3) are based on the full sample of SLLs, specifications (4) - (6) on all SLLs with at least one environmental KPI, specifications (7) - (9) on all SLLs with at least one social KPI, specifications (10) - (12) on all SLLs with at least one CO2-related KPI and specifications (13) - (15) on all SLLs with a high KPI score as described in section II.4. The model accounts for firm, year, country, industry, industry-by-year and country-by-year fixed effects. Robust standard errors in parentheses are clustered at the firm-year level in columns (1), (4), (7), (10) and (13) and at the firm level otherwise. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Dependent variable	ESG Score	ESG Score	ESG Score	E-Score	E-Score	E-Score	S-Score	S-Score	S-Score	Climate Score	Climate Score	Climate Score	ESG Score	ESG Score	ESG Score
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
SLL Borrower$_i$ × Post Loan Issuance$_t$	0.289*	0.166	0.078	-0.055	0.021	0.004	-0.062	-0.032	0.062	0.329	-0.204	-0.050	0.178	-0.039	-0.063
	(0.132)	(0.121)	(0.119)	(0.208)	(0.128)	(0.114)	(0.304)	(0.242)	(0.224)	(0.328)	(0.300)	(0.232)	(0.098)	(0.166)	(0.151)
Post Loan Issuance$_t$	0.164	-0.200**	-0.188**	0.382	0.065	0.025	-0.016	-0.199	-0.192	0.056	0.006	-0.092	0.247	-0.120	-0.140
	(0.131)	(0.099)	(0.090)	(0.211)	(0.123)	(0.094)	(0.296)	(0.179)	(0.157)	(0.352)	(0.239)	(0.189)	(0.179)	(0.135)	(0.122)
Firm FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Year FE	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
Industry FE	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No
Country FE	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No
Industry × Year FE	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No
Country × Year FE	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No
Observations	2,637	2,637	2,637	1,504	1,504	1,504	752	752	752	987	987	987	1,172	1,172	1,172
Adjusted R-squared	0.217	0.829	0.823	0.128	0.874	0.882	0.237	0.750	0.757	0.278	0.780	0.769	0.196	0.805	0.802

Specifications (1) to (3) show positive coefficients, but statistical significance is only observed in specification (1) at the 10% level. For specifications (4) to (6) focusing on SLLs with environmental KPI, and specifications (7) to (9) considering SLLs with social KPIs, there is no clear evidence of a significant impact on the environmental and social scores of the borrowers, respectively. Likewise, specifications (10) to (12) examining SLLs with CO2-related KPIs, and specifications (13) to (15) analyzing SLLs with a high KPI score, also do not indicate any significant positive effect on the climate and overall ESG scores of the borrowers. Overall, the coefficients for ESG borrower$_i$ $\times$ Post Loan Issuance$_{i,t}$ across different specifications indicate that there is no consistent and strong evidence to support the idea that the issuance of SLLs leads to higher ESG performance for the borrowing firms. The coefficients are generally small and often statistically insignificant, suggesting that the relationship between SLLs and ESG performance is weak or inconclusive.

These findings are in line with with those of Du et al. (2023) who also report that SLL borrowers do not improve their ESG performance in the years after SLL origination. In contrast, Kim et al. (2023) document a post-loan deterioration in ESG performance, particularly for borrowers with low-transparency SLLs. The divergent findings may be due to differences in model specification, matching procedures, or choice of ESG performance measures. Notably, the choice of borrowers' sustainability scores can significantly affect the results of analyses, as documented by Du et al. (2023) and in prior studies on ESG ratings (Berg, Kölbel & Rigobon 2022). However, due to considerations highlighted in Section II.5.1, including backward revisions in Asset4 ESG scores (Berg et al. 2020), we choose to rely on MSCI in our analyses.

A recent literature shows that estimating equation (1) as a conventional event study, that is, by ordinary least squares (OLS) with two-way fixed effects and some lags, pro-

duces estimates that are not reliable (see e.g., de Chaisemartin & D'Haultfœuille (2020), Baker et al. (2022)). This is because the TWFE estimator compares firms that received an SLL later in the sample period with firms treated earlier, creating a "bad comparison" problem Baker et al. (2022). One way to address concerns about the reliability of the TWFE estimator is to measure the weighted group-time average treatment effect on the treated (ATT), as proposed by Callaway & Sant'Anna (2021). By suppressing the 2 x 2 differences-in-differences comparisons between newly treated and previously treated firms, this procedure is robust to heterogeneity in the treatment effect resulting from differences in the timing of SLL issuance.

Table II.13 presents the group-time ATTs along with 95% confidence bands. In Column (1), we report the ATT for all samples. First, we use the entire sample of borrowers and test whether issuing an SLL leads to an increase in the ESG score. Then, we repeat the analysis with different subsamples of borrowers and analyze whether the sustainability dimensions captured by the KPIs cause a change in the corresponding sustainability scores. In other words, we analyze the impact of SLLs with environmental, social, or climate change KPIs on environmental, social, or climate change scores, respectively. The ATT coefficients are all statistically non-significant, confirming our results above and suggesting that SLLs do not cause a change in corporate sustainability performance and that the KPIs included in an SLL do not lead to an increase in the respective ESG pillar score. Finally, we also examine the sub-sample of SLL borrowers with a high KPI score. Our results may be heterogeneous due to SLLs that score poorly in all six KPI dimensions. However, even when using a subset of all borrowers whose SLLs have a score of at least 3.5 and their respective control firms, we still find no statistical significance.

Table II.13: **Weighted average treatment effects of sustainability-linked loan issuance on ESG performance (matched sample)**. The table presents the weighted group-time average treatment effect on the treated following Callaway & Sant'Anna (2021). Standard errors (SE), lower and upper 95% confidence intervals (CI) are adjusted for multiple testing and calculated using bootstrapped standard errors. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

	ATT	SE	Lower CI	Upper CI
Dependent variable	(1)	(2)	(3)	(4)
Whole Sample				
ESG Score	-0.156	0.111	-0.373	0.061
E KPI Sample				
E Score	-0.082	0.092	-0.263	0.099
Climate Score	0.020	0.111	-0.197	0.238
S KPI Sample				
S Score	-0.055	0.179	-0.406	0.296
CO2 KPI Sample				
Climate Score	-0.036	0.121	-0.274	0.203
High KPI Sample				
ESG Score	-0.183	0.142	-0.462	0.095

Taken together, these results support the hypothesis that SLL issuance is not associated with a significant change, i.e., neither deterioration nor improvement, in borrowers' ESG profiles ex-post. While existing studies have produced mixed results regarding the impact of SLLs on ESG improvements (Du et al. 2023, Dursun-de Neef et al. 2023), our methodology for assessing the quality of KPIs in SLLs contributes to a deeper understanding of the underlying factors that can explain the observed non-existent relationship between SLL issuance and sustainability performance. In addition to the lack of credible incentives provided by the KPIs, another possible explanation for our results could be that firms that receive SLLs already have above-average ESG performance before the loan is even issued, as shown in the data from II.5.1. Thus, SLLs appear to simply sustain the current level of ESG performance rather than significantly improving it in the years following the issuance.

II.5.3 Stock market reactions to SLL issuance announcements

One of the reasons often cited in the literature for issuing sustainable debt is the signaling effect (see e.g., Flammer (2021), Kim et al. (2023)), which states that borrowers seek to signal their ESG commitment by obtaining sustainable debt instruments from established lenders. In this section, we explore this question by analyzing stock market reactions to SLL announcements. Such announcements may be perceived positively by investors, leading to positive market reactions. However, there are also several reasons to believe that stock markets may respond negatively or be indifferent to the issuance of SLLs.

First, assuming that stock prices reflect all the information available at a given point in time, SLLs may not provide investors with new information that is not already included in companies' annual reports or sustainability strategies. Second, the selected KPIs often fail to address issues that are financially material, as shown by our KPI analysis. Therefore, it is likely that the issuance of SLLs does not provide any new information about a company's financial performance, which is the primary driver of stock prices. In addition, the financial incentives tied to SLLs may not have an immediate and strong effect on firms' financial performance, making it difficult for investors to assess the potential financial benefits of SLLs. Moreover, in an equilibrium, the more sustainable stocks of greener firms tend to exhibit lower ex ante CAPM alphas (Pástor et al. 2022). Finally, SLLs are also typically costly due to the additional reporting and monitoring requirements in the short run,[7] while the longer-term nature of their sustainability goals may not align with the short-term focus of the equity market (**?**).

In our analyses, we make use of the fact that the Refinitiv Dealscan database contains

[7] Kim et al. (2023) show that SLL borrowers do not enjoy pricing benefits at issuance from obtaining SLLs.

the announcement date of the SLLs, i.e. the day on which a company announced the closing of a loan. The announcement date is the relevant date for our event study because it captures the day when the information is released to the market. However, for most SLLs in our sample, we find that the announcement date and the financial close date are similar, suggesting that the market is generally informed about an SLL issuance as soon as the loan agreement is successfully closed. In our analyses, we use unique events and consider each announcement of one or more SLLs on a single day as one event.

To conduct the event study, we employ the standard market-model methodology using an estimation window of 120 trading days that ends 30 days prior to the event. The abnormal returns are computed using STOXX Europe 600 and S&P 500 as our relevant benchmarks for SLL borrowers in the EU and the US, respectively. In addition, we consider the following four event windows: [–1,1] and [–1,5], [1,3] and [1,10], which account both for the possibility that some information may have been known to the public prior to the announcement and for a staggered response.

In Table II.14, we report the average cumulative abnormal stock returns (CARs) expressed as a percentage for each event window. In Panel A, we report the average CARs for the sub-sample of EU SLL borrowers, comprising 436 issuance events. As shown, the results indicate that the CARs are insignificant, with the exception of the larger event window [0,10], where the CARs are negative and significant at the 5% level. While this suggests that the stock market reacts negatively to the issuance of SLLs, the results could also be due to unrelated trends around the event date. In a next step, we report the average CARs for the subsample of loan issuances with at least one environmental KPI and the subsample of loan issuances with at least one social KPI. In both subsamples, the CARs are insignificant for all event windows.

Table II.14: **Borrower stock returns around sustainability-linked loan issuance announcements**. This table reports average cumulative abnormal stock returns (CARs) of SLL borrowers for different time windows around public announcements of SLL issuance. The overall sample consists of 584 SLL issuance events. CARs are computed from a market model using the Stoxx Europe 600 in Panel A and and the S&P 500 in Panel B as the market benchmark for the 120 trading day period ending 30 trading days prior to the loan announcement date. We report average CARs around different event windows for the whole sample and subsamples of SLLs with either environmental and/or social KPIs. CARs are reported in %. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Event Window	All SLLs			E KPI			S KPI		
	CAR	t-stat	N	CAR	t-stat	N	CAR	t-stat	N
Panel A: EU Sample									
[-1,1]	-0.11	-0.547	436	-0.24	-0.809	214	-0.38	-1.241	112
[-1,5]	-0.26	-0.912	436	-0.25	-0.634	214	-0.43	-0.872	112
[1,3]	-0.19	-0.780	436	-0.13	-0.155	214	-0.31	-0.679	112
[1,10]	-0.77**	-2.223	436	-0.88	-1.778	214	-0.51	-0.789	112
Panel B: US Sample									
[-1,1]	-0.49*	-1.809	148	-0.74*	-1.751	67	-0.92	-1.608	27
[-1,5]	-0.51	-1.143	148	-0.71	-0.888	67	-0.54	-0.751	27
[1,3]	-0.44	-1.644	148	-0.93	-1.547	67	-0.82	-0.967	27
[1,10]	-0.92	-1.328	148	-1.54*	-1.888	67	-1.31	-0.856	27

Panel B of Table II.14 presents the average CARs for the US subsample, comprising a total of 148 issuance events. In this case, we document a significant negative market reaction with cumulated abnormal returns of -0.49% in the event window [-1,1], symmetrically surrounding the announcement date of issuance. This result also holds when considering only the subsample of US firms issuing SLLs with a least one environmental KPI. These firms exhibit CARs of -0.74% in the event window [-1,1] and -1.54% in the event window [1,10].

In Table II.15, we present the average CARs for subsamples of issuance events associated with high KPI (at least 3.5) or low KPI score (below 3.5). The CARs are insignificant in all intervals, except for US firms issuing SLLs with a high KPI score

which exhibit negative CARs of -2.40% in the event window [1,10].

Table II.15: **Borrower stock returns around high- and low-quality KPI loan announcements**. This table reports average cumulative abnormal stock returns (CARs) of SLL borrowers for different time windows around public announcements of SLL issuance. The sample consists of 285 SLL issuance events. CARs are computed from a market model using the Stoxx Europe 600 in Panel A and and the S&P 500 in Panel B as the market benchmark for the 120 trading day period ending 30 trading days prior to the loan announcement date. We report average CARs around different event windows for subsamples of SLLs with high and low KPI scores. We report the difference of means between the two subsamples as well as the associated p-value. CARs are reported in %. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Event Window	High KPI Score			Low KPI Score			Difference	t-stat
	CAR	t-stat	N	CAR	t-stat	N		
Panel A: EU Sample								
[-1,1]	-0.23	-0.536	91	-0.21	-0.740	126	-0.020	-0.030
[-1,5]	-0.30	-0.516	91	-0.13	-0.401	126	-0.170	-0.236
[1,3]	-0.02	-0.031	91	-0.34	-1.036	126	0.320	0.676
[1,10]	-0.81	-1.144	91	-0.75	-1.353	126	-0.060	-0.070
Panel B: US Sample								
[-1,1]	-0.78	-1.557	35	0.13	0.288	33	-0.910	-1.192
[-1,5]	-0.99	-0.975	35	1.60	1.338	33	-2.590**	-2.066
[1,3]	-0.65	-0.984	35	0.36	0.073	33	-1.010	-1.390
[1,10]	-2.40*	-1.754	35	-0.11	-0.385	33	-2.290	-1.280

Overall, our results suggest that stock markets are rather indifferent to the issuance of SLLs by EU firms. In contrast, announcements of SLL issuance in the US are met with caution by investors, especially when the loans include environmental KPIs. There are several possible interpretations for these observations. First, investors may remain skeptical about the value of integrating ESG factors into investment decisions, which could contribute to the observed lack of positive response (see, e.g., Edmans (2023)). This is particularly the case in the US, where growing ESG sentiment, especially in Republican states, has led to restrictions on state funds from investing in ESG products. Second, investors may be also wary of possible greenwashing practices, which have

become more prevalent in recent years (Kim et al. 2023). Third, SLLs have higher costs than conventional loans due to additional reporting and monitoring requirements, which may also discourage investors from responding positively to their issuance.

In a next step, we investigate whether specific loan characteristics may explain the observed stock market reactions described above. While our KPI analysis helps explain the nonexistent relationship between SLL issuance and borrowers' ex-post sustainability performance, it may also shed light on the different stock market reactions to SLL announcements. Thus, we estimate the following basic equation using ordinary least squares (OLS):

$$CAR_i = \beta_0 + \beta_1 \text{Number of KPIs}_i + \beta_2 \text{KPI Score}_i + \gamma' \mathbf{x}_i + \epsilon_i \tag{II.2}$$

where CAR_i is CAR(-1,1) for firm i measured using the market model abnormal returns, Number of KPIs_i is the number of KPIs per loan, KPI Score_i corresponds to the KPI score for each loan. We either consider the total KPI score or each of the score dimensions separately. $x_{i,t}$ is a vector of additional control variables, which are described in Section II.5.1. ϵ_{it} is the error term.

Table II.16 reports results from estimating equation II.2 for the sample of SLLs with KPI information. The coefficient for Number of KPIs_i is significant and negative in columns (1) and (2). This result is consistent with the previous findings indicating that investors are vigilant against the issuance of SLLs, especially when such loans involve a high number of KPIs. In column (3) we find further evidence of a negative association between a higher number of KPIs and market responses to loan issuance. More precisely, the relationship becomes negative once a SLL has four KPIs. This is consistent with our findings in II.1 where the average KPI score in the sample drops

significantly after four KPIs. This is also in line with Carrizosa & Ghosh (2022) who document a negative relationship between the number of KPIs and CAR (-1,1).

In contrast, we do not find clear evidence that stock markets respond to SLL design characteristics. In column (1), *KPI Total Score* has a negative coefficient, while it has a positive coefficient in column (2). In both cases, the coefficients are not statistically significant. Similarly, there is no clear association between the dimensions of the KPI score and CARs, as shown in column (4), with the exception of *Measurability*, which appears to be positively linked to CAR (-1,1).

Table II.16: **CAR determinants of sustainability-linked loan announcements**. This table reports the OLS estimations for different samples of SLLs issued from January 1, 2017 to December 31, 2022. The sample consists of 579 SLL issuance events. CAR(-1,1) is the cumulative abnormal return with an event window of one day before the event to one day after. We estimate the market model using value-weighted market returns for the 120 trading day period ending 30 trading days prior to the loan announcement date. CARs are reported in %. Robust standard errors are in parentheses. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Dependent variable	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)
	(1)	(2)	(3)	(4)
Number of KPIs	-0.007***	-0.007**		
	(0.002)	(0.003)		
Total KPI Score	-0.001	0.001		
	(0.002)	(0.003)		
2 KPIs			-0.011	
			(0.008)	
3 KPIs			-0.009	
			(0.008)	
4 KPIs			-0.033**	
			(0.013)	
5 KPIs			-0.006	
			(0.029)	
KPI Score - Strategic Relevance				-0.044
				(0.008)
KPI Score - Materiality				0.010
				(0.010)
KPI Score - Measurability				0.041**
				(0.021)
KPI Score - Benchmarking				-0.002
				0.010
KPI Score - Pricing Mechanism				0.004
				(0.007)
KPI Score - External Review				0.001
				(0.010)
Controls	No	Yes	Yes	Yes
Observations	347	167	167	167
Adjusted R-squared	0.019	0.005	0.005	0.006

Overall, our results are consistent with Carrizosa & Ghosh (2022) who document negative and mostly insignificant market reactions to SLL issuances. They also corroborate the findings of Kim et al. (2023) who report negative market reactions for low-transparency loans.

II.6 Conclusion

In this paper, we contribute to the emerging literature on ESG lending by conducting a comprehensive analysis of the characteristics of SLLs, with a particular focus on their underlying KPIs. The selection and design of KPIs are critical aspects of ESG-linked loan contracts. Therefore, a detailed analysis of the KPIs is essential to draw conclusions about the ability of SLLs to incentivize corporate sustainability efforts.

As a first step, we propose a new framework that examines KPIs in SLL agreements along six dimensions: strategic relevance, materiality, measurability, benchmarking, pricing, and external review. By examining KPIs along each dimension, our framework provides a detailed understanding of the strengths and weaknesses of SLLs. In particular, our results show that KPIs often have strategic relevance and are based on measurable and quantifiable metrics. However, KPIs frequently lack materiality and are not always subject to external, independent review. In addition, we find that KPIs are only occasionally developed against a specific benchmark and that failure to meet KPIs does not consistently result in financial penalties in the form of interest rate increases. Overall, SLL borrowers appear to enter into such agreements to showcase their existing sustainability practices rather than to incentivize further ESG improvements through stringent KPIs.

In a second step, we empirically analyze whether the issuance of SLLs is associated with a change in borrowers' ex-post ESG performance using a difference-in-differences design. Our results confirm the results of our KPI analysis and suggest that the issuance of an SLL does not have a significant impact on the firms' ex-post ESG performance. We also examine stock market reactions to public announcements of SLLs by conducting an event study. Our results suggest that the issuance of SLLs by EU firms has no significant

impact on their stock prices, while US firms experience a significant negative market reaction, especially when their loans include environmental KPIs.

Our study has several practical implications for market participants. First, lenders and borrowers should be careful when designing KPIs for SLLs, as lax KPIs can damage their reputation and raise greenwashing concerns. This applies not only to the sustainability targets associated with the KPIs, but also to their implementation and independent verification over the life of the loan. Although SLLs have the potential to promote sustainability, our findings suggest that they are not effective in significantly improving ESG performance in the short term. Instead, SLLs may be more effective in sustaining the already high level of ESG performance of borrower firms, rather than significantly improving it. Borrowers and lenders should therefore have reasonable expectations about the potential impact of SLLs as an incentive for sustainable practices.

Overall, our study contributes to the growing literature on ESG lending. Due to the novelty of SLLs, current studies typically suffer from small sample sizes. As more data become available, future research could examine the long-term sustainability impacts of SLL issuance on borrowers. Additionally, while transitioning away from use-of-proceeds-based debt instruments can help democratize sustainable finance, hurdles remain for companies with lower ESG profiles and for small and medium-sized enterprises. In particular, firms that lack specific sustainability resources or expertise may stay out of the SLL market, despite potentially having a greater need for new forms of sustainability incentives. Therefore, a more inclusive approach to sustainable finance instruments may be needed – one that does not compromise on design rigor and allows all market actors to contribute to addressing critical societal challenges.

II.7 First Appendix

Table II.17: **KPI Classification**. The table provides an overview of the issues addressed by the KPIs in our sample. The issues are grouped into four main categories: environmental, social, governance and ESG. The right side of the table provides examples of the objectives covered by each KPI issue.

Category	Example
Environmental	
Biodiversity	Conserve, promote and protect biodiversity and ecosystems.
Energy consumption and energy efficiency	Reduce energy consumption, improve energy efficiency.
Renewable energy	Increase the share of renewable energy produced or installed, increase the share of renewable energy used or sold, increase the share of electric vehicles in the total vehicle fleet.
Circular economy	Increase recycling rates, increase recovered materials from production waste, reduce waste of resources using recycled and/or reusable raw materials, reuse and repair equipment.
Sustainable resources and responsible sourcing	Increase the use of sustainable raw materials in production, sourcing and use of products from responsible sources, sustainable and transparent supply chains.
Environmentally sustainable investments	Increase the share of sustainable investments to total investments that contribute to environmental sustainability.
Reduction and elimination of waste	Reduce & avoid waste, reduce waste & avoid landfilling of waste, improve waste separation & collection.
Greenhouse gas emissions	Reduce scope 1, 2 and/or 3 greenhouse gas emissions, achieve carbon neutrality in own operations, and use emission-free machinery and vehicle fleets.
Water consumption	Make water use more sustainable, improve water conservation, reduce water consumption in operations and production.
Social	
Employee health and safety	Reduce the incidence of occupational accidents, injuries and diseases, implement health and safety measures, promote employee well-being and satisfaction at work, ensure human and labor rights.
Employee diversity and gender equality	Increase the number of women in leadership positions, promote gender equality in all areas of the company, encourage diversity in leadership positions.
Sustainable products and customer benefits	Provide sustainable, safe and reliable products and solutions to customers, expand the range of sustainable products, increase sales of sustainable products and revenue from products that improve sustainability and safety for customers.
Employee training	Increase the number of employee training hours, encourage participation in sustainability-related training, increase employee skill development.
Diverse and sustainable supply chain	Establish a diverse and sustainable supply chain by selecting suppliers that adhere to ethical and sustainable practices and reflect the diversity of the communities they serve.
Social responsibility and community engagement	Improve the relationship and dialogue between companies and the communities in which they operate, provide (financial) support to non-profit organizations, foundations, and local initiatives, support disadvantaged groups, reduce social inequalities, implement social responsibility and community engagement programs.
Governance	
Business ethics	Ensure compliance with the company's business ethics, code of conduct and code of ethics of the company, engage with stakeholders, prevent business ethics violations, including corruption, bribery, fraud or insider trading, provide training to board members, improve ESG-related processes and due diligence.
ESG	
ESG rating	Improve ESG rating performance.
Other ESG assessment and certification	Improve ESG rating or achieve equivalent ESG assessments or ESG certifications.

II.8 Second Appendix

Examples of KPIs

Below are examples of KPIs that received a value of 1 for each score dimension. The name of the borrower is indicated in parentheses.

Dimension #1: Strategic relevance

- **KPI:** "The margin of the new credit facility is in fact linked to two strategic targets in the field of energy transitioning and the circular economy which A2A has defined in its 2021-2030 Business Plan and which are included in the recently published Sustainable Finance Framework. The first goal is related to the growth of installed capacity from renewable sources while the second is represented by the increase of recovered materials from treated waste." (A2A SpA)

- **KPI:** "The indicators are linked to Corbion's key sustainability initiatives from its Creating Sustainable Growth strategy: Responsible sourcing, Responsible operations and Sustainable ingredient solutions." (Corbion NV)

Dimension #2: Materiality

- **KPI:** "The pricing mechanism of the RCF is linked to Stora Enso's science-based climate targets. Stora Enso commits to reducing absolute scope 1 and 2 greenhouse gas (GHG) emissions from its own operations, as well as scope 3 GHG emissions from its value chain, by 50% by 2030 from the 2019 base-year." (Stora Enso Oyj). The company belongs to the Basic Materials sector. Comparing this KPI with the SASB standards for this company (see pulp and paper products), we find that reduction of gross global scope 1 emissions is a material issue.

- **KPI:** "Pricing for the facility is based upon the company's performance against annual intensity reduction targets for its sulfur dioxide (SO2) and nitrogen oxide (NOX) emissions." (Cabot Corp). Comparing this KPI with the SASB standards for this company (see chemicals), we find that the reduction of emissions from air pollutants, including sulfur oxides and nitrogen oxides, is a material issue.

Dimension #3: Measurability

- **KPI:** "Endesa has committed to increasing the percentage of renewable sources in its total installed power generation capacity in the Iberian Peninsula from 45% at the start of the year to 50% by end December 2021." (Endesa SA)

- **KPI:** "The Sustainability-Linked financing is linked to the achievement of Enel's sustainability target to reduce direct greenhouse gas emissions (Scope 1), measured in grams of CO2eq per kWh, to equal or less than 148 gCO2eq/kWh by 31 December 2023, thereby contributing to the United Nations Sustainable Development Goal (SDG) 13 (Climate Action)." (Enel SpA)

Dimension #4: Benchmarking

- **KPI:** "The credit margin under the facility will be adjusted based on Maersk's progress to meet its target of reducing CO2 emissions per cargo moved by 60% by 2030, which is significantly more ambitious than the IMO target of 40% by 2030 (all 2008 baseline)." (AP Moller-Maersk A/S)

- **KPI:** "The first target is Ørsted's science-based target of reducing the carbon emissions from its energy generation and operations (scopes 1-2) to 10 g CO2e/kWh by 2025, which is the main lever for achieving carbon neutrality in 2025, and

which is aligned with a 1.5 °C climate scenario. The second target is Ørsted's taxonomy-aligned green investments linked to its announced approx. DKK 350 billion investment programme for 2020-2027, which constitute a significant step in achieving Ørsted's strategic ambition of reaching approx. 50 GW of installed renewable capacity by 2030." (Orsted A/S)

Dimension #5: Pricing mechanism

- **KPI:** "Under this loan, the margin amount that we are required to pay can be either increased or decreased, by up to 10 basis points per year, to the extent that we are able to meet certain sustainability metrics for any fiscal year beginning with the fiscal year ended December 31, 2021." (Diana Shipping Inc)

- **KPI:** "Supplier SBT Percentage Applicable Spread Adjustment Amount means, with respect to any period between Sustainability Pricing Adjustment Dates, (a) positive 0.04%, if the Supplier SBT Percentage for such period as set forth in the KPI Metric Report is less than the Supplier SBT Percentage Target for such period, and (b) negative 0.04%, if the Supplier SBT Percentage for such period as set forth in the KPI Metric Report is greater than or equal to the Supplier SBT Percentage Target for such period." (Moody's Corp)

Dimension #6: External review

- **KPI:** "Kinnevik will seek independent and external verification of our actual KPI performance relative to the SPT(s), on an annual basis and in relation to the Target Observation Date(s). The verification will be conducted by a reviewer with relevant expertise with limited assurance by the reviewer. The verification will be made public on our website by the dates outlined in the transaction specific documentation." (Kinnevik AB)

- **KPI:** "Such determination and reporting in the ESG Annual Report shall be verified by an independent third party in accordance with the Greenhouse Gas Protocol Corporate Reporting and Accounting Standard (the "ESG Third Party Verification") and such final, verified reporting will be attached to and reported on the ESG Compliance Certificate as the Sustainability Metric for such Reference Year." (Ingredion Inc)

II.9 Third Appendix

Example of pricing mechanism

To illustrate how SLLs align financial incentives with sustainability goals, we present the following example of an SLL issued to Avangrid in 2018 by a syndicate of lenders.

The baseline applicable margin of the loan is first determined based on Avangrid's credit rating. As described in the loan agreement, this applicable margin may also vary depending on the borrower's performance against a sustainability target:

"**Applicable Margin**" shall mean for each type of loan, the rate per annum set forth under the relevant column heading below which corresponds with the most current rating of such Borrower's senior unsecured long-term debt issued by Moody's and S&P, respectively. Such Applicable Margin may be increased or decreased pursuant to the Applicable Sustainability Adjustment.

Ratings	Applicable Margin for Eurodollar Loans	Applicable Margin for ABR Loans
>A1/A+	0.800%	0.000%
A2/A	0.900%	0.000%
A3/A-	1.000%	0.000%
Baa1/BBB+	1.075%	0.075%
Baa2/BBB	1.275%	0.275%
Baa3/BBB-	1.475%	0.475%
<Baa3/BBB-	1.650%	0.650%

The margin adjustment resulting from the firm's sustainability performance is defined as follows in the loan agreement:

"**Applicable Sustainability Adjustment**" means, for any fiscal year (beginning with fiscal year 2018): (a) if the annual Sustainability Amount is greater than or equal to 110% of the Baseline Sustainability Amount, a 0.05% increase in the specified Applicable Margins; and (b) if the annual Sustainability Amount is less than or equal to 90% of the Baseline Sustainability Amount, a 0.05% decrease in the specified Applicable Margins.

The above definition of Applicable Sustainability Adjustment specifies that such adjustment depends on a Sustainability Amount and a Baseline Sustainability Amount, defined as follows:

"**Baseline Sustainability Amount**" means 58.4g CO2/kWh, as contained in the opinion of Vigeo Eiris delivered to the Borrowers and furnished to the Lenders.
"**Sustainability Amount**" means the greenhouse gas emissions intensity resulting from the Borrowers' and their Subsidiaries' operations, calculated in the manner set forth by Global Reporting Initiative 305-4 (previous G4-EN18) based on direct emissions from production facilities divided by the net production, including steam, and expressed as a ratio of grams of carbon dioxide to kilowatt hour (g CO2/kWh).

In summary, this loan agreement incorporates a dynamic pricing mechanism that rewards or penalizes Avangrid's sustainability performance relative to the Baseline Sustainability Amount of 58.4g CO2/kWh. The spread charged by the lenders may be adjusted up or down by 5 basis points.

Chapter III

Beyond carbon emissions: Is climate change exposure priced?

Coauthors:

Paul Eubel

Andreas Walter

Relative share:

20%

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Beyond carbon emissions: Is climate change exposure priced?

Abstract

This paper documents the relationship between climate change exposure (*CCE*) and stock returns in a multi-factor investment framework. We find *CCE* to be a relevant factor on the portfolio level, and in the cross-section of stock returns, highlighting the role of *CCE* in the formulation of climate-conscious investment strategies. Further, we calculate the residuum of *CCE* that is not explained by carbon emissions and find that *CCE* is not priced after controlling for carbon risk.

Keywords: Socially responsible investing, Climate finance, ESG

JEL-Codes: G10, G11, G12

Declarations of interest: none

III.1 Introduction

Climate change is one of the greatest challenges of our time. It already has a significant impact, on our planet and also on our economy. Giglio et al. (2021) argue that the effects of climate change are omnipresent and affect virtually every business. Extreme weather events such as droughts, floods, or storms can damage infrastructure and production facilities leading to operational disruptions, production stoppages, or even plant closures (physical risk). In addition to these direct and indirect effects of climate change, risks can also arise for firms from the transition to a low-carbon economy (transitional risk). These include higher costs for the usage of fossil fuels, changes in regulation, and loss of reputation. Alongside the negative effects of climate change, there are also opportunities for firms. For example, firms can expand into new markets by developing new products and services to meet changing consumer needs.

All of these channels have direct and indirect effects on a company's business and involve uncertainty about the future. Barnett et al. (2020) argue that this uncertainty should be theoretically priced. In addition to the actual risks and opportunities, Pástor et al. (2021) argue that the trend towards ESG investing, i.e., investors' green taste, additionally affects stock returns through two channels. First, a change in expectations about future cash flows due to a shift in customer demand as well as the threat of regulatory intervention can negatively affect the cash flows of brown firms. Second, investors preference for social impact may result in the utility of holding green stocks. Both theories raise the question of whether climate change exposure factors into stock returns.

As climate change affects each company differently, a key challenge is to measure the exposure of individual firms in terms of risks and opportunities (Giglio et al. (2021)). Previous studies mostly focus on carbon emissions (Bolton & Kacperczyk (2021) or

Bolton & Kacperczyk (2023)) and ESG ratings (Ardia et al. (2023) or Engle et al. (2020)) to asses the performance of green vs brown firms. However, as the significance of the results tends to depend on the ESG rating provider (Berg, Kölbel & Rigobon (2022)) or the type of carbon emissions analyzed (Aswani & Rajgopal (2022)), it is important to gain more clarity on this relationship through further measures. Berkman et al. (2021) argue that text-based measures of climate change exposure capture the complexity of climate risk more effectively than a purely emission-based proxy. Further, unlike ESG ratings, text-based measures of climate change exposure do not rely solely on backward-looking numbers, but also incorporate soft information. To address this gap, we use a text-based measure of climate change exposure (CCE) developed by Sautner et al. (2023a) and analyze the relationship between a company's climate change exposure and its stock returns. CCE measures the proportion of communication devoted to the topic of climate change within earnings call transcripts. Sautner et al. (2023a) argue that CCE allows for a detailed assessment of climate change exposure, and its drivers in terms of risks and opportunities.

To investigate the relationship between CCE and stock returns, we run an analysis at both, the portfolio and firm level. The portfolio approach is a simple trading strategy where we buy (sell) the firms with the lowest (highest) CCE in each industry. The firm-level analysis on the other hand provides insights into the effect of different CCE levels without the need to make assumptions about the portfolio construction. Further, since CCE captures the proportion of communication about climate change, the measure is prone to mostly reflect carbon emissions. Therefore, we calculate the residuum of CCE that is not explained by carbon emissions. This allows us to answer two key questions. First, does CCE have an effect on stock returns, and second, is CCE priced after controlling for carbon risk.

In the first part of this paper, using a large sample of U.S. firms between 2008 and 2022, we analyze the effect of CCE at the portfolio level by constructing quintile CCE portfolios and a zero-cost long-short strategy buying (selling) the portfolio with the lowest (highest) CCE. We test for abnormal returns by running regressions against a six-factor model that combines the five-factor model from Fama & French (2015) with the momentum factor from Carhart (1997). Afterwards, we repeat our portfolio analysis with the share of CCE that is not explained by carbon emissions. We find significant abnormal returns for our long-short CCE portfolios. These findings are robust to various allocation and weighting approaches, as well as different sub-periods and cut-off values for the portfolio formation. Further, our analysis shows lower abnormal returns for the residual CCE portfolios compared to the CCE portfolios indicating that returns of the CCE portfolios can be partially explained by carbon emissions.

In the second part of this paper, we test the effect of CCE on stock returns at the firm-level. While the portfolio approach considers only the firms with the highest and lowest CCE (of each industry), the firm-level analysis provides insights into the effect of different CCE levels across the entire sample on stock returns. To estimate the effect of CCE in the panel structure, we use fixed effects models following the work of Bolton & Kacperczyk (2021). We find a significant positive relationship between the lagged climate change exposure and stock returns. Our results are robust to industry and firm fixed effects and hold in a sample where we exclude the industries with the highest CCE levels. Similar to the portfolio level we re-run our analysis using the residual as our independent variable and find that the relationship between climate change exposure and stock returns losses significance after controlling for carbon emissions. Our results indicate that returns may be misattributed to CCE, while in part reflecting carbon emissions.

Our paper is most closely related to the work of Sautner et al. (2023*b*), who use a Fama & MacBeth (1973) procedure to investigate expected and realised risk premiums of CCE for S&P 500 firms. Their work supports the hypothesis of Barnett et al. (2020), who argue that uncertainty associated with climate change should be priced. Unlike Sautner et al. (2023*b*), who focus solely on risk premiums, we are the first to conduct a comprehensive battery of asset pricing tests to analyze the specific effect of climate change exposure (CCE) on stock returns for a broad sample of more than 7,000 U.S. firms.

Similar to our analysis, Berkman et al. (2021), construct long-short portfolios based on their own measure of climate change exposure derived from 10-K filings. Their study primarily investigates the hedging potential of their measure by incorporating unexpected climate change concerns (see Ardia et al. (2023)) into their Carhart (1997) four-factor model. Li et al. (2024) find a negative relationship between their measure of transition risk and Tobin's q, showing that firm-level transition risk exposure is priced. Another study using a text-based measure of climate change exposure is Baz et al. (2023), who use a difference-in-differences approach to analyze the stock market reaction to the 2016 Trump election. Their results indicate that firms with high exposure experienced higher cumulative returns after the election.

This paper contributes to the existing body of research analyzing the relationship between climate change and stock returns. To the best of our knowledge, we are the first to analyze the specific effects of climate change exposure on stock returns. Existing literature, such as Sautner et al. (2023*b*), has identified a risk premium associated with CCE, while Berkman et al. (2021) focus on the hedging properties of their own measure of climate change exposure. We contribute to the existing literature by applying different asset pricing tests to a large sample of U.S. firms, providing a broader and

more comprehensive analysis. Second, we are the first to isolate the impact of climate change exposure on stock returns from the influence of carbon emissions. Earnings calls may include information on carbon emissions, potentially confounding the relationship between CCE and stock returns. Third, our paper makes a novel contribution to the ongoing debate on whether investing in green versus brown firms generates significant abnormal returns (Ardia et al. (2023), Halbritter & Dorfleitner (2015), Pástor et al. (2022) or Görgen et al. (2020)).

The rest of this paper is organised as follows. In Section 2, we present the theoretical foundations based on the current literature. Section 3 presents the data and discusses some implications of its characteristics. In section 4, we present the methodology, by discussing the portfolio approach and then the fixed effects approach. In section 5, the empirical results are presented and discussed, followed by a series of robustness checks. In section 6 we summarise the main findings.

III.2 Related Literature

This paper contributes to a body of literature examining the relationship between a firm's greenness and its stock returns. Pástor et al. (2021) propose that investors' taste for green assets can affect asset prices through two main mechanisms. The first mechanism involves a shift in expectations about future cash flows due to a shift in customer demand as well as the threat of regulatory intervention, which can negatively (positively) affect the cash flows of brown (green) firms. The second mechanism arises from investors' desire for social impact, which leads them to derive satisfaction from owning stocks of green firms, thereby aligning their investments with their personal beliefs and values. Earlier considerations by Fama & French (2007) provide a theoretical link between investor's preferences and asset pricing. They argue that significant distortions in

expected returns can occur when investors with misinformation or specific asset preferences control a substantial amount of wealth.

Avramov et al. (2022) find that investor demand for environmentally friendly ('green') stocks tends to decrease during periods of high uncertainty about ESG ratings. Conversely, they find that stocks with poor environmental performance ('brown' stocks) tend to outperform green stocks when ESG-rating uncertainty is low. Pedersen et al. (2021) propose an ESG-CAPM in which they estimate expected returns as a function of idiosyncratic risk together with an ESG component. They argue that investors may perceive stocks with high (low) ESG score as less (more) risky and therefore demand lower (higher) expected returns. Additionally, Zerbib (2022) shows that sustainable investing can affect asset returns through the joint practice of exclusionary screening and ESG integration (i.e. the inclusion of ESG factors in financial analysis).

Following the Pástor et al. (2021) hypothesis, green stocks can outperform brown stocks in the event of an unexpected increase in climate concerns. Ardia et al. (2023) test this proposition empirically. They construct a daily Media Climate Change Concerns index (MCCC) using data from U.S. newspapers and news-wires to measure the level of climate concern expressed in the media. By modeling unexpected concerns as residuals of an AR(1) process, they find that green stocks (defined by carbon intensity) on average outperform brown stocks on days with unexpected increases in climate change concerns. Similarly, Pástor et al. (2022) use residuals from the MCCC index to evaluate the performance of their constructed green-minus-brown portfolio, which is based on MSCI environmental scores. Their findings indicate that this portfolio yields positive ex-post returns during periods of escalating climate concerns. However, they also observe a trend of lower expected returns for this green-minus-brown portfolio.

The research of Ardia et al. (2023) and Pástor et al. (2022), together with the findings

of Giglio et al. (2021), highlight different methodologies used to evaluate a company's environmental performance. A key method among them is the use of Environmental, Social, and Governance (ESG) scores, with a particular focus on the environmental sub-scores that quantifies a firm's impact on the natural environment. However, the association between these environmental (E) scores and stock returns appears to be influenced by factors such as the time frame of the analysis and the agency providing the ratings. Halbritter & Dorfleitner (2015)) construct portfolios of high and low E-score stocks for U.S. firms between 2002 and 2011. Their high-minus-low E-score portfolio yield positive but insignificant alphas for the Refinitiv and MSCI, and a negative but insignificant alpha for the Bloomberg E-score in a Carhart (1997) four-factor model. According to the authors, only the MSCI ESG-scores provide a significant positive risk premium in the cross-section using a Fama & MacBeth (1973) regression.

Bennani et al. (2018) find positive alphas for companies with high E-scores between 2010 and 2013 while the effect reverses during the period 2014 to 2017. They suggest that these performance variations are related to the growing importance of ESG screening and the increased demand for green assets in investment decisions, indicating a dynamic and evolving relationship between environmental performance and stock returns. Lins et al. (2017) observe that stocks with high MSCI ESG-score significantly outperform stocks with low ESG-score during the great financial crisis in 2008 and 2009, suggesting that during periods of market turmoil, investors may prefer or perceive stocks with higher ESG ratings as safer or more resilient investments. Engle et al. (2020) document that firms with high MSCI and Sustainalytics E-scores tend to yield higher returns during periods of negative news about the future trajectory of climate change. This finding suggests that during periods of heightened environmental concern or uncertainty, firms with better environmental performance records may be viewed

more favorably by investors, reflecting a risk-averse approach towards environmental issues.

Other widely used measures of climate risk include carbon emissions and the concept of carbon intensity, which expresses emissions per dollar of sales. Bolton & Kacperczyk (2021) conduct fixed effects regressions for U.S. firms between 2005 and 2017 and find a carbon premium, that was evident in both the overall level of emissions and in the year-to-year changes. However, this premium did not extend to carbon intensity in their panel data analysis. The results of Görgen et al. (2020) confirm a carbon premium in a global sample and Bolton & Kacperczyk (2023) show that the premium is robust for level and year-to-year changes across all sectors and most countries. Aswani et al. (2023) argue that the premium disappears when using company-reported data rather than standardized and vendor-estimated data.

At the portfolio level, In et al. (2019) construct long-short portfolios investing long in U.S. companies with low carbon emission intensity while taking short positions in companies with high carbon emission intensity between 2005 and 2018. Their findings reveal significant positive portfolio alphas after 2009. Similarly, Hsu et al. (2023) construct portfolios based on toxic emission intensity. The authors find a positive significant premium for a high-minus-low toxic emission intensity portfolio of U.S. firms, suggesting that, similar to carbon emissions, the market also factors in toxic emissions when evaluating the financial performance of companies, with lower emissions correlating with better financial returns.

A new class of measures captures firm-specific climate change exposure through textual-analysis of corporate documents. Berkman et al. (2021) argue that this approach captures the complexity of climate risk better than a pure emissions-based proxy. Unlike ESG ratings, these measures rely not only on backward-looking numbers, but also

incorporate soft information, providing a more holistic view of a firm's climate risk exposure. The type of corporate documents used and the methods of analysis vary from study to study. While Baz et al. (2023) assert that 10-Ks provide a comprehensive and standardized source, Sautner et al. (2023*a*) argue that conference call transcripts provide more timely information. The use of machine learning algorithms proposed by Sautner et al. (2023*a*) can capture nuances in language, but also raises concerns about transparency and sensitivity to initial parameters, according to Li et al. (2024).

First results for the relationship between stock returns and climate change exposure suggest a positive risk-return relationship. Baz et al. (2023) analyze the impact of the 2016 U.S. presidential election on stock prices. Using a difference-in-differences approach, they discovered that companies with greater exposure to climate change risk experienced higher cumulative returns following the election of Donald Trump. Berkman et al. (2021) use their textual-analysis measure derived from 10-K filings to create long-short portfolios of Russell 3000 stocks for the period 2011-2019 to hedge against climate risk. However, they found that none of the constructed long-short portfolios generates statistically significant abnormal returns.

Sautner et al. (2023*b*) use the CCE measure from Sautner et al. (2023*a*), which identifies the attention paid by earnings call participants to firms' climate change exposures, and estimate risk premiums between 2005 and 2020. They find that stocks in the S&P 500 offer only an insignificant risk premium for CCE in the cross-section based on realized returns. However, prior to 2008, they find a compensation of about 1% per annum for CCE using a Fama & MacBeth (1973) approach which disappears after 2008. For their expected return proxies, they find no significant risk premium before 2011. However, both proxies turn positive after 2012.

In this paper we examine the effects of CCE on stock returns, significantly extend-

ing the current body of research in three key aspects. To the best of our knowledge, we are the first to analyze the specific effects of climate change exposure on stock returns. Existing literature, such as Sautner et al. (2023*b*), has identified a risk premium associated with *CCE*, while Berkman et al. (2021) focus on the hedging properties of their own measure of climate change exposure. We bridge this gap by applying different asset pricing tests to a large sample of U.S. firms, providing a broader and more comprehensive analysis. Second, we are the first to isolate the impact of climate change exposure on stock returns from the influence of carbon emissions. Earnings calls may include information on carbon emissions, potentially confounding the relationship between *CCE* and stock returns. Third, our paper makes a novel contribution to the ongoing debate on whether investing in green versus brown firms generates significant abnormal returns (Ardia et al. (2023), Halbritter & Dorfleitner (2015), Pástor et al. (2022) or Görgen et al. (2020)).

III.3 Data

III.3.1 Climate Change Exposure

As a measure of firm-level climate change exposure, we use the *CCE* measure proposed by Sautner et al. (2023*a*). The measure is based on transcripts of quarterly earnings conference calls of 10,673 firms from 34 countries between 2002 and 2021. To account for the dynamic nature of climate change-related vocabulary, the authors rely on a machine learning based keyword algorithm proposed by King et al. (2017). Based on a small list of initial bigrams, the algorithm constructs a model that predicts whether a sentence is related to climate change.

CCE is the sum of climate change-related bigrams scaled by the total number of bigrams in the corresponding transcript. By averaging across the quarterly data, the authors aggregate the measure to an annual level. In addition to quantifying the proportion of communication devoted to climate change, the authors create two additional measures that decompose communication into distinct components. First, a sentiment measure captures the amount of climate change bigrams after conditioning on the presence of positive ($CCE_{i,t}^{Pos}$) or negative ($CCE_{i,t}^{Neg}$) tone words using the dictionary by Loughran & McDonald (2011). Second, $CCE_{i,t}^{Risk}$ captures the relative frequency of climate change bigrams stated in the same sentence as the terms "risk", "uncertainty", or its synonyms. Both measures are normalized by the number of bigrams in the corresponding transcript. Panel A of Table III.1 provides an overview of all measures used in this paper.

As shown by Sautner et al. (2023*a*), the CCE level varies across sectors and industries. To reduce the influence of industry-specific effects on our findings, we compute z-scores for each year-industry and year-sector combination. Further, the distribution of the CCE variable is highly skewed due to a large number of observations being zero. However, we do not drop these zero-value observations as they indicate the absence of climate change communication in the respective transcripts.

III.3.2 Firm-level controls

Our investment universe includes all 7,113 U.S. based firms from the Sautner et al. (2023*a*) database for the period 2008 to 2022. We use the total return and market capitalization from the Refinitiv database to calculate the time series returns for the CCE portfolios. For the analysis of returns in the panel structure, we use a set of firm-specific control variables, which we also obtain from the Refinitiv database. As proposed by

previous literature (e.g. Bolton & Kacperczyk (2021)), we use the natural logarithm of market capitalization (price times shares outstanding) to account for firm size ($Size_{i,t}$) of firm i in year t, the book-to-market ratio ($BTM_{i,t}$) of firm i in year t and the leverage ratio ($Leverage_{i,t}$) of firm i in year t, which is calculated as total debt divided by total assets. $Momentum_{i,t}$, which is measured by the cumulative return, and $Rolling\ Volatility_{i,t}$ are both calculated over the last trailing 12 months. $Investment\ Intensity_{i,t}$ is the ratio of CAPEX to total assets of firm i in year t. $Profitability_{i,t}$ is measured by the return on equity of firm i in year t. Physical capital ($PPE_{i,t}$) of firm i in year t is accounted for by the natural logarithm of plant, property, and equipment. Market risk ($Beta_{i,t}$) is proxied by the CAPM beta using the rolling last five years of monthly observations. $Sales\ Growth_{i,t}$ and $EPS\ Growth_{i,t}$ of firm i in year t are employed to capture the firm's growth prospects. Further, we use $Carbon\ Emissions_{i,t}$ as the natural logarithm of the sum of scope 1 and scope 2 emissions of firm i in year t to account for carbon risk. We remove all observations with missing values and winsorize all variables at the 1% and 99% level. Panel B of Table III.1 provides an overview of all firm-level controls used in this paper. The industry and sector classification for each company is determined according to the Industry Classification Benchmark (ICB).

III.3.3 Time-series controls

For our portfolio-level analysis we estimate betas in a multivariate factor model using six common-risk factors from Fama & French (2015) and Carhart (1997), defined as follows: MKT_t is the monthly return of the CRSP value-weighted portfolio in month t, over the risk-free rate; SMB_t is the monthly return of a portfolio strategy that invests in small-cap stocks while shorting large-cap stocks; HML_t measures the monthly return of a portfolio strategy that goes long on stocks with high book-to-market ratios and shorts

those with low ratios; WML_t is the monthly return of a strategy that buys stocks with strong returns over the past year and sells those with weak returns; CMA_t calculates the monthly return from a strategy that favors stocks with conservative investment profiles over those with aggressive investment strategies; and RMW_t is the monthly return of a portfolio of firms with robust (high) operating profitability minus a portfolio of firms with weak (low) operating profitability. All factors are derived from Kenneth R. French database. Panel C of Table III.1 shows the summary statistics of common risk factor returns.

Table III.1: **Summary Statistics**. This table reports summary statistics for all financial and non-financial data employed in our sample. Panel A reports the different measures from the Sautner et al. (2023*a*) database on a year-company level. The variables are scaled by 1,000. CCE measures the relative frequency with which bigrams related to climate change occur in earnings calls. $CCE_{i,t}^{Risk}$ measures the relative frequency with which bigrams that capture risks related to climate change occur in earnings call transcripts. $CCE_{i,t}^{Pos}$ ($CCE_{i,t}^{Neg}$) measures the relative frequency with which bigrams related to climate change occur in earnings calls after conditioning on the presence of positive (negative) tone words using the dictionary by Loughran & McDonald (2011). For all measures, Sautner et al. (2023*a*) average values of the four earnings calls during the year. Panel B reports data for firm characteristics. All company-level variables are winsorized at the upper and lower 1%. Panel C contains monthly returns for common risk factors between 2008 and 2022 from the Kenneth R. French data base.

Variable	Mean	STD	25%	50%	75%	Obs.
Panel A: Firm-level climate change exposure						
$CCE_{i,t}$	1.325	2.433	0.165	0.413	1.136	21,520
$CCE_{i,t}^{Risk}$	0.029	0.106	0.000	0.000	0.000	21,520
$CCE_{i,t}^{Pos}$	0.604	1.211	0.000	0.159	0.517	21,520
$CCE_{i,t}^{Neg}$	−0.238	0.481	−0.227	−0.073	0.000	21,520
Panel B: Firm-level controls						
$Return_{i,t}$	0.013	0.140	−0.041	0.011	0.063	252,032
$Size_{i,t}$	21.911	1.462	20.902	21.712	22.946	252,032
$Momentum_{i,t}$	0.182	0.430	−0.059	0.129	0.348	252,032
$Rolling\ Volatility_{i,t}$	0.330	0.166	0.217	0.293	0.397	252,032
$Beta_{i,t}$	1.236	0.576	0.824	1.220	1.579	252,032
$BTM_{i,t}$	0.466	0.341	0.229	0.372	0.608	21,520
$Leverage_{i,t}$	0.371	0.220	0.227	0.368	0.517	21,520
$Investment\ Intensity_{i,t}$	0.038	0.034	0.015	0.028	0.049	21,520
$Profitability_{i,t}$	0.122	0.218	0.067	0.129	0.203	21,520
$PPE_{i,t}$	6.842	1.704	5.724	6.759	7.863	21,520
$Sales\ Growth_{i,t}$	0.094	0.250	−0.010	0.060	0.142	21,520
$EPS\ Growth_{i,t}$	0.258	1.091	−0.043	0.121	0.290	21,520
$Carbon\ Emissions_{i,t}$	11.332	2.122	9.978	11.196	12.739	21,520
Panel C: Time-series controls						
Market (MKT_t)	0.007	0.048	−0.018	0.013	0.035	180
Size (SMB_t)	0.001	0.026	−0.018	0.002	0.018	180
Value (HML_t)	−0.001	0.033	−0.019	−0.003	0.015	180
Momentum (WML_t)	0.001	0.041	−0.021	0.004	0.028	180
Profitability (RMW_t)	0.004	0.019	−0.009	0.004	0.013	180
Investments (CMA_t)	0.002	0.019	−0.011	0.000	0.013	180

III.4 Methodology

III.4.1 CCE Portfolios

To analyze the relationship between CCE and stock returns, we construct portfolios based on the CCE values of the firms. This portfolio approach is widely used in the asset pricing literature (see for example Carhart (1997) or Pástor & Stambaugh (2003)). Further, this approach helps to aggregate a large number of panel observations into simple time series for each portfolio.

Each January, we form quintile portfolios based on the previous year's CCE. Thereby, we ensure that the data is publicly available at the time we construct the portfolios in order to eliminate a potential look-ahead bias. As discussed in section 3.1, the average CCE varies strongly across industries. To avoid industry biases, we form individual portfolios for each industry and aggregate them into industry-neutral portfolios. By weighting the stocks in the portfolios by their market capitalization, we account for their economic relevance and a realistic allocation process. We use 20% cut-offs to ensure balanced portfolios despite the skewness of the CCE distribution and still measure the impact of high and low CCE.

We allocate the top (bottom) 20% of stocks from each industry to a CCE_{High} (CCE_{Low}) portfolio. We also construct a zero-cost long-short strategy that reflects the portfolio of an investor who goes long in the CCE_{High} and short in the CCE_{Low} portfolio. To evaluate the alpha potential of the CCE portfolios, we run a multivariate factor model that combines the Fama & French (2015) five-factor model with the momentum factor from Carhart (1997). For each portfolio i, we estimate the following regression:

$$CCE_{i,t} = \alpha_i + \beta_i * MKT_t + s_i * SMB_t + h_i * HML_t + w_i * WML_t + r_i * RMW_t + c_i * CMA_t + u_{i,t} \quad \text{(III.1)}$$

where $CCE_{i,t}$ is either the excess return of portfolio CCE_{High}, CCE_{Low} or the return of portfolio $CCE_{Low-High}$ in month t. We explained $CCE_{i,t}$ by the excess market return, and by portfolios mimicking size, value, momentum, profitability and investments factors (MKT_t, SMB_t, HML_t, WML_t, RMW_t and CMA_t, respectively). The corresponding coefficients a_i, β_i, s_i, h_i, w_i, r_i & c_i and the residuals $u_{i,t}$ are estimated by OLS regressions. We use robust standard errors as proposed by Newey & West (1987) to adjust for autocorrelation.

To further understand the alpha potential of CCE portfolios, we test a number of model modifications. Since companies with high CCE may not end up in the CCE_{High} portfolio due to the CCE of their peers, we run a simple allocation using raw CCE scores. We also adjust the portfolio construction to weight each stock equally. This allows us to understand the effect of the average company and whether a small number of large firms drive the portfolio performance. To examine the dependence of the results on the selection process, we test different cut-offs ranging from 10% to 50%. Further, we divide the full sample into three equally long periods to test the temporal robustness of our findings.

Since CCE captures the proportion of communication about climate change the measure is prone to reflect existing climate risk proxies. **?** find that 38% of asset managers in their survey analyze the carbon footprint of their portfolios, and Bolton & Kacperczyk (2021) show that institutional investors divest from industries with high carbon emissions. Since carbon emissions are a widely used proxy for climate risk, we want to ensure that the communication captured by CCE provides new information.

Therefore, we dissect carbon emissions and CCE using the following regression:

$$CCE_{i,t} = \alpha_0 + \alpha_1 * Carbon\ Emissions_{i,t-1} + u_{i,t} \tag{III.2}$$

where $CCE_{i,t}$ is explained by $Carbon\ Emissions_{i,t-1}$ of firm i in year t. $u_{i,t}$ is the residuum that is not explained by $Carbon\ Emissions_{i,t-1}$. We then re-run our portfolio analysis with portfolios constructed on the residuum $u_{i,t}$ ($RES\_CCE_{i,t}$) and $CCE_{i,t}$ for the investment universe of firms that report data on their their carbon emissions.

III.4.2 Cross-Sectional Regressions

Next, we examine the impact of CCE on stock returns in a panel structure. Unlike the portfolios, which include only the firms with the highest and lowest CCE values, the cross-sectional analysis weighs all observations equally. Thereby, we gain a deeper understanding of how CCE levels influence stock returns without the need for assumptions for the portfolio construction.

Analogous to Bolton & Kacperczyk (2021), who analyze the effect of carbon emissions on stock returns, we run fixed effects models to understand the effect of CCE on stock returns. Specifically, we estimate the following fixed effects regressions:

$$(r_{i,t} - r_{f,t}) = \alpha_0 + \alpha_1 * Climate\ Exposure_{i,t-1} + \alpha_2 * CONTROL_{i,t-1} + \mu_t + u_{i,t} \tag{III.3}$$

where $(r_{i,t} - r_{f,t})$ is the excess return of the stock i over the risk-free rate (r_f) in month t. $Climate\ Exposure_{i,t-1}$ is either $CCE_{i,t-1}$, $CCE^{Risk}_{i,t-1}$, $CCE^{Pos}_{i,t-1}$ or $CCE^{Neg}_{i,t-1}$. $CONTROL_{i,t-1}$ is a vector of control variables consisting of stock return predictors.

We follow Bolton & Kacperczyk (2021) and incorporate $Size_{i,t}$, $MTB_{i,t}$, $Momentum_{i,t}$, $Rolling\ Volatility_{i,t}$, $Investment\ Intensity_{i,t}$, $Profitability_{i,t}$, $PPE_{i,t}$, $Leverage_{i,t}$, $Beta_{i,t}$, $Sales\ Growth_{i,t}$ and $EPS\ Growth_{i,t}$ as control variables. All variables are defined in section 3.2. For the base model in equation III.3, we estimate year-month fixed effects to account for unobserved heterogeneity by excluding time-invariant effects. As Sautner et al. (2023*a*) shows, the average CCE varies strongly across industries. To account for industry-specific effects we include additional industry fixed effects in a second model. Finally, we include firm fixed effects in a third model to account for unobserved heterogeneity in the form of unobserved firm-specific factors that could affect stock returns for that we do not control for in our model. In all three models, the standard errors are clustered at the firm-year level. Similar to the portfolio level, we test whether CCE is priced after controlling for carbon risk. As a first step, we re-run the regression from equation III.2 for $CCE^{Risk}_{i,t-1}$, $CCE^{Pos}_{i,t-1}$ and CCE^{Neg} to calculate $RES\_CCE_{i,t-1}$, $RES\_CCE^{Risk}_{i,t-1}$, $RES\_CCE^{Pos}_{i,t-1}$ and RES_CCE^{Neg}. In the second step we use these residual measures to re-run the fixed effects model from equation III.3.

III.5 Results

III.5.1 CCE Portfolios

Table III.2 shows the regression results from equation (1) for the upper and lower quintile portfolios as well as the long-short strategy. In Panel A, the CCE_{Low} and $CCE_{Low-High}$ portfolios generate positive annualized abnormal returns which are significant at the 5% level while the alpha of the CCE_{High} portfolio is not statistically significant. This effect is robust for the industry-neutral allocation with the raw score

(Panel B). The significance disappears for industry-year (Panel C) and sector-year z-score portfolios (Panel D), suggesting that sector and industry effects do influence the results.

The common risk factor loadings in Table III.2 show that in most cases the average stock in the CCE_{High} portfolio has a higher beta than the average stock in the CCE_{Low} portfolio suggesting that stocks with higher climate change exposure are associated with greater market risk. Further, the positive and significant HML coefficients for most of the $CCE_{Low-High}$ portfolios suggest a value tilt for the CCE_{Low} portfolios. We find no systematic differences between the portfolios for size and momentum. The significant coefficients imply that the firms in CCE_{Low} portfolios behave like firms with weak profitability and aggressive investments.

Table III.2: **Climate Change Exposure Portfolios**. This table reports results for multivariate factor regressions with factors from Carhart (1997) and Fama & French (2015). The regressions are run individually for each portfolio with monthly returns from 2008 to 2022. Portfolio returns are weighted by market capitalisation. Portfolio CCE_{High} is formed on the highest quintile of CCE and CCE_{Low} on the lowest. $CCE_{Low-High}$ is a zero-cost long-short portfolio constructed by going long in the lowest and shorting the highest quintile. Alphas are reported annualized. The coefficients are estimated by OLS regressions with Newey & West (1987) robust standard errors. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

	Alpha	MKT	SMB	HML	WML	RMW	CMA	R^2
Panel A: Simple Allocation								
CCE_{Low}	0.031**	0.955***	0.689***	0.187***	−0.127***	−0.177**	−0.225***	0.964
CCE_{High}	−0.011	1.044***	0.670***	0.192***	−0.105***	−0.038	0.032	0.952
$CCE_{Low-High}$	0.041**	−0.089**	0.020	−0.006	−0.022	−0.0139	−0.258***	0.097
Panel B: Industry-Neutral Allocation								
CCE_{Low}	0.027**	0.982***	0.708***	0.219***	−0.116***	−0.182**	−0.142*	0.972
CCE_{High}	0.003	1.021***	0.681***	0.137***	−0.102**	−0.082	−0.077	0.981
$CCE_{Low-High}$	0.024**	−0.039*	0.027	0.082**	−0.014	−0.101	−0.065	0.070
Panel C: Industry-Year Z-Scores								
CCE_{Low}	0.021*	1.008***	0.597***	0.244***	−0.091***	−0.132**	−0.122*	0.978
CCE_{High}	0.004	1.007***	0.661***	0.141***	−0.098**	−0.083	−0.084*	0.974
$CCE_{Low-High}$	0.017	0.001	−0.064	0.103*	−0.007	−0.049	−0.038	0.075
Panel D: Sector-Year Z-Scores								
CCE_{Low}	0.014	1.055***	0.647***	0.281***	−0.102***	−0.150**	−0.042	0.979
CCE_{High}	0.003	1.002***	0.660***	0.162**	−0.099***	−0.088	−0.062	0.976
$CCE_{Low-High}$	0.010	0.053***	−0.013	0.119**	−0.003	−0.062	−0.019	0.203

Given of the evolution of investor perceptions and the increasing importance of climate change over the past decades, we split our analysis into different time periods to capture potential temporal shifts in the relationship between climate change exposure (CCE) and stock returns. Table III.3 shows the abnormal returns estimated by the six-factor model for all portfolios and weighting approaches for the sub-periods 2008-2014 and 2015-2022. For the value-weighted portfolios, we observe that the magnitude and statistical significance of the alphas decreases over time for the CCE_{Low} and $CCE_{Low-High}$ portfolios. This is consistent with Sautner et al. (2023*b*), who find that the risk premium for CCE has disappeared over time for firms in the S&P 500. Similar to the abnormal returns of the value-weighted $CCE_{Low-High}$ portfolios, abnormal returns of

our equally-weighted $CCE_{Low-High}$ portfolios disappear in the second sub-period. While the positive alphas of the value-weighted $CCE_{Low-High}$ portfolios result from positive abnormal returns of the CCE_{Low} portfolios, the positive alphas of the equally-weighted $CCE_{Low-High}$ portfolios can be attributed to the negative alphas of the CCE_{High} portfolios.

Table III.3: **Climate Change Exposure Portfolios for various Sub-Periods**. This table reports abnormal returns for multivariate factor regressions with factors from Carhart (1997) and Fama & French (2015). The regressions are run individually for each portfolio and sub-sample. Portfolio returns are value-weighted on the left and equally-weighted on the right part of the table. Portfolio CCE_{High} is formed on the highest quintile of CCE and CCE_{Low} on the lowest. $CCE_{Low-High}$ is a zero-cost long-short portfolio constructed by going long in the lowest and shorting the highest quintile. Alphas are reported annualized. The coefficients are estimated by OLS regressions with Newey & West (1987) robust standard errors. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

	Value-Weighted			Equally-Weighted		
	Full Sample	2008-2014	2015-2022	Full Sample	2008-2014	2015-2022
Panel A: Simple Allocation						
CCE_{Low}	0.031**	0.049***	0.005	0.003	0.011	−0.006
CCE_{High}	−0.011	−0.012	0.004	−0.032**	−0.035**	−0.013
$CCE_{Low-High}$	0.041**	0.061**	0.001	0.034*	0.045	0.006
Panel B: Industry-Neutral Allocation						
CCE_{Low}	0.027**	0.044***	0.006	0.001	0.008	−0.005
CCE_{High}	0.003	0.009	0.000	−0.022**	−0.023**	−0.015
$CCE_{Low-High}$	0.024**	0.035**	0.006	0.023**	0.031*	0.009
Panel C: Industry-Year Z-Scores						
CCE_{Low}	0.021*	0.036**	0.003	0.005	0.016	−0.005
CCE_{High}	0.004	0.006	0.004	−0.021**	−0.023**	−0.011
$CCE_{Low-High}$	0.017	0.030**	−0.001	0.026**	0.040***	0.005
Panel D: Sector-Year Z-Scores						
CCE_{Low}	0.014	0.028*	−0.003	−0.004	0.005	−0.012
CCE_{High}	0.003	0.011	0.001	−0.021**	−0.018	−0.016
$CCE_{Low-High}$	0.010	0.017	−0.003	0.017**	0.022**	0.005

Finally, Table III.4 presents the abnormal returns for the CCE_{High}, CCE_{Low} and $CCE_{Low-High}$ portfolios for different cut-offs ranging from 10% to 50%. Across all cut-offs and allocation strategies tested, the results for the value-weighted portfolios show a consistent pattern. Most of the $CCE_{Low-High}$ and CCE_{Low} portfolios provide positive

abnormal returns that are significant at the 5% or 10% level, while the CCE_{High} portfolios consistently fail to generate significant abnormal returns. Our results indicate that a higher cut-off value reduces the magnitude and statistical significance of abnormal returns, ultimately converging towards the market return. The overall relationship also holds for the equally-weighted portfolios. The difference between the negative alphas for equally-weighted CCE_{High} and CCE_{Low} portfolios and the positive alphas for the value-weighted portfolios indicates that the relationship differs for large firms and the average firm in our sample.

Table III.4: **Climate Change Exposure Portfolios for Different Cut-Offs**. This table reports abnormal returns for multivariate factor regressions with factors from Carhart (1997) and Fama & French (2015). The regressions are run individually for each portfolio with monthly returns from 2008 to 2022. To test the effect of cut-off choice, we test multiple cut-offs between 10% and 50%. Portfolio returns are value-weighted on the left and equally-weighted on the right part of the table. Portfolio CCE_{High} contains the firms with the highest and CCE_{Low} those with the lowest CCE. $CCE_{Low-High}$ is a zero-cost long-short portfolio constructed by going long in the CCE_{Low} and shorting the CCE_{High} portfolio. Alphas are reported annualized. The coefficients are estimated by OLS regressions with Newey & West (1987) robust standard errors. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

	Value-Weighted					Equally-Weighted				
	10%	20%	30%	40%	50%	10%	20%	30%	40%	50%
Panel A: Raw CCE										
CCE_{Low}	0.032**	0.031**	0.029**	0.029**	0.027**	0.004	0.003	0.006	0.007	0.006
CCE_{High}	−0.017	−0.011	−0.005	−0.001	0.003	−0.041**	−0.032**	−0.030**	−0.023**	−0.019**
$CCE_{Low-High}$	0.048**	0.041**	0.034**	0.029**	0.025**	0.045**	0.034**	0.036**	0.030***	0.025**
Panel B: Industry-Neutral Allocation										
CCE_{Low}	0.030**	0.027**	0.023**	0.018**	0.017*	0.004	0.001	−0.001	−0.004	−0.005
CCE_{High}	−0.001	0.003	0.008	0.009	0.012	−0.029**	−0.022**	−0.014*	−0.013*	−0.008
$CCE_{Low-High}$	0.031*	0.024**	0.015*	0.009	0.006	0.032**	0.023**	0.014*	0.009	0.003
Panel C: Industry-Year Z-Scores										
CCE_{Low}	0.024*	0.021*	0.012	0.012	0.013*	0.008	0.005	−0.003	−0.005	−0.06
CCE_{High}	0.002	0.004	0.004	0.009	0.016*	−0.023*	−0.021**	−0.019**	−0.014	−0.007
$CCE_{Low-High}$	0.021	0.017	0.008	0.004	−0.004	0.031*	0.026**	0.016	0.009	0.001
Panel D: Sector-Year Z-Scores										
CCE_{Low}	0.012	0.014	0.012	0.011	0.012*	−0.008	−0.004	−0.005	−0.009	−0.006
CCE_{High}	−0.007	0.003	0.007	0.007	0.017*	−0.036***	−0.021**	−0.018**	−0.018**	−0.007
$CCE_{Low-High}$	0.019*	0.010	0.005	0.003	−0.004	0.028**	0.017**	0.013*	0.009	0.001

III.5.2 CCE Portfolios & Carbon Emissions

Since CCE captures the proportion of communication about climate change we test whether CCE is priced after controlling for carbon risk. Table III.5 presents the coefficients for portfolios formed on CCE as well as for portfolios formed on residuals that are not explained by carbon emissions, RES_CCE. To ensure comparability, we exclude observations with missing data for carbon emissions.

For the $CCE_{Low-High}$ portfolios in Table III.5 Panel A and C we observe positive abnormal returns that are significant at the 5% level. The significance disappears for the corresponding $RES\_CCE_{Low-High}$ portfolios in Panel B and D, indicating that the significant abnormal returns observed for the $CCE_{Low-High}$ portfolios may be falsely attributed to CCE, while potentially reflecting information about carbon emissions in the form of communication that is captured by CCE. Regardless of the portfolio allocation mechanism, we observe positive abnormal returns for both CCE_{Low} and RES_CCE_{Low} portfolios. This underscores the robustness of the positive abnormal returns from our base model in Table III.2. Further, the significant alphas indicate that the share of CCE after controlling for carbon emissions still provides price relevant information. Our results also hold for the equally-weighted portfolios in Table III.6.

Table III.5: **Climate Change Exposure Portfolios & Emission Residuals - Value-Weighted**. This table reports results for multivariate factor regressions with factors from Carhart (1997) and Fama & French (2015). The regressions are run individually for each portfolio with monthly returns from 2008 to 2022. Portfolio returns are value-weighted. Portfolio CCE_{High} is formed on the highest quintile of CCE and CCE_{Low} on the lowest. $CCE_{Low-High}$ is a zero-cost long-short portfolio constructed by going long in the lowest and shorting the highest quintile. Portfolios in panel A & C use CCE while portfolios in panel B & D use RES_CCE. Alphas are reported annualized. The coefficients are estimated by OLS regressions with Newey & West (1987) robust standard errors. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

	Alpha	MKT	SMB	HML	WML	RMW	CMA	R^2
Panel A: Simple Allocation - CCE								
CCE_{Low}	0.061***	0.988***	0.630***	0.222***	−0.061*	−0.268***	−0.105*	0.969
CCE_{High}	0.024*	1.019***	0.612***	0.265***	−0.090***	−0.048	0.157**	0.956
$CCE_{Low-High}$	0.038**	−0.031	0.018	−0.043	0.029	−0.220**	−0.262***	0.161
Panel B: Simple Allocation - RES_CCE								
RES_CCE_{Low}	0.044***	0.980***	0.549***	0.194***	−0.081***	−0.144**	−0.024	0.976
RES_CCE_{High}	0.028**	1.023***	0.669***	0.270***	−0.082***	−0.072	0.157**	0.960
$RES\_CCE_{Low-High}$	0.016	−0.043*	−0.120*	−0.076	0.002	−0.072	−0.181**	0.143
Panel C: Industry-Neutral Allocation - CCE								
CCE_{Low}	0.060***	1.005***	0.649***	0.233***	−0.078***	−0.215***	−0.005	0.978
CCE_{High}	0.035***	1.041***	0.649***	0.203***	−0.075***	−0.122**	0.057	0.979
$CCE_{Low-High}$	0.026**	−0.036	0.000	0.030	−0.003	−0.093	−0.062	0.066
Panel D: Industry-Neutral Allocation - RES_CCE								
RES_CCE_{Low}	0.042***	1.009***	0.539***	0.232***	−0.075***	−0.155**	0.023	0.977
RES_CCE_{High}	0.037***	1.040***	0.675***	0.195***	−0.078***	−0.131**	0.060	0.979
$RES\_CCE_{Low-High}$	0.005	−0.031	−0.136***	0.036	0.003	−0.024	−0.037	0.109

Table III.6: **Climate Change Exposure Portfolios & Emission Residuals - Equally-Weighted**. This table reports results for multivariate factor regressions with factors from Carhart (1997) and Fama & French (2015). The regressions are run individually for each portfolio with monthly returns from 2008 to 2022. Portfolio returns are equally-weighted. Portfolio CCE_{High} is formed on the highest quintile of CCE and CCE_{Low} on the lowest. $CCE_{Low-High}$ is a zero-cost long-short portfolio constructed by going long in the lowest and shorting the highest quintile. Portfolios in panel A & C use CCE while portfolios in panel B & D use RES_CCE. Alphas are reported annualized. The coefficients are estimated by OLS regressions with Newey & West (1987) robust standard errors. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

	Alpha	MKT	SMB	HML	WML	RMW	CMA	R^2
Panel A: Simple Allocation - CCE								
CCE_{Low}	0.063***	0.986***	0.654***	0.229***	−0.064*	−0.253***	−0.089	0.969
CCE_{High}	0.022*	1.024***	0.637***	0.271***	−0.097***	−0.055	0.148**	0.957
$CCE_{Low-High}$	0.041**	−0.038	0.017	−0.042	0.032	−0.197*	−0.237***	0.156
Panel B: Simple Allocation - RES_CCE								
RES_CCE_{Low}	0.048***	0.979***	0.583***	0.203***	−0.084***	−0.140**	−0.011	0.976
RES_CCE_{High}	0.026**	1.028***	0.694***	0.275***	−0.088***	−0.078	0.150**	0.962
$RES\_CCE_{Low-High}$	0.022	−0.049*	−0.112*	−0.073	0.004	−0.062	−0.162**	0.141
Panel C: Industry-Neutral Allocation - CCE								
CCE_{Low}	0.062***	1.005***	0.671***	0.241***	−0.082***	−0.203***	−0.000	0.977
CCE_{High}	0.032***	1.044***	0.673***	0.210***	−0.080***	−0.121**	0.058	0.979
$CCE_{Low-High}$	0.029**	−0.040	−0.001	0.032	−0.002	−0.082	−0.058	0.038
Panel D: Industry-Neutral Allocation - RES_CCE								
RES_CCE_{Low}	0.045***	1.009***	0.571***	0.239***	−0.079***	−0.148**	0.026	0.977
RES_CCE_{High}	0.034***	1.043***	0.697***	0.201***	−0.083***	−0.133**	0.060	0.980
$RES\_CCE_{Low-High}$	0.011	−0.035	−0.126***	0.037	0.004	−0.016	−0.034	0.105

Consequently, the CCE portfolio strategy does support a significant relationship between CCE and stock returns. We find significant abnormal returns for the $CCE_{Low-High}$ and CCE_{Low} portfolios for our six-factor model while the CCE_{High} portfolios themselves generate no significant positive abnormal returns. In addition, our results for RES_CCE indicate that abnormal returns may be misattributed to CCE, while in part reflecting carbon emissions.

III.5.3 Cross-Sectional Regressions

Since our analyses on the portfolio level only considers the stocks with the highest and lowest CCE (from each industry and sector), we also analyze the relationship for all firms in a panel structure.

Table III.7 presents the estimated coefficients of multiple fixed effects models from equation (3), where we use $CCE_{i,t-1}$, $CCE^{Risk}_{i,t-1}$, $CCE^{Pos}_{i,t-1}$ and $CCE^{Neg}_{i,t-1}$ as our independent variables. In column (1), we observe a positive relationship between CCE and stock returns that is significant at the 10% level, suggesting that a higher exposure to climate change is associated with higher stock returns. While $CCE^{Risk}_{i,t-1}$ in column (2) and $CCE^{Pos}_{i,t-1}$ in column (3) have no explanatory power, $CCE^{Neg}_{i,t-1}$ in column (4) has a significant effect on stock returns. The construction of $CCE^{Neg}_{i,t-1}$ (where lower values indicate a stronger negative associated exposure), allows us to investigate the risk-return relationship. Our findings indicate a positive risk-return relationship as investors may demand higher returns for holding stocks with greater exposure to negative climate change effects, possibly as compensation for the increased risk.

Table III.7: **Climate Change Exposure & Stock Returns**. This table presents regression coefficients for fixed effects models, with standard errors clustered at the firm-year level (in parentheses). The sample spans over the period of 2008 to 2022. The dependent variable for all models are stock returns. All regressions include a vector of control variables as well as year-month fixed effects. Columns (5) through (8) additionally include industry-fixed effects and columns (9) through (12) firm-fixed effects. Significance levels are denoted by ***, **, and * for 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$CCE_{i,t-1}$	0.999*				0.747***				3.118**			
	(0.464)				(0.258)				(1.348)			
$CCE^{Risk}_{i,t-1}$		8.994				−0.683				−2.295		
		(9.359)				(9.721)				(15.329)		
$CCE^{Pos}_{i,t-1}$			0.799				0.081				−0.200	
			(0.813)				(0.624)				(1.645)	
$CCE^{Neg}_{i,t-1}$				-4.550**				-4.124*				-7.191
				(2.131)				(1.961)				(5.806)
Year + Month Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No
Firm Fixed Effects	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	289,359	289,359	289,359	289,359	289,359	289,359	289,359	289,359	289,359	289,359	289,359	289,359
R-squared	0.286	0.286	0.286	0.287	0.287	0.287	0.287	0.287	0.315	0.314	0.314	0.315

Since Sautner et al. (2023*a*) find that the average CCE varies strongly across industries, we follow Bolton & Kacperczyk (2021) by adding industry fixed effects for columns (5) to (8). As a result, the positive effect of $CCE_{i,t-1}$ on stock returns increases from 10% to 1% statistical significance. This suggests that the impact of CCE on stock returns may be more industry-specific than initially indicated. While the significance level of $CCE^{Neg}_{i,t-1}$ decreases to the 10% level, $CCE^{Risk}_{i,t-1}$, and $CCE^{Pos}_{i,t-1}$ do not have statistically significant relationships with stock returns. We further extend our analysis by including firm fixed effects in columns (9) through (12) to control for firm-specific differences that are unrelated to CCE. Again, the positive effect of $CCE_{i,t-1}$ on stock returns remains significant in column (9) while $CCE^{Risk}_{i,t-1}$, and $CCE^{Pos}_{i,t-1}$ do not show statistical significance. However, $CCE^{Neg}_{i,t-1}$ loses it's significance, indicating that the effects of negative climate change exposure on stock returns is more heterogeneous at the firm level than at the industry level.

Further, we also remove the industries with the highest CCE level for further robustness. In Panel A of Table III.8, we exclude all utility firms from our sample as they have the highest average CCE. Compared to the base model from table III.7, we find a similar positive relationship between $CCE_{i,t-1}$ and stock returns that is significant at the 5% level for industry and firm fixed effects (columns (5) and (9)). This relationship holds also in Panel B of Table III.8 where we, additionally to utility firms, exclude basic material firms. The positive effect of $CCE_{i,t-1}$ on stock returns remains significant at the 5% level for industry fixed effects in column (5) and firm fixed effects in column (9).

Our results for $CCE^{Risk}_{i,t-1}$ and $CCE^{Pos}_{i,t-1}$ in Table III.8 are robust across the exclusion of both, utility and basic material firms, as we do not find a significant relationship like in the base model. While, the significance for $CCE^{Neg}_{i,t-1}$ in Panel A is the same as in the base model, the significance decreases in Panel B. The exclusion of high-emitting industries

such as utilities and basic materials weakens the effect of negative associated climate change exposure, suggesting that the initial significance for $CCE^{Neg}_{i,t-1}$ may be driven by these specific industries. Firms in these industries are more dependent on fossil fuels and thus vulnerable to climate change regulations and costs.

Table III.8: **Climate Change Exposure & Stock Returns: Industry Dependency**. This table presents regression coefficients for fixed effects models, with standard errors clustered at the firm-year level (in parentheses). The sample spans over the period of 2008 to 2022. Panel A contains coefficients for the sample excluding utility firms and panel B excluding utility and basic material firms. The dependent variable for all models are stock returns. All regressions include a vector of control variables as well as year-month fixed effects. Columns (5) through (8) additionally include industry-fixed effects and columns (9) through (12) firm-fixed effects. Significance levels are denoted by ***, **, and * for 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A: Ex Utilities												
$CCE_{i,t-1}$	0.820				0.837**				4.016**			
	(0.475)				(0.303)				(1.635)			
$CCE^{Risk}_{i,t-1}$		2.648				1.062				0.926		
		(10.987)				(12.581)				(19.934)		
$CCE^{Pos}_{i,t-1}$			0.128				0.033				−0.417	
			(0.864)				(0.724)				(2.106)	
$CCE^{Neg}_{i,t-1}$				-5.169**				-4.890*				-9.209
				(2.379)				(2.418)				(7.356)
Year + Month Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No
Firm Fixed Effects	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	281,011	281,011	281,011	281,011	281,011	281,011	281,011	281,011	281,011	281,011	281,011	281,011
R-squared	0.292	0.292	0.292	0.292	0.293	0.293	0.293	0.293	0.320	0.319	0.319	0.320
Panel B: Ex Utilities & Basic Materials												
$CCE_{i,t-1}$	0.789				0.807**				4.159**			
	(0.505)				(0.342)				(1.724)			
$CCE^{Risk}_{i,t-1}$		1.161				−0.559				−0.440		
		(11.732)				(13.448)				(21.346)		
$CCE^{Pos}_{i,t-1}$			0.033				−0.058				−0.613	
			(0.933)				(0.790)				(2.220)	
$CCE^{Neg}_{i,t-1}$				-5.032*				-4.775*				-9.739
				(2.530)				(2.551)				(7.876)
Year + Month Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No
Firm Fixed Effects	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	269,333	269,333	269,333	269,333	269,333	269,333	269,333	269,333	269,333	269,333	269,333	269,333
R-squared	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.292	0.319	0.319	0.319	0.319

Similar to the portfolio approach, we test whether CCE is priced after controlling for carbon risk. To do so, we replace CCE with RES_CCE and its sub-categories as the independent variable in our fixed effects models. Again, we ensure comparability, by excluding observations with missing carbon data. Our results in Panel A of Table III.9 show the same positive relationship between $CCE_{i,t-1}$ and stock returns. Further, the effect of $CCE^{Risk}_{i,t-1}$, $CCE^{Pos}_{i,t-1}$ and $CCE^{Neg}_{i,t-1}$ are similar in this restricted sample. Compared to the results for RES_CCE in Panel B we observe a systematic difference. The significance for $RES\_CCE_{i,t-1}$ diapers in columns (1) and (5) and weakens in column (9). Similar, it disappears for $RES\_CCE^{Neg}_{i,t-1}$ in column (4) but increases for firm fixed effects in column (12). Our results indicate that the relationship with excess returns may be misattributed to CCE, while in part reflecting carbon emissions.

Table III.9: **Climate Change Exposure & Stock Returns: Residual CCE**. This table presents regression coefficients for fixed effects models, with standard errors clustered at the firm-year level (in parentheses). The sample spans over the period of 2008 to 2022. Panel A contains coefficients for CCE and panel B for RES_CCE. The dependent variable for all models are stock returns. All regressions include a vector of control variables as well as year-month fixed effects. Columns (5) through (8) additionally include industry-fixed effects and columns (9) through (12) firm-fixed effects. Significance levels are denoted by ***, **, and * for 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A: Climate Change Exposure												
$CCE_{i,t-1}$	0.818*				0.764**				3.237**			
	(0.424)				(0.257)				(1.435)			
$CCE^{Risk}_{i,t-1}$		5.184				−1.326				−5.050		
		(8.168)				(8.534)				(15.913)		
$CCE^{Pos}_{i,t-1}$			0.942				0.606				0.828	
			(0.840)				(0.701)				(1.086)	
$CCE^{Neg}_{i,t-1}$				−3.994*				−3.236				−1.899
				(2.056)				(2.130)				(5.981)
Year + Month Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No
Firm Fixed Effects	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	230,022	230,022	230,022	230,022	230,022	230,022	230,022	230,022	230,022	230,022	230,022	230,022
R-squared	0.297	0.296	0.297	0.297	0.298	0.298	0.298	0.298	0.319	0.318	0.318	0.318
Panel B: Residual of Climate Change Exposure												
$RES\_CCE_{i,t-1}$	0.333				0.088				1.944*			
	(0.542)				(0.673)				(0.921)			
$RES\_CCE^{Risk}_{i,t-1}$		6.982				1.166				8.879		
		(8.092)				(7.654)				(11.764)		
$RES\_CCE^{Pos}_{i,t-1}$			0.219				−0.168				0.268	
			(0.752)				(0.754)				(1.010)	
$RES\_CCE^{Neg}_{i,t-1}$				−2.008				−0.963				−8.806**
				(2.888)				(3.345)				(3.341)
Year + Month Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No
Firm Fixed Effects	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	230,022	230,022	230,022	230,022	230,022	230,022	230,022	230,022	230,022	230,022	230,022	230,022
R-squared	0.296	0.296	0.296	0.296	0.297	0.297	0.297	0.297	0.321	0.321	0.321	0.321

In summary, our analysis reveals a significant effect of $CCE_{i,t-1}$ on stock returns when examined in a panel structure. However, its sub-categories $CCE^{Risk}_{i,t-1}$ and $CCE^{Pos}_{i,t-1}$ show no explanatory power and the effect of $CCE^{Neg}_{i,t-1}$ seems to be driven by some industries. Our results are not robust after accounting for carbon emissions. These findings contribute to a broader understanding of how climate change exposure factors into stock returns, and highlight the complex and evolving nature of this relationship.

III.6 Conclusion

In this paper, we study the relationship between climate change exposure and stock returns using the *CCE* measure proposed by Sautner et al. (2023*a*). While previous studies document a *CCE* risk premium (Sautner et al. (2023*b*)) and examine the hedging properties of climate change exposure (Berkman et al. (2021)), this paper is the first comprehensive investigation of the direct impact of climate change exposure on stock returns. We investigate this relationship at both the portfolio and firm level for a sample of more than 7,000 U.S. firms between 2008 and 2022.

At the portfolio level, we find significant abnormal returns for *CCE* long-short portfolios in a multi-factor framework with common risk factors from Fama & French (2015) and Carhart (1997). These findings are robust to various allocation and weighting approaches, as well as to different cut-off values. Like Sautner et al. (2023*b*), who observe a positive risk premium prior to 2008 in their S&P 500 sample, we find a stronger relationship for our first sub-sample. Since *CCE* captures the communication about climate change, we control in our analysis for carbon emissions. Our results indicate that the variation of *CCE* that is not explained by carbon emission produces lower abnormal returns compared to the pure *CCE*. These observations question the existence of a

relationship between CCE and stock returns at the portfolio level.

Following Bolton & Kacperczyk (2021), we analyze the effect of CCE on stock returns at the firm level, using fixed effects regressions. We find a significant positive relationship between the lagged climate change exposure and stock returns that is also robust when we exclude the industries with the highest CCE. While climate change exposure associated with risk or a positive sentiment has no explanatory power for stock returns, our findings indicate a mixed role of negative associated climate change exposure. Our results indicate a positive risk-return relationship. However, after controlling for carbon emissions the significance weakens, indicating that excess returns may be misattributed to CCE, while in part reflecting carbon emissions.

In summary, we find a positive relationship between climate change exposure and stock returns. This relationship weakens after we control for carbon emission, indicating that carbon emissions factor into CCE as an topic of discussion. Differences between the portfolio and firm-level analysis may be due to the construction of our portfolios, which by design only include the 20% of observations with the highest and lowest CCE values each year. Our findings for the portfolio level analysis and the firm-level analysis indicates a noteworthy association between CCE and stock returns. These findings imply that even while a trading strategy based solely on CCE may not be profitable, incorporating climate change considerations into portfolio construction is crucial, as CCE can significantly influence the stock returns of individual firms.

Chapter IV

Raising their Voices: Soft Shareholder Engagement on ESG at Annual General Meetings

Coauthors:

Alix Auzepy

Christina E. Bannier

Relative share:

47.5%

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Raising their Voices: Soft Shareholder Engagement on ESG at Annual General Meetings

Abstract

The right to speak and ask questions at annual general meetings (AGMs) represents one of the few avenues for shareholders to interact directly and publicly with the firm's management. We examine the tone and content of shareholder communication during AGMs with a focus on environmental, social, and governance (ESG) issues. Using AGM transcripts of U.S. companies between 2003 and 2022, we find that institutional shareholders are more vocal about sustainability issues than their non-institutional counterparts. Shareholders are especially vocal and critical at AGMs of firms with poor sustainability performance. The negative tone is associated with lower approval rates for management and director proposals, but not with higher approval rates for ESG proposals, illustrating that shareholders "walk the talk" to varying degrees. Overall, shareholder soft engagement at AGMs complements voting as part of a broader spectrum of shareholder activism.

Keywords: shareholder engagement, annual general meeting, ESG, textual analysis

JEL-Codes: G03, G23, G34, G39

Declarations of interest: none

IV.1 Introduction

Annual general shareholder meetings (AGMs) at publicly listed companies are a key corporate governance ritual. Beyond voting on specific agenda items, AGMs provide shareholders with a platform to interact with management, discuss the company's past performance and future strategy, ask questions and express their views — essentially exercising their "voice" (Cuñat et al. 2015). Although AGMs have been criticized as overly scripted events that simply rehash "old news" to shareholders (Short & Keasey 1999), they offer a distinct advantage when used actively: they grant all shareholders, regardless of the size of their ownership stake, the right to engage in a public, direct, individual and therefore comparatively nuanced dialogue with the firm's management (Monks et al. 2004).

Unlike other common engagement mechanisms, such as filing proposals or engaging in private negotiations — options generally only accessible to large investors (Gillan & Starks 1998, Denes et al. 2015, McCahery et al. 2016, Hoepner et al. 2023) — the AGM dialogue stands out as a particularly cost-effective engagement option for shareholders seeking to voice their concerns and press for corporate reform (Van der Elst 2011).[1] This form of communication is not only public and direct, but also unrestricted by specific time constraints, making it attractive for a wide range of shareholders. Different groups such as trade unions, religious organizations, non-governmental organizations (NGOs), as well as non-institutional shareholders, including employees and small in-

[1]For example, to file a proposal, shareholders are required to own at least $2000 US in market value, or 1%, of the company's securities for at least one year. In addition, shareholders may submit only one proposal, which has to be worded as a request or a recommendation, and may only address specific topics (O'Rourke 2003). Thus, management often excludes proposals by citing limitations on permissible topics. In addition, non-institutional shareholders, who typically have fewer resources, may face the added challenge of hiring legal expertise or mobilizing other shareholders (Norli et al. 2014, Flammer 2021).

dividual shareholders, have increasingly embraced this "soft" form of engagement to "look managers and directors in the eye" and raise key concerns during AGMs. With shareholders able to submit questions remotely (e.g., via a chat), this trend has even persisted with the rise of digital and hybrid AGMs (Gao et al. 2020, Brochet et al. 2023).

Since statements made during an AGM are not only witnessed by other shareholders, but may also attract the attention of the financial media, this form of public engagement allows the views expressed to quickly gain wider visibility (Dimitrov & Jain 2011). In addition, if management fails to adequately address the concerns raised, media reports may generate widespread discussions that could harm the firm's reputation (O'Rourke 2003, Cranenburgh et al. 2014, Gomez-Carrasco & Michelon 2017, Benton & You 2018). As a result, the possibility of facing sharp criticism from shareholders during AGMs represents a significant concern for managers (Cepuk 2007).

The AGM dialogue gains particular relevance when considering that shareholders' expectations have evolved considerably in recent years, moving beyond a sole focus on financial aspects to also encompass broader sustainability considerations. This shift is reflected in the growing number of sustainability-related proposals brought to a vote at AGMs, underscoring investors' growing efforts to push environmental and social issues higher up the corporate agenda (Flammer 2021, Grewal et al. 2016, Krueger et al. 2020, Hoepner et al. 2023). However, since shareholder proposals are non-binding and unlikely to be implemented (Levit & Malenko 2011), their impact is often limited. Furthermore, these proposals, along with other forms of investor engagement, predominantly reflect the interests of large and sophisticated investors (Brochet et al. 2023, Barko et al. 2021, Flammer 2021, Hoepner et al. 2023). As a result, shareholders with more limited resources may be increasingly turning to the AGM dialogue as a means of holding management accountable for their track record on sustainability issues. For

example, a study on AGMs of Dutch listed companies found that sustainability-related questions and comments increased from about 2% in 2004 to over 20% in 2017 Lafarre & Van der Elst (2018). In this paper, we provide evidence that the AGM dialogue has emerged as an important channel for shareholders to engage on these issues.

While extensive research has examined various facets of shareholder engagement — such as the activities of large investors with portfolio companies, the submission of shareholder proposals, and voting behavior (see e.g., Cuñat et al. 2015, Aggarwal et al. 2019, Dikolli et al. 2022, Hoepner et al. 2023) — relatively little attention has been given to the practice of shareholders voicing their concerns during AGMs as another form of engagement. In this paper, we use the term of "soft engagement" to describe the act by shareholders of making statements (e.g., by asking questions or sharing a comment) during AGMs. Our focus is specifically on shareholder soft engagement related to environmental, social and governance (ESG) issues. Motivated by the growing importance of sustainability issues for shareholders, this paper aims to provide a comprehensive and detailed analysis of the AGM as a platform for shareholder engagement and interaction with company management. As sustainability issues, including those related to climate change, grow in importance and complexity, understanding shareholder perspectives on these issues also becomes increasingly critical. As such, AGMs serve as a unique forum where diverse shareholder views are expressed and represented. Furthermore, considering the recent politicization of ESG topics in the United States (**?**), the U.S. context provides a particularly compelling and relevant setting for examining these increasingly polarizing issues.

In this paper, we analyze three key aspects. The first focuses on shareholders who raise their voices on ESG issues, and their defining characteristics. We examine the types of shareholders engaging in such AGM dialogue, the range of sustainability top-

ics they address (i.e., their "ESG-related communication"), and the extent of this ESG-related communication. In particular, we document how different types of institutional and non-institutional shareholders actively engage on these issues at the AGM. In addition, using data related to the geographical location of the AGM participants, we assess the role of the "political environment" in this context. For the purposes of this study, we define the political environment as the partisan orientation of the U.S. states in which the shareholders reside or are headquartered. We categorize it as Republican-leaning or Democratic-leaning based on voting patterns in presidential elections.

The second aspect focuses on the firms as "targets" of shareholder soft engagement on ESG issues. In particular, we analyze how such engagement relates to the sustainability performance of the firms holding their AGMs. Prior studies have shown that AGMs generate strong attention among shareholders and are particularly contentious events when investors are dissatisfied with the firm's financial performance (Dimitrov & Jain 2011). For example, critical questions about executive compensation are more likely to be raised at shareholder meetings following a poor performance of the share price (Cepuk 2007). We assess whether a comparable dynamic may be observed for corporate ESG performance. In particular, we assess whether shareholders are more likely to address ESG issues in their AGM statements when a firm's ESG performance is weaker, as measured by its ESG rating. Furthermore, we analyze the tone of shareholder statements, focusing on the negativity of their language, and examine whether such tone also relates to the ESG performance. The underlying intuition is that shareholders may be particularly attentive to sustainability issues if they consider managerial performance in this area to be lacking. In addition, they may also express their discontent at the AGMs by raising concerns with a negative tone.

The third aspect pertains to AGM proposals. Beyond the idea of "one share, one

voice", AGMs play a critical role in enabling shareholders to vote on various agenda items (i.e, "one share, one vote"). These voting items may be initiated by management (management-sponsored proposals) or by shareholders themselves (shareholder-sponsored proposals).[2]. We therefore examine the relationship between shareholder soft engagement and voting behavior with respect to both management-sponsored and shareholder-sponsored proposals. The first underlying premise is that shareholder soft engagement at AGMs may serve as a "barometer" of broader shareholder sentiment, reflecting either approval or discontent with management's performance. As a result, there may be a relationship between such sentiment, as reflected in shareholder tone, and voting behavior. The second premise is that AGMs may serve as a platform for specific shareholder groups to mobilize support for their proposals, particularly those related to ESG issues. By vocally expressing their views at AGMs, shareholders may seek to rally their peers and garner support for their cause. We examine both premises.

To address these questions, we study a large sample of 1,813 AGM transcripts from U.S. firms over the time period 2003 to 2022. We explicitly focus on statements made by shareholders during these meetings. In our analyses, we employ a textual analysis approach to examine the content and tone of shareholder communication (Hillert et al. 2014, Tetlock 2007, Price et al. 2012). We draw on two established dictionaries: the dictionary of Loughran and McDonald (Loughran & McDonald 2011) and the Harvard IV-4 psychosocial dictionary (Tetlock 2007), which are designed to capture negative tone in a financial and sociological context, respectively.[3] In addition, we also add to the literature by developing a dictionary designed to capture the environmental, social

[2]Depending on the format of the AGM, shareholders may submit their vote at the meeting in person or online. Many firms also provide shareholders with the possibility to submit their vote in advance of the AGM, e.g., by mail. Shareholders who cannot attend the AGM can appoint a proxy, i.e., a representative or another individual to vote on their behalf.

[3]In the following, we refer to these dictionaries as "LMD dictionary" and "Harvard-IV dictionary".

and governance words in shareholder communication. Based on this newly created dictionary, we calculate the share of words in shareholder AGM statements that pertain to environmental, social and governance topics. We also classify the shareholder statements according to ten fine-grained categories of institutional and non-institutional shareholders to better capture nuances in shareholder characteristics and preferences. Our classification comprises the following ten categories: individual shareholder, (former) employee, trade union, asset manager, public asset manager, religious asset manager, analyst, NGO, religious organization, proxy.[4]

Our analyses deliver the following sets of results. First, our findings indicate that ESG topics are an integral part of shareholder soft engagement at AGMs, with all categories of shareholders in our sample addressing ESG-related issues. At the same time, we also find that these categories of shareholders attach varying degrees of importance to different ESG issues according to their preferences. For example, religious asset managers[5] and NGOs are among the shareholder types that contribute most to the share of environmental words relative to individual shareholders. This is in line with earlier studies underlying that these shareholder categories were among the first investors to integrate sustainability considerations into their investment process and are nowadays important actors in the field of responsible investments (see e.g., Gillan & Starks 1998, Hong & Kacperczyk 2009, Louche et al. 2012). Furthermore, we find that trade unions are comparatively more vocal about social issues, in line with the notion that trade unions represent the collective interests of workers and employees, and resort to

[4]We provide a detailed description of the various shareholder categories assessed in our study in Section IV.2.2 of this paper. Examples of statements by each shareholder category can be found in Appendix IV.8.

[5]For example, we make a distinction between different types of institutional shareholders, including "religious" asset managers, such as church pension funds and faith-based investment firms, and "public" asset managers, including public sector funds and public pension funds like the Illinois State Board of Investment.

shareholder engagement to safeguard their interests (see e.g., Marens 2004, Anderson et al. 2007, Sjöström 2009).

Considering the distinction between institutional and non-institutional shareholders, we find that institutional shareholders (especially asset managers, religious asset managers, and public-sector investors) are more vocal about ESG issues than small, non-institutional shareholders. Therefore, while AGMs provide a uniquely democratic platform where even the smallest shareholders can participate, our results suggest that non-institutional shareholders do not use this forum as prominently as institutional shareholders to advocate for ESG issues. This relationship is also partly shaped by the political orientation of the U.S. states where shareholders are geographically located. Individual shareholders in Republican-leaning states are even less likely to address ESG issues at AGMs compared to those in Democratic-leaning states. For institutional shareholders, the influence of the political environment is less pronounced, though. Overall, we find that institutional investors actively engage on ESG issues in their AGM statements, and this engagement is not significantly constrained when their headquarters are located in Republican-leaning states.

Second, our analysis reveals a negative relationship between a firm's ESG performance and the prominence of ESG-related words in shareholder communication during AGMs. Specifically, firms with a higher ESG performance, as measured by their industry-adjusted ESG ratings, attract a lower proportion of shareholder statements addressing ESG issues. This relationship is most pronounced when examining the overall ESG ratings but also holds, albeit to a lesser extent, when considering the individual pillar scores. For example, shareholders engage less on social issues at the AGMs of firms with a comparatively higher social performance. Likewise, we find some evidence that firms with stronger governance performance see fewer shareholder statements address-

ing governance-related concerns. As a next step, we look more closely at the tone of shareholder statements. Similar to the relationship between ESG performance and ESG-related shareholder communication, we find that stronger overall ESG performance is associated with a less negative tone of shareholder statements, as captured by the LMD and Harvard-IV dictionaries.

Third, we show that shareholders only partly "walk the talk" when it comes to proposals. On the one hand, we find that a more negative tone in their statements is associated with lower approval rates for management-sponsored proposals. Furthermore, we also find that this relationship is particularly strong for management proposals related to director elections or re-elections. This supports the idea that shareholder tone at AGMs serves as a barometer of broader shareholder sentiment. On the other hand, we do not find evidence that a more negative tone and a higher proportion of ESG-related communication during AGMs are associated with an increased support for ESG proposals. Thus, while some shareholders who voice ESG concerns during AGMs may be more likely to vote in favor of such proposals (e.g., Dikolli et al. (2022)), this verbal engagement does not appear to have a strong mobilizing effect and translate into broader support for other shareholder-sponsored proposals as another form of shareholder advocacy.

In sum, our paper is one of the first to comprehensively examine the role of shareholders in shaping the AGM dialogue with respect to sustainability issues. In doing so, we contribute to several research streams. First, we add to the research on direct interaction settings between management and shareholders. Previous studies have focused on settings such as investor conferences (Zhang 2022), earnings conference calls (Matsumoto et al. 2011, Blau et al. 2015, Dzieliński et al. 2022), and internal investor relations functions (Chapman et al. 2022). Unlike AGMs, these forums typically cater to

sophisticated investors (Brochet et al. 2023). In contrast, AGMs, which offer a broader and more democratic platform for interaction, have received comparatively less scholarly attention. Notable exceptions include Brochet et al. (2023) and Gao et al. (2020), who explore the determinants and outcomes of virtual shareholder meetings, and Dimitrov & Jain (2011), who highlight how managers attempt to mitigate shareholder pressure by reporting favorable news ahead of shareholder meetings. The authors conclude that AGMs are an "important corporate governance mechanism, so much so that managers attempt to influence shareholders" (p. 1198, Dimitrov & Jain 2011). In addition, Lafarre & Van der Elst (2018) document a substantial increase in the share of sustainability-related questions asked by institutional shareholders of Dutch listed companies. Our findings therefore contribute to the limited body of research on AGMs by examining both the tone and ESG-related content of shareholder communication during these meetings.

Second, our study contributes to the growing body of literature on shareholder engagement and sustainability issues. Consistent with Flammer (2021), our findings highlight that shareholders are not a monolithic group, but exhibit heterogeneity in their objectives and preferences. AGMs serve as an important forum where various types of shareholders, each with their own history of ESG engagement, can express their views. For example, endowment funds of religious organizations and political groups were historically among the first to use the shareholder proposal process to address social and environmental concerns (Gillan & Starks 1998). By the mid-1980s, public pension funds and individual activist shareholders, often referred to as "corporate gadflies", also became prominent filers of shareholder resolutions at AGMs (Gillan & Starks 1998, Gantchev & Giannetti 2020, Wang & Mao 2015). Furthermore, NGOs began purchasing shares to initiate CSR-focused lobbying campaigns and disrupt shareholder meet-

ings (Subramanian 2020). More recently, a growing number of more traditional institutional investors have joined initiatives like the Principles for Responsible Investment (PRI) to advocate for the inclusion of social and environmental factors in investment strategies (Flammer 2021). Our study therefore provides valuable insights into the soft engagement pursued by these diverse actors via the AGM dialogue.

In addition, our paper sheds light on the role of shareholders as "norm promoters", who leverage their position of ownership to drive change — not only in the traditional corporate governance sense, but also increasingly in terms of corporate social responsibility (Sjöström 2009). This form of "norm entrepreneurship" is increasingly supported by both financial and non-financial motivations (see e.g., Sjöström 2009, Renneboog et al. 2008, Riedl & Smeets 2017). Denes et al. (2015) note that shareholder activism is motivated by attempts to improve the financial performance of poorly performing firms as reflected in stock returns, return to sales and market to book ratio. More recently, a survey of institutional investors conducted by Krueger et al. (2020) showed that drivers of shareholder engagement on environmental issues are now also linked to factors such as: the need to protect corporate reputation, fulfill legal and fiduciary responsibilities, and adhere to moral or ethical principles. Our study builds on and extends this empirical evidence by exploring the extent to which shareholders act as agents of change, particularly in contexts where managerial performance in ESG areas falls short.

The remainder of this paper proceeds as follows: Section IV.2 describes our sample and the variables construction. Section IV.3 outlines our methodology. Section IV.4 presents and discusses the findings, while Section IV.5 offers concluding remarks and implications.

IV.2 Data and summary statistics

IV.2.1 AGM transcripts and shareholder statements

We obtain a total of 3,553 AGM transcripts available for U.S. firms from the Refinitiv database. These firms were listed on the NYSE or NASDAQ at least once between 2003 and 2022.[6] The AGM transcripts are in a text file ("txt") format and capture the verbatim of speeches and presentations delivered by the board of directors. They also contain the statements made by the shareholders, including those made during the questions-and-answers sessions, and therefore provide a textual record of the interactions between management and shareholders. In addition, the transcripts typically provide a short overview of the participants who spoke during the meetings. This information consists of the names of the directors and the names of the shareholders who spoke, together with their affiliations. Some shareholders, however, are listed as "unidentified participants".

Since AGM transcripts are not mandatory, there is also no clear-cut content and format of textual data that we can automatically extract for our empirical analysis. As we are only interested in shareholder communication at AGMs, we manually remove all statements made by company representatives (e.g., board members) and make sure to keep only the questions and comments made by shareholders in the text files. Shareholders can participate in AGMs in various ways, and their interventions are not limited to brief questions; they may also include affirmative statements, such as suggestions, or comments on issues raised by the board of directors (Lafarre & Van der Elst 2018).

[6]Refinitiv only began collecting AGM transcripts systematically in 2017 (including retroactively), which is why the sample size is smaller for the earlier years in our sample period. In the U.S., AGMs are governed by state law (Brochet et al. 2023). While listed firms are required to hold AGMs, there is no state law that mandates the provision of a written, audio, or video record of these meetings. However, the bylaws or internal policies of individual firms may include specific requirements regarding the recording and distribution of AGM proceedings (Brochet et al. 2023).

In addition, as shareholders have the opportunity to submit written questions prior to the meetings, it is common practice for board members to respond to these questions by quoting and elaborating on them directly during the AGMs. These questions are also included in our analyses as they may reflect important concerns of shareholders. We assume that board members do not materially change the wording of these questions by repeating them. For example, we classified the following pre-submitted question as shareholder statement, which was read by the director of Investor Relations of PNC Financial Group during an AGM in 2021: "*We received a question asking if we are considering a stock split, why or why not? And if yes, what timing or conditions would you like to see before taking that action?*". Further examples of shareholder statements are provided in Appendix IV.7. Furthermore, we drop all transcripts that do not comprise any comments, remarks or questions from shareholders. This leaves us with a sample of 1,978 transcripts covering 650 unique firms.[7]

Table IV.1 shows the frequency of transcripts by year. We note that the largest share of transcripts in our sample comes from the year 2020. Specifically, AGM transcripts from 2020 constitute 19.77% of the total sample, representing 858 files, 391 of which include shareholder statements. Interestingly, we also find that more recent transcripts tend to have a lower average word count. This may be related to the COVID-19 pandemic, which prompted many firms to switch to virtual AGM formats and initiated a widespread move towards holding AGMs in virtual or hybrid formats in subsequent years (Brochet et al. 2023). In general, virtual AGMs are substantially shorter than in-person meetings, with business presentations being shorter and more generic (Brochet

[7]This sample size aligns closely with prior literature. For example, Brochet et al. (2023) analyze a sample of 1,432 virtual or hybrid AGMs held by 426 unique firms between 2000 ad February 2020.

et al. 2023). However, in the context of our analysis, we did not differentiate between in-person meetings and virtual meetings as both formats represent an opportunity for shareholders to ask questions (Brochet et al. 2023, Gao et al. 2020).

Table IV.1: **Frequency by year**. This table presents the frequency of AGM transcripts by year and the mean of total words of transcripts per year in our sample.

Frequency by year				
Year	N transcripts	N transcripts with shareholder statements	% of sample	Mean total words
2003	5	4	0.20%	1031.000
2004	34	29	1.47%	1255.413
2005	46	42	2.12%	1153.381
2006	75	59	2.98%	1045.016
2007	91	67	3.39%	1151.731
2008	98	72	3.64%	1127.708
2009	93	75	3.79%	1792.053
2010	89	68	3.44%	1692.661
2011	76	56	2.83%	1777.321
2012	89	68	3.44%	1295.676
2013	76	53	2.68%	1419.754
2014	70	51	2.58%	1440.039
2015	63	47	2.38%	1572.319
2016	56	39	1.97%	1352.794
2017	217	137	6.93%	1094.503
2018	263	154	7.79%	946.649
2019	278	166	8.39%	970.656
2020	858	391	19.77%	356.744
2021	739	343	17.34%	421.251
2022	216	57	2.88%	377.110
Total	3,553	1,978	100%	

Table IV.2 provides the industry breakdown of the firms in our sample for which we have AGM transcripts, based on their GICS classification. We observe that the Financials sector accounts for the largest share of AGM transcripts (17.95%), followed by the Health Care sector (14.41%), Consumer Discretionary (12.99%), and Industrials (12.08%).

Table IV.2: **Frequency by sector**. This table presents the frequency of AGM transcripts to GICS classification sector codes.

Frequency by sector		
GICS Sector	N	%
Communication Services	108	5.46%
Consumer Discretionary	257	12.99%
Consumer Staples	200	10.11%
Energy	66	3.34%
Financials	355	17.95%
Health Care	285	14.41%
Industrials	239	12.08%
Information Technology	200	10.11%
Materials	92	4.65%
Real Estate	59	2.98%
Utilities	117	5.92%
Total	1,978	100%

IV.2.2 Shareholder types and geographical location

A firm's shareholder base is composed of institutional and non-institutional investors, with considerable differences in terms of their resources, preferences and objectives (Flammer 2021). To account for this heterogeneity in a more granular way, we manually classify each of the shareholder statements in our sample according to a predefined shareholder category. To do so, we employ categories that appear in prior literature on shareholder activism. With respect to institutional investors, Flammer (2021) distinguish between public pension funds, socially responsible investment (SRI) funds, special interest investors, and asset management funds. In the case of non-institutional investors, Flammer (2021) identify individual, union, religious, and other shareholders. In their analysis of shareholder-sponsored proposals, Grewal et al. (2016) use the categories individuals, public pension funds, religious groups, SRI funds, special interest groups, union funds, and coalitions. Benton & You (2018) differentiate between investment funds (e.g., mutual funds), public pensions (e.g., California Public Employees Re-

tirement System), religious and SRI funds, special interest groups, and union-affiliated pension funds. Di Giuli et al. (2023) examine union-affiliated sponsors, such as private-sector labor unions and retiree associations, and the role of union-sponsored shareholder proposals. Agrawal (2011) and Grant (2021) study how unions, through their pension funds, use their position as shareholders to influence corporate behavior. Finally, Guay et al. (2004) discuss the role of NGOs as institutional investors and their influence in shaping socially responsible investing.

We extend the literature by introducing additional, fine-grained shareholder categories identified in our sample. Since shareholders typically disclose their identity prior to asking a question or making a comment, we determine the shareholder category based on the affiliation and the content of the statement. Overall, our classification comprises the following ten categories of shareholders: individual shareholder, (former) employee[8], trade union, asset manager, public asset manager, religious asset manager, analyst, NGO, religious organization, proxy. Appendix IV.7 provides an overview and examples for each shareholder type. Furthermore, we also add the category "none" for shareholder statements that cannot be classified due to a lack of information.

Our analysis encompasses a detailed classification of institutional and non- institutional shareholders. Among the institutional shareholders, we classify portfolio managers representing asset management funds, hedge funds, and mutual funds, i.e., entities typically holding large stakes in portfolio companies, as "asset managers". Large public-sector investors, such as public pension funds (e.g., the Illinois State Board of Investment), are categorized as "public asset managers", while church pension funds and faith-based investment firms fall under the category of "religious asset managers". AGM participants from equity research divisions and investment banking institutions

[8]This category includes current and former employees, as well as company retirees

fall under the category of "analysts". AGM participants from trade unions (e.g., AFL-CIO) and union affiliated pension funds (e.g., United Brotherhood of Carpenters Pension Fund) are classified as "trade unions". In order to account for further types of shareholders, we classify community-based associations, think tanks and foundations as "NGOs". Furthermore, we dedicate a specific category to "religious organizations" for churches and church representatives. Finally, we categorize shareholder advocacy groups and proxy advisory firms as "proxy".

In addition to institutional shareholders, our analysis considers non-institutional AGM participants. Small retail investors are classified as "individual shareholders". Since employees may own shares of their employer's stock and possess both shareholder and employee rights (e.g., retirement savings plan offered by employers), we introduce the category "(former) employees". The term "former" is included in parentheses to reflect the inclusion of both current employees and former employees, such as retirees, ex-employees, and representatives of retiree associations. Overall, we expect these various categories of institutional and non-institutional shareholders to have contrasted sustainability preferences reflected in their AGM statements.

We categorize each shareholder statement found in an AGM transcript according to the previously outlined shareholder categories. A statement is defined as a segment of text delineated as such within a transcript. To illustrate, let us consider an excerpt from a 2004 AGM transcript of The Walt Disney Company. In this example, the transcript contains a statement by an individual named Portia Spear. The transcript includes her name and designation (i.e., Portia Spear, Shareholder), followed by her statement, which consists of several sentences (e.g., "*Mr. Chairman, members of the Board and stockholders, my name is Portia Spear, and I am here today on behalf of the New York City Pension System to present the fund's resolution on the implementation of Disney's human rights*

labor standards in China. Over the last several years, reports of human rights abuses in the overseas subsidiaries and suppliers of some U.S. corporations have led to increased public awareness of issues such as child labor, sweatshop conditions, and the denial of labor rights in U.S. corporate overseas operations (...)." The statement concludes when the next speaker begins — in this case, Michael Eisner, Chairman and Chief Executive Officer, who is also identified accordingly in the transcript. In this example, we assign the category "public asset manager" to the statement made by Portia Spear. As can be seen from this example, a statement can consist of several sentences.

In addition to the above, we also manually gather and compile data on the geographical locations of the various shareholders in our sample. Shareholders, particularly non-institutional ones, sometimes disclose their place of residence when introducing themselves at the beginning of a statement. For example: "*Hi, I'm Jill Strew from Bellevue, Kentucky and I want to thank you for the ability to save money on gas. I really like it. And I'm wondering when the Bellevue Market Place Kroger gas pumps will be open. We've been looking at empty pumps for about a year. So if anybody could answer that, I'd appreciate it. Thank you.*" When such information is provided, we document the city and state, incorporating it into our categorization of statements. Unless stated otherwise, we assume that the shareholder resides in the U.S. In the example above, the statement is classified under the shareholder category "individual shareholder" and is tagged with the city "Bellevue", the state "Kentucky" and the country "United States".

For institutional shareholders, such as asset management firms and their asset managers participating in AGMs, we collect data on the location of their company headquarters, as their representatives on AGMs rarely disclose their personal residence.[9] How-

[9]For consistency, we focus on the location of the asset management firm as the shareholder, rather than the company representative, who may not be a shareholder themselves.

ever, it can generally be assumed that asset managers and analysts spend significant time at their headquarters or work near their firms' headquarters (Di Giuli & Kostovetsky 2014). Furthermore, their statements are likely to be aligned with the firms' internal corporate position, justifying our choice to use these locations.

IV.2.3 Measures of negative tone and ESG communication

We measure the tone of shareholder communication by applying the "bag of words" method, a widely adopted approach for textual analysis in financial research (Tetlock 2007, Tetlock et al. 2008, Loughran & McDonald 2011, 2015, Hillert et al. 2023). The "bag of words" method collects words that express negativity or positivity, respectively, compiles them into a corresponding dictionary and uses this dictionary to systematically measure the tone of a text (Hillert et al. 2023). For our analysis, we focus specifically on the negative tone, as prior research indicates that negative sentiment is easier to isolate and less ambiguous than positive statements (see e.g., Loughran & McDonald (2015)).

In terms of negative word lists, we rely on two widely accepted dictionaries: the Loughran and McDonald (LMD) negativity dictionary developed by Loughran & McDonald (2011) and the Harvard IV-4 psycho-social dictionary by Tetlock (2007). While the first was developed to capture the sentiment in financial texts or communication, the Harvard IV-4 dictionary was originally designed for psychological and sociological contexts (Yang et al. 2019, Hillert et al. 2023). The use of the Harvard IV-4 dictionary is particularly relevant in our context, as some shareholder groups — such as nongovernmental organizations or religious organizations — are less likely to use financial jargon in their statements compared to asset managers or financial analysts. These shareholders may rely on everyday language rather than technical terminology, making the dictionary

by Loughran & McDonald (2011) potentially inadequate or insufficient for fully capturing the tone in their statements.

To refine our analyses, we adopt a term frequency and inverse document frequency adjusted negativity measure, denoted as $LMD^{-}_{tf.idf}$ and $HAR^{-}_{tf.idf}$, following the methodology in Loughran & McDonald (2011) and Hillert et al. (2023). This approach assigns higher weights to words that appear frequently within a specific document (term frequency, TF) but are relatively rare across an entire corpus (inverse document frequency, IDF). The TF-IDF statistic therefore enhances the discriminatory power of less common terms and addresses concerns that certain high-frequency words could disproportionately influence our negativity measures (Gorovaia & Makrominas 2024).[10] Based on the aforementioned dictionaries, the weight of the negative word i in an AGM transcript j is defined as:

$$LMD^{-}_{tf.idf} = \frac{(1 + log(tf_{i,j}))}{(1 + log(tf_j))} * log\left(\frac{N}{df_i}\right) \tag{IV.1}$$

if negative word i occurs at least once in transcript j and is zero otherwise. $tf_{i,j}$ is the term frequency of word i in transcript j, tf_j is the average word frequency in transcript j, N is the total number of transcripts, and df_i is the number of transcripts containing negative word i. While the first term, the term frequency, attenuates the impact of high-frequency words by applying logs, the second term, the inverse document frequency, modifies a word's weight based on its commonality. The same calculation is used for $HAR^{-}_{tf.idf}$, where the Harvard IV-4 instead of the LMD dictionary is employed. Fur-

[10] For example, Hillert et al. (2023) provide the example of the word "volatility", which is often used in a financial context but does not necessarily carry a negative connotation in the context of mutual fund performance.

thermore, we follow the approach by Hillert et al. (2023) and standardize the negativity measures to mean zero and unit variance.

In addition to the negative tone, we examine the ESG-related content of shareholder communication ("ESG communication") during AGMs. To do so, we develop a dictionary that allows us to capture the share of environmental, social and governance words in shareholder statements. We isolate these words in a staggered process. First, we extract word lists found in relevant literature on climate change and corporate social responsibility (Sautner et al. 2023*a*, Vaupel et al. 2022, Briscoe-Tran 2023). Second, we complement these lists by manually collecting relevant keywords from the websites of the Global Reporting Initiative (GRI), the Climate Disclosure Project (CDP), the Task Force on Climate Related Financial Disclosures (TCFD), and the International Labor Organization (ILO). Appendix IV.8 provides an overview of the ESG-related word lists used in our analyses.

We then construct several metrics to quantify the ESG communication in shareholder statements. The variable $ESG\ Share_{j,t}$ represents the share of environmental, social, and governance words in the AGM transcript j in year t, serving as a proxy for ESG-related communication from shareholders. In addition, we define separate measures for each of the individual ESG pillars, $ENV\ Share_{j,t}$, $SOC\ Share_{j,t}$ and $GOV\ Share_{j,t}$, which capture the share of environmental ("E") words, social ("S") words and governance ("G") words, respectively. In addition, we account for the frequency of ESG words by adjusting their share, using the term frequency inverse document frequency approach, as outlined in equation IV.1. We label the resulting variables $ENV\ Share_{tf.idf}$, $SOC\ Share_{tf.idf}$ and $GOV\ Share_{tf.idf}$, respectively. We also standardize them to mean zero and unit variance. Unlike our negativity measures, we include in some of our analyses both the unadjusted share of ESG-related words in shareholder

communication as well as the corresponding TF-IDF-adjusted statistic. This approach allows us to account for the fact that some ESG terms may frequently appear across multiple transcripts, without reducing their overall weight.[11]

IV.2.4 Independent variables

To examine whether the tone of shareholder communication at the AGM is affected by a firm's sustainability performance, we gather ESG data for the companies in our sample from the MSCI database. Specifically, we collect data on both the industry-adjusted ESG scores and non-adjusted scores for the environmental, social and governance pillars. In addition, we obtain data on the theme scores of the environmental pillar (i.e., environmental opportunities, climate change, waste management and natural resource usage), the social pillar (i.e., human capital, product liability, and social opportunities) and the governance pillar (i.e., corporate governance and business ethics). MSCI evaluates these factors on a scale from 0 to 10, where 10 denotes the highest level of sustainability performance and 0 represents the lowest.

Methodologically, MSCI ESG ratings capture a company's risk exposure to key ESG issues based on a granular breakdown of company characteristics, including the company's business risk exposure in terms of revenue (e.g., core products or business segments), assets or operations, as well as its geographical risk exposure based on these same factors. Furthermore, the ratings consider company-level risk exposure elements such as the number of employees, company size, reliance on government contracts, and dependence on outsourced production (MSCI ESG Research LLC 2024). Finally, they

[11] For example, some shareholder categories may use the word "climate" particularly frequently during multiple AGMs. While we cannot determine if this is the case prior to our analysis, we aim to account for this potential by incorporating both measurements, ensuring a more comprehensive measurement of ESG-related communication.

also take into account the extent to which a company has developed robust strategies and demonstrated a strong track record of performance in managing these specific level of risks or opportunities. Ongoing or structural controversies lead to score deductions.

For our analyses, MSCI ESG ratings offer several advantages compared to other data providers. First, they cover a broad range of U.S. firms over an extended period (Grewal et al. 2016). Second, the ESG ratings provide a granular measure of a firm's environmental, social and governance performance focusing on key issues relevant to the industry in question. For example, under the environmental pillar, MSCI tracks performance on carbon emissions, biodiversity & land use and raw material sourcing, among other issues. As such, these ratings capture many aspects that may be of concern to shareholders, making them particularly relevant for understanding soft engagement at AGMs. Finally, MSCI ratings are widely used in academic studies investigating the relationship between ESG and financial performance (see e.g., Pástor et al. (2022) and Tsai & Wu (2022)).

In our analyses, we control for confounding factors by including a battery of firm-specific variables using data from Refinitiv. We account for *firm size* by including log-transformed total assets. To account for profitability and growth opportunities, we add the *fixed assets to total assets*, *net income to total assets* and *capital expenditures to total assets*. Lastly, our set of control variables also comprises the *leverage ratio*, measured as long-term debt divided by total assets (Ng & Rezaee 2015). We winsorize the control variables at the 1st and 99th percentiles. After dropping all transcripts that do not contain any shareholder statements and merging them with ESG performance data and control variables, our final sample consists of 1,813 AGM transcripts from 2007 to 2022 covering 502 unique firms.

IV.2.5 Descriptive statistics

Table IV.3 presents the summary statistics of our sample. Panel A shows that the average AGM transcript includes about 60 sentences and an average of 16 words per sentence. As Table IV.1 already shows, the average number of words peaks in 2009 and remains relatively high until 2019. The drops from 2020 to 2022 can be explained by the COVID-19 crisis and the fact that many AGMs took place in a virtual format. In general, virtual AGMs have been found to be substantially shorter than in-person meetings, with business presentations being shorter and more generic (Brochet et al. 2023). However, in the context of our analysis, we did not differentiate between in-person meetings and virtual meetings as both formats still represent an opportunity for shareholders to ask questions and make comments (Brochet et al. 2023, Gao et al. 2020).

Table IV.3: **Descriptive statistics**. This table presents the descriptive statistics of our sample. *Panel A* provides descriptive statistics for the tone and shareholders' communication measures. *Panel B* for the sustainability performance variables and *Panel C* for the control variables.

	N	Mean	Median	Std. dev.	Min	Max
Panel A: Shareholder tone and ESG communication measures						
Words per sentence	1,813	16.099	15.583	5.012	5.166	86.000
Number of sentence	1,813	59.557	25.000	103.350	3.000	1,133
$HAR^{-}_{tf.idf}$	1,760	0.023	-0.379	1.128	-0.568	8.576
$LMD^{-}_{tf.idf}$	1,722	0.044	-0.375	1.104	-0.695	8.336
ENV Share	1,813	0.017	0.011	0.019	0.000	0.143
SOC Share	1,813	0.025	0.0212	0.020	0.000	0.136
GOV Share	1,813	0.073	0.060	0.051	0.000	0.305
ENV $Share_{tf.idf}$	1,783	0.026	-0.379	1.073	0.055	8.631
SOC $Share_{tf.idf}$	1,783	0.051	-0.608	1.027	0.407	5.547
GOV $Share_{tf.idf}$	1,783	0.091	-0.261	1.086	0.456	5.747
Panel B: Sustainability performance variables						
ESG Score	1,813	5.077	5.100	2.211	0.000	10.000
Environmental Score	1,813	5.912	5.800	2.351	0.000	10.000
Social Score	1,813	4.465	4.400	1.523	0.000	9.800
Governance Score	1,813	5.344	5.300	1.617	0.000	10.000
Environmental Opportunities Score	429	4.734	4.500	1.634	1.700	9.000
Waste Management Score	590	6.070	6.000	2.502	0.000	10.000
Climate Change Theme Score	1,478	7.331	8.000	2.631	0.000	10.000
Natural Resource Usage Score	1,244	6.693	6.400	2.484	0.000	10.000
Log(Scope 1)	1,734	10.996	10.592	2.9701	0.000	18.814
Product Safety Score	1,065	4.216	4.000	1.997	0.000	10.000
Human Capital Score	1,473	4.526	4.400	1.930	0.000	10.000
Social Opportunities Score	427	4.437	4.500	1.551	0.700	7.9000
Corporate Gov. Score	1,479	5.903	6.000	1.529	0.000	10.000
Business Ethics Score	1,101	5.264	5.600	1.926	0.000	10.000
Panel C: Control variables						
Ln(Total assets)	1,760	10.405	10.323	1.813	6.273	14.674
Leverage	1,740	0.285	0.268	0.198	0.000	2.780
Return on Assets	1,466	0.090	0.079	0.086	-0.399	0.538
Capex to Total Assets	1,462	0.031	0.023	0.028	0.000	0.181
Fixed Assets to Total Assets	1,658	0.212	0.116	0.233	0.000	0.927

Panel A in Table IV.3 shows that the TF-IDF adjusted mean percentage of negative words in a given AGM transcript amounts to 2.3% when measured using the Harvard-IV dictionary and to 4.4% using the LMD dictionary. This is in line with an average nega-

tivity of 1.57% for 10-K filings found in Loughran & McDonald (2011) as well as the mean percentage of negative words of 2.08% (according to LMD) found for shareholder letters in Hillert et al. (2023). In a given AGM transcript, the TF-IDF adjusted mean percentage of environmental words is 2.6%, of social words 5.1% and of governance-related words 9.1%. A similar pattern emerges when examining the non-adjusted shares of these words, where governance-related terms are most prevalent, followed by social and environmental words. The higher percentage of governance words can be attributed to the fact that governance topics, such as board compensation, are mandatory agenda items at shareholder meetings and are central to these events.

Furthermore, Panel B reports the descriptive statistics for the sustainability performance variables. The average company in our sample has an ESG score of 5.08, suggesting a moderate level of overall sustainability performance within the sample. Breaking this down by individual pillar, the average environmental score is slightly higher at 5.91, suggesting a stronger track record on environmental factors. The average company has an average governance score of 5.34 and a comparatively lower social score of 4.46. Panel C provides the descriptive statistics for the control variables used in the analysis. Size is calculated as the natural logarithm of total assets and averages 10.41, indicating a wide range of firm sizes. Average financial ratios, such as leverage (28.5%), return on assets (9%), and capital expenditure to total assets (3.1%) are consistent with sample data in previous related studies (see e.g., (Cuñat et al. 2015, Grewal et al. 2016, Brochet et al. 2023)).

IV.3 Empirical methodology

IV.3.1 Shareholder soft engagement and shareholder characteristics

We first analyze whether specific shareholder characteristics influence shareholder soft ESG engagement at AGMs. Given that a firm's investor base comprises a diverse range of shareholder types, we include fine-grained categories to capture potential variation in their sustainability preferences and objectives. Drawing on Grewal et al. (2016), Flammer (2021) and Benton & You (2018), we identify ten distinct shareholder categories: individual shareholders, (former) employees, trade unions, asset managers, public asset managers, religious asset managers, analysts, NGOs, religious organizations, and proxies. These categories differ in their level of sophistication as well as engagement approaches (see e.g., Brochet et al. (2023), Barko et al. (2021), Flammer (2021)).

We expect these different types of shareholders to prioritize sustainability dimensions to varying degrees. Thus, for this subsection, we transform our panel dataset from the AGM level (i.e., one AGM is one observation) to a panel dataset structured at the individual shareholder statement level (i.e., one statement represents one observation). This approach enables a more granular analysis of the heterogeneity in tone and content of shareholder communication. In a first step, we test our hypothesis by regressing the share of environmental, social and governance words in each shareholder statement across all AGMs in our sample against the type of shareholder that made the respective statement:

$$ESG\ Share_{i,j,t} = \beta_1 * Shareholder\ Type_{i,j,t} + \gamma * Controls_{i,t} + \alpha_i + \alpha_t \qquad \text{(IV.2)}$$

where $ESG\ Share_{i,j,t}$ denotes the share of either environmental, social or governance words in shareholder statement j made during the AGM of company i in year t. The shares are calculated by dividing the number of environmental, social and governance words by the number of total words in a statement. $Shareholder\ Type_{i,j,t}$ is a vector of dummy variables for each shareholder type, with the individual shareholder representing our baseline category. $Controls_{i,t}$ describes a vector of control variables. It includes the logarithm of a firm's total assets, the leverage ratio measured by total debts to total assets, return on assets, its fixed assets to total assets ratio and its capital expenditures to total assets ratio. α_t and α_i denote year fixed effects and industry fixed effects, respectively. We further cluster the standard errors at the firm level.

Starting with the environmental pillar, we expect certain shareholder groups, such as NGOs, religious organizations and asset managers, to be more vocal about environmental issues than the average individual investor. NGOs have social and/or environmental agendas and participate in AGMs to draw attention to corresponding issues (Subramanian 2020). Similarly, religious organizations, particularly religious asset managers, play a very active and sometimes overlooked role as investors Louche et al. (2012). This category of investors pioneered socially responsible investing and were among the first to integrate both environmental and social considerations into their investment strategies (Hong & Kacperczyk 2009). Consequently, we expect religiously motivated investors in our sample to be particularly vocal about both environmental and social issues. In addition, studies by Krueger et al. (2020) and Hoepner et al. (2023) show that

institutional investors tend to actively engage one environmental issues, especially those related to climate, given their potential financial implications (Flammer 2021, Sautner et al. 2023*a*). As a result, we expect asset managers in our sample to also be vocal about environmental issues. Turning to the social pillar, we expect shareholders that are or were directly involved with the firm, such as current and former employees as well as trade unions, to be particularly vocal about social matters since they encompass topics related to their work environment and human capital management. With regard to governance aspects, we expect all categories of shareholders to address these topics, as they are generally standard agenda items at general meetings (Ertimur, Ferri & Muslu 2010).

In addition to these distinct shareholder categories and their respective objectives, it is also well established that shareholders hold diverse political views (see e.g., DesJardine et al. (2024)). Consequently, both their identity as shareholders and their political orientation may affect their investment priorities and thus their engagement strategies. Specifically, several studies highlight the role of political preferences in the context of shareholder activism and corporate social responsibility (see e.g.,Min & You (2019), Duan et al. (2021), Hoepner & Lin (2022), Di Giuli et al. (2023)). Most of these studies focus on institutional shareholders and their political orientation. For example, Duan et al. (2021) show that public pension funds support shareholder (management) proposals more (less) when Democrats gain more power in the funds' home states. Kim et al. (2020) report that institutional shareholders with a Republican orientation are negatively associated with their investee firms' environmental performance. Furthermore, the authors find that firms with Republican-oriented institutional shareholders are less likely to issue environmental reports. Overall, Republican shareholders are generally found to be more business-friendly and support corporate policies that prioritize business in-

terests over concerns related environmental issues and labor rights (Duan et al. 2021). At a more individual level, Smith et al. (2024) report that Republicans are less likely to be concerned about the environment and climate change, or to support environmental policies.

The political environment, i.e., the political orientation of U.S. states, may also play a critical role in shaping the extent of shareholder engagement strategies. This is illustrated by recent initiatives launched by Republican-led states opposing ESG-focused investment practices by institutional investors. For example, in late 2022 and early 2023, the Tennessee attorney general and other Republican officials accused several asset management firms of breaching fiduciary duties through their environmental and social investing practices (Reuters n.d.). In a related development, Larry Fink, Chairman and CEO of BlackRock, announced that he would cease using the term ESG due to its politicization and the growing scrutiny and boycotts initiated by Republican-controlled states (Financial Times 2022). These developments highlight how the political environment not only shapes shareholder priorities, but also influences the discourse and issues addressed (or deliberately avoided) during AGMs.

We add to this literature by examining the role of the political environment for soft ESG engagement at AGMs. To examine how shareholders' political environment may influence their soft engagement, we focus on the political orientation of the U.S. states in which they reside. Specifically, we map the results of U.S. presidential elections to the geographical location of the shareholders. To this end, we collect data from the presidential elections between 2000 and 2022.[12] In our panel data, we assume that in non-election years, the results of the most recent election continue to represent the political landscape of each state. We classify U.S. states that consistently voted Re-

[12] We therefore focus on the election years 2000, 2004, 2008, 2012, 2016, 2020.

publican across these elections as "Republican states" and those that consistently voted Democratic as "Democratic states". We also exploit data on the shareholders' geographical location as outlined in Section IV.2.2. We then analyze whether shareholders from Republican or Democratic states differ in their ESG communication by estimating the following regression:

$$ESG\ Share_{i,j,t} = \beta_1 * Individual\ Shareholder_{i,j,t} \times REP + \gamma * Controls_{i,t} + \alpha_i + \alpha_t \tag{IV.3}$$

where $ESG\ Share_{i,j,t}$ denotes the share of either environmental, social or governance words in shareholder statement j made during the AGM of company i in year t. *Individual*
$Shareholder_{i,j,t}$ is a dummy variable that equals one if the statement j during AGM i in year t was made by an individual shareholder and zero otherwise. REP is a dummy variable that equals one if the shareholder resides in a U.S. state that voted Republican in a previous presidential election, and zero otherwise. $Controls_{i,t}$ describes the same vector of control variables as in equation IV.2. α_t and α_i denote year fixed effects and industry fixed effects, respectively. We cluster the standard errors at the firm level.

IV.3.2 Shareholder soft engagement, tone and firm sustainability performance

Next, we examine whether a firm's sustainability track record affects shareholder soft engagement on ESG issues at AGMs. A large strand of literature shows that targets of shareholder activism display certain characteristics. For example, Gillan & Starks (1998) and Huson (1997) report that the targets of large public institutional investors

are characterized by poor governance structures. Empirical evidence also indicates that firms with abnormal CEO compensation and limited shareholder voting rights are more likely to be the target of shareholder resolutions (Ertimur, Ferri & Muslu 2010, Renneboog & Szilagyi 2011). Johnson & Shackell (1997) examine executive compensation proposals and find that the probability of filing such a proposal is higher for firms that face negative financial press coverage. Finally, Denes et al. (2015) find that firms targeted by shareholder activism tend to be poor performers, as measured by prior stock returns, sales growth or return to sales.

We focus on firm sustainability performance as a potential driver of shareholder soft engagement. To do so, we employ both the overall ESG score, which reflects a firm's overall sustainability performance, and the individual pillar scores as well as their theme scores, which capture a more granular view of environmental, social and governance performance. We expect shareholders to engage more strongly with respect to sustainability issues at AGMs of companies that perform relatively poorly in these areas. For example, if a company has a particularly poor track record on environmental issues, as measured by its environmental score, we expect the number of questions and comments in this area to be higher. However, if a company is an environmental leader, shareholders may have little reason to ask a particularly large number of questions or make critical statements about these issues. These assumptions are corroborated by empirical evidence showing that firms targeted by shareholder activism tend to be poor performers in specific areas (see e.g., Denes et al. (2015), Gillan & Starks (1998)). To estimate the effect of ESG performance on the share of sustainability-related communication by shareholders during an AGM, we conduct regressions in the form of the following equation:

$$ESG\ Share_{i,t} = \beta_1 * ESG\ Score_{i,t} + \gamma * Controls_{i,t} + \alpha_i + \alpha_t \quad \text{(IV.4)}$$

where $ESG\ Share_{i,t}$ measures the relative share of either environmental, social or governance words from shareholders during the AGM of company i in year t. As some of the ESG words in our dictionary might be used in an inflationary manner, we adjust the share by re-weighting it based on the term frequency and the inverse document frequency of the words as in Loughran & McDonald (2011). $ESG\ Score_{i,t}$ is the ESG score for company i in year t. We also use individual pillar scores and theme scores. $Controls_{i,t}$ describes the same vector of control variables as in equation IV.2. We include industry and time fixed effects and cluster the standard errors at the firm level. We, again, re-estimate equation IV.4 by including the ESG pillar scores and the subscores as the independent variables.

If shareholders particularly care about certain sustainability issues and feel that a firm in question is not doing enough to address such issues, we hypothesize that shareholders may engage with a negative tone at the AGM. Given that poor sustainability performance may lead to immediate or long-term reputational and financial risks, we expect lower ESG performance to be associated with a more negative tone of shareholder statements. Formally, we test this by estimating an OLS panel regression in the following way:

$$Tone_{i,t} = \beta_1 * ESG\ Score_{i,t} + \gamma * Controls_{i,t} + \alpha_i + \alpha_t \quad \text{(IV.5)}$$

where we regress shareholder tone, $Tone_{i.t}$, on a company's ESG score, $ESG\ Score_{i,t}$,

controlling for the same firm controls as in equation IV.2. We include industry and time fixed effects and cluster the standard errors at the firm level. The tone is measured by the adjusted negativity measures based on the LMD and the Harvard IV-4 dictionary, $LMD^{-}_{tf.idf}$ and $HAR^{-}_{tf.idf}$. We re-estimate equation IV.5 by including the ESG pillar scores and the theme scores as the independent variables to gain a deeper understanding of the relationship between shareholder tone and ESG performance, expecting to find negative coefficients for ESG measures.

IV.3.3 Shareholder tone and further engagement activities

In the last part of our analysis, we focus on the relationship between shareholder tone at the AGM and voting outcomes on submitted proposals. During AGMs, shareholders have the opportunity not only to engage with management by asking questions or making comments, but they can also vote actively on a range of agenda items presented as proposals (Van der Elst 2011). Typically, shareholders are asked to vote on issues such as director and committee member elections, say-on-pay policies, auditor appointment and ratifications, and the approval of financial statements and statutory reports (Cuñat et al. 2015, Babenko et al. 2018). Shareholders may approve such proposals, reject or withhold a vote (Van der Elst 2011). In addition, shareholders may also submit their own "shareholder-sponsored" proposals for consideration.

To support our analyses, we gather data from the Institutional Shareholder Services (ISS) Voting Analytics database. For each proposal, the database provides several attributes, including a description of the proposal, the date of the AGM, the sponsor and the voting requirement. As a first step, we focus on proposals classified as "management-sponsored" by ISS. We examine whether a negative tone from sharehold-

ers is associated with reduced support for these proposals. In addition, prior research (see e.g., Cai et al. (2009), Yermack (2010), Aggarwal et al. (2023)) highlights that director elections provide shareholders with another important avenue to express their discontent, especially when management falls short of their expectations. Directors of firms that performed well typically receive more "yes" votes, while directors of badly governed companies receive more opposition (Van der Elst 2011). Furthermore, directors play a crucial role in representing shareholders and their interests (Cai et al. 2009, Ertimur, Ferri & Stubben 2010). We therefore place particular focus on proposals related to director elections or re-elections, and treat such proposals as proxies for gauging overall support for management.

As shareholder dissatisfaction is likely to be reflected in lower approval rates (i.e., more votes against) for management-sponsored proposals, including proposals related to director elections, we expect voting outcomes to be less favorable when shareholder sentiment, as expressed at AGMs, is more negative. We test this hypothesis as follows:

$$Votes_{i,t} = \beta_1 * Tone_{i,t} + \gamma * Controls_{i,t} + \alpha_i + \alpha_t \tag{IV.6}$$

where $Votes_{i,t}$ describes the mean or median percentage of votes against management-sponsored proposals or director-related proposals for the AGM of company i in year t. We include a median value to account for potential outliers. $Tone_{i,t}$ describes the negativity of shareholder communication for the AGM of company i in year t, measured by the adjusted negativity measures $LMD^{-}_{tf.idf}$ and $HAR^{-}_{tf.idf}$. α_t and α_i denote year fixed effects and industry fixed effects, respectively.

Finally, we examine the relationship between shareholder sentiment expressed at the AGM, ESG communication and the voting outcomes on ESG proposals. We use the

classification provided by ISS of SRI proposals and include shareholder governance-related proposals on issues such as shareholder rights, political donations and transparency, following Dikolli et al. (2022). Our analysis examines whether the tone of shareholder statements at AGMs is linked to the approval rates of shareholder-sponsored ESG proposals. For example, it may be anticipated that when significant ESG concerns are raised during the AGM, shareholders may also be more likely to vote in favor of ESG proposals. In addition, shareholders might express dissatisfaction with the management's handling of key ESG issues by more strongly endorsing shareholder-sponsored proposals. To examine this, we apply the following regression analysis:

$$Votes_{i,t} = \beta_1 * Tone_{i,t} * \beta_2 * ESG\ Score_{i,t} + \gamma * Controls_{i,t} + \alpha_i + \alpha_t \tag{IV.7}$$

where $Votes_{i,t}$ describes the mean or median of votes for shareholder-sponsored ESG proposals for the AGM of company i in year t. $Tone_{i,t}$ describes the negativity of shareholder communication for the AGM of company i in year t, measured by the adjusted negativity measures $LMD^{-}_{tf.idf}$ and $HAR^{-}_{tf.idf}$. $ESG_{i,t}$ denotes the tf-idf adjusted share of either environmental, social or governance communication by shareholders.

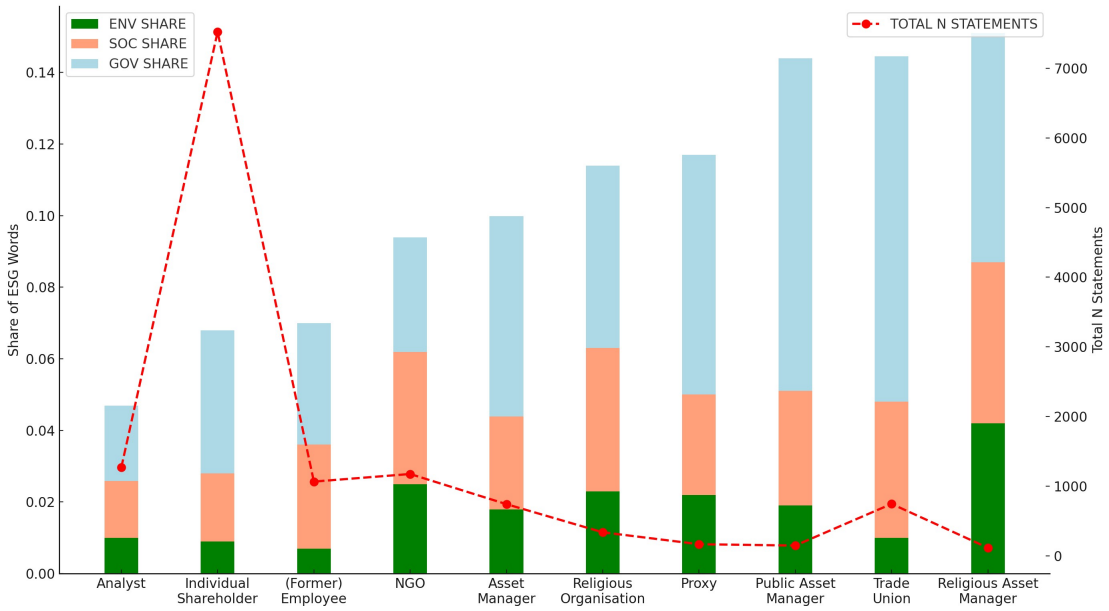
IV.4 Results

IV.4.1 To what extent do shareholders engage on ESG issues at AGMs?

We begin by conducting an exploratory analysis of shareholder statements at AGMs. Figure IV.1 presents the total number of statements by each shareholder type on the right axis, while the left axis depicts the share of environmental, social, and governance words used in these statements. Individual shareholders contribute the highest number

of statements at AGMs, followed by analysts, NGOs and (former) employees. Figure IV.1 also highlights that the proportion of environmental, social and governance words varies considerably across shareholder types. Although religious asset managers engage less at AGMs compared to other groups, their statements display a large share of words related to environmental and social themes. Historically, religious asset managers were the first investors to integrate sustainability considerations into their investment process (Gillan & Starks 1998). Hong & Kacperczyk (2009) find that religious investors are less likely to hold sin stocks, while Louche et al. (2012) show that they are important actors in the field of responsible investment and impact investing. Thus, the high proportion of environmental and social words observed for this category appears plausible. In contrast, while analysts and individual shareholders make a substantial number of statements at AGMs, their focus on environmental and social themes is considerably more limited. Furthermore, we observe that governance words are consistently present across all shareholder types, in line with our expectation that governance issues are standard agenda items at general meetings and a central concern for shareholders engaging in the AGM dialogue. Overall, the analysis shows that ESG topics are an integral part of shareholder soft engagement at AGMs.

Figure IV.1: **Assessment of KPI score per dimension.** The figure displays the total number of statements made by each shareholder type on the right axis, while the left axis represents the share of environmental, social and governance terms within these statements.



Next, we examine the environmental, social and governance words most frequently used by the different types of shareholders to identify potential nuances in their sustainability-related priorities. Table IV.4 presents an overview of the 30 most frequently used environmental words for each shareholder category. We observe that words such as "climate", "change", and "disclosure" are commonly employed by institutional investors, particularly asset managers. This is in line with earlier studies that highlight the growing importance of engagement on climate risks for institutional investors (Krueger et al. 2020, Ilhan et al. 2023, Hoepner et al. 2023). For example, Krueger et al. (2020) document that investors believe that climate change has financial implications for portfolio companies, necessitating the integration of climate-related risk considerations into the

investment decision-making process. Ilhan et al. (2023) find that institutional investors value climate-related disclosures and see them as complementary to traditional financial reporting. Furthermore, Sautner et al. (2023*a*) document a significant increase in climate-related discussions during earnings conference calls in recent years. A comparison of word frequencies further shows that the term "climate" is also frequently mentioned by NGOs, religious organizations and individual shareholders. Moreover, NGOs and religious organizations are particularly vocal about issues related to biodiversity and pollution, often using words such as "energy", "water", "animals", "coal" and "land". Lastly, we find that trade unions and (former) employees frequently reference terms like "future" and "protect", along with words such as "refinery" and "oil". In line with previous research (e.g., Grant 2021), unions therefore also actively engage as shareholders at AGMs, although they typically do not prioritize environmental projects (see e.g., Ertugrul & Marciukaityte (2021)).

Table IV.4: **Top 30 Environmental Words by Frequency**. This table reports the 30 most frequent environment-related words used by each shareholder type.

Top 30 Environmental Words																			
Analyst	Freq.	Asset Manager	Freq.	Pub. Asset Mg.	Freq.	Rel. Asset Mg.	Freq.	Rel. Org.	Freq.	NGO	Freq.	Trade Union	Freq.	Proxy	Freq.	Indiv. Sh.	Freq.	(Form.) Emp.	Freq.
change	59	climate	227	disclosure	94	climate	55	climate	135	climate	214	disclosure	123	plastic	50	energy	333	electric	39
impact	47	disclosure	153	climate	67	energy	48	land	93	energy	188	impact	44	packaging	28	power	323	change	34
target	40	change	112	energy	55	future	40	disclosure	88	water	150	change	43	climate	21	change	268	future	28
targets	29	global	91	change	39	disclosure	38	change	68	animal	147	future	42	change	21	future	266	global	24
climate	29	commitment	76	goals	19	change	36	impact	55	environmental	122	alternative	36	animal	19	coal	216	refinery	24
energy	28	impact	76	resources	18	coal	35	gas	53	coal	122	protect	34	water	18	climate	213	power	22
future	27	carbon	57	gas	13	gas	32	water	50	animals	122	building	34	gas	17	global	177	building	20
global	23	oil	57	commitment	12	responsible	29	environmental	49	change	114	commitment	34	environmental	17	water	174	refineries	20
environment	20	future	54	reduce	12	carbon	28	goals	47	commitment	101	climate	27	disclosure	17	gas	150	commitment	19
positive	20	energy	53	carbon	12	environmental	27	commitment	45	carbon	91	positive	26	energy	15	impact	138	aware	18
oil	19	gas	50	greenhouse	12	oil	27	energy	45	power	84	global	24	responsible	15	oil	112	oil	18
environmental	19	reduce	48	global	11	impact	24	global	43	responsible	82	power	23	global	14	technology	110	energy	16
gas	18	environmental	47	efficient	11	emissions	23	reduce	43	fossil	82	oil	22	coal	12	disclosure	109	impact	15
water	18	responsible	44	impact	11	greenhouse	22	greenhouse	39	impact	80	negative	21	commitment	12	electric	104	protect	13
below	17	protect	39	transition	11	reduce	20	responsible	37	disclosure	76	resources	18	recycling	12	commitment	98	responsible	13
net	17	emissions	38	protection	11	sustainability	20	emissions	36	oil	75	responsible	18	waste	12	nuclear	96	positive	12
production	16	power	33	paris	11	power	18	future	32	gas	70	protecting	17	future	10	solar	96	car	12
disclosure	14	sustainability	32	emissions	10	water	18	oil	32	reduce	69	align	15	impact	10	negative	93	reduce	11
fuel	13	goals	32	future	9	goals	18	power	23	arctic	66	aware	15	goal	9	carbon	92	chemical	10
negative	11	greenhouse	30	oil	9	nuclear	17	carbon	23	protect	63	protection	15	welfare	9	reduce	88	below	9
chain	11	impacts	30	power	9	impacts	15	sustainable	23	future	56	chain	14	impacts	8	renewable	87	solar	9
power	11	sustainable	26	sustainability	8	warming	14	protect	22	sustainability	50	goals	14	reduce	8	protect	87	resources	8
emissions	10	water	25	sustainable	8	targets	13	sustainability	21	renewable	49	sustainability	14	animals	8	responsible	84	water	8
technology	10	positive	24	ghg	7	waste	12	coal	20	environment	45	sustainable	14	oil	7	clean	83	plants	8
carbon	10	environment	23	protect	7	commitment	12	reduction	20	clean	43	environmental	14	greenhouse	7	environmental	81	goals	8
reduction	9	technology	22	responsible	7	wetlands	11	chain	20	positive	43	water	13	ocean	7	air	77	negative	7
reduce	9	fossil	22	reduction	6	reduction	11	targets	19	goals	40	energy	13	pollution	7	aware	76	resource	7
air	9	resources	21	electric	5	hydraulic	10	impacts	19	technology	39	refineries	13	sustainable	7	building	73	fire	7
building	9	aware	21	technology	5	paris	10	mitigate	18	fuel	39	impacts	12	emissions	7	car	71	coal	7
reducing	8	goal	18	target	5	air	9	pollution	16	emissions	37	transition	11	zero	7	net	69	environmental	7

Table IV.5 gives an overview of the 30 most common social words used by the shareholders in our sample. Overall, the terms “people”, “employees”, “pension” and “workers” are among the most frequently used. Trade unions, for instance, prominently use words such as “pension”, “workers”, “employees” and “safety”, reflecting their strong focus on labor rights, employee welfare, and retirement benefits. This is consistent with the role of trade unions in advocating for the protection of workers and ensuring fair treatment in areas such as wages, working conditions and pension plans (Sjöström 2009). It also supports the idea that trade unions represent the collective interests of workers and resort to shareholder activism to safeguard such interests (Marens 2004, Anderson et al. 2007). Employees and former employees, who engage in the AGM dialogue, display a similar pattern, frequently using words like “employee”, “retirees” and “right”, which suggests that their concerns align closely with those of trade unions, particularly on issues related to labor conditions and employee benefits. NGOs, on the other hand, frequently refer to “people”, “public”, “community” and “health”, but also “hispanic”, “children” and “latino”, indicating their broader concern for social welfare, public health and the well-being of communities. This also suggests that NGOs approach shareholder engagement with a focus on societal impacts of corporate actions, advocating for issues that affect broader populations and marginalized groups. Finally, institutional investors, particularly asset managers, show a slightly different set of priorities in their choice of words. They frequently highlight issues associated with words such “employees”, “public”, “women”, “gender” and “gap”. This suggests a focus on diversity and inclusion. Such issues have notably become important criteria for share ownership by socially responsible investment funds (von Meyerinck et al. 2018). In addition, the presence of words such as “gender” and “gap” also suggests that institutional investors are increasingly paying attention to gender-related issues, such as

those related to pay gaps and representation, which is in line with von Meyerinck et al. (2018), Billings et al. (2022), Haan (2022). Finally, the words "public" and "pension" frequently appear in the statements by public asset managers, which is in line with Duan et al. (2021), who show that this category of shareholders is often influenced by organized labor and prioritizes labor-related objectives.

Table IV.5: **Top 30 Social Words by Frequency**. This table reports the 30 most frequent social-related words used by each shareholder type.

Top 30 Social Words																		
Analyst	Freq.	Asset Manager	Freq.	Pub. Asset Mg.	Freq.	Rel. Asset Mg.	Freq.	Rel. Org.	Freq.	NGO	Freq.	Trade Union	Freq.	Proxy	Freq.	Indiv. Sh.	Freq.	(Form.) Emp.	Freq.
right	126	employees	177	public	80	public	53	people	174	people	543	pension	377	access	38	people	1456	people	352
data	73	public	161	pension	66	rights	47	rights	146	public	366	union	269	human	35	right	963	employee	243
people	68	women	153	accountability	43	trade	37	human	137	community	270	workers	228	people	35	employees	380	employees	243
opportunities	53	trade	141	trade	43	people	36	workers	113	health	218	employees	202	public	31	access	379	retirees	215
equity	35	gender	126	access	42	indigenous	36	health	109	right	207	public	128	diversity	31	public	344	right	140
public	34	rights	118	employees	40	diversity	35	public	80	rights	192	rights	115	rights	24	job	275	retiree	120
working	28	gap	115	transparency	37	social	33	right	76	human	177	labor	111	health	23	family	263	workers	120
respect	25	people	102	gender	29	human	32	labor	66	communities	149	right	111	data	23	community	247	union	117
trade	25	social	101	data	28	health	29	employment	63	working	148	equity	108	equity	23	health	222	job	113
income	24	equal	100	discrimination	25	transparency	22	fair	62	hispanic	143	trade	104	labor	20	care	181	health	86
fair	24	equity	94	sexual	24	right	21	communities	58	diversity	136	health	101	pension	17	rights	176	care	86
employees	22	diversity	89	rights	21	data	21	trade	56	employees	133	safety	100	employee	16	working	174	working	85
life	20	right	87	diversity	21	access	21	community	56	trade	118	accountability	88	racial	16	life	150	safety	65
diversity	20	data	80	human	20	healthcare	20	transparency	52	workers	115	people	79	right	16	employee	135	family	62
human	19	accountability	75	orientation	18	pension	15	discrimination	48	children	114	collective	78	employees	15	children	125	pension	53
rights	19	human	65	people	17	respect	14	diversity	48	accountability	100	working	69	transparency	14	income	121	healthcare	47
restructuring	17	labor	59	employee	17	nations	13	employees	48	latino	100	human	67	workforce	12	social	107	life	45
care	17	transparency	59	right	16	community	12	working	46	care	89	employee	65	social	12	young	106	jobs	45
contract	17	health	58	equity	16	opportunities	11	data	46	population	85	pandemic	55	welfare	12	fair	105	public	43
access	17	workers	56	job	13	care	10	social	44	social	81	transparency	53	gender	11	human	101	women	40
transparency	17	indigenous	53	community	13	socially	10	equal	39	family	79	local	53	gap	11	equal	98	hours	40
women	15	jobs	51	protection	12	communities	10	accountability	34	labor	77	care	47	communities	10	safety	98	contract	40
equal	13	racial	51	health	9	accountability	9	indigenous	34	religious	77	job	44	equal	10	security	95	fair	38
job	12	working	49	fundamental	8	pandemic	9	children	32	refuge	75	worker	34	workers	10	jobs	95	human	34
safety	12	employee	44	social	8	employees	9	moral	32	women	75	community	33	accountability	9	women	93	community	29
health	11	pension	42	employment	8	drug	8	access	30	fair	73	contract	31	inclusion	9	poor	92	wage	29
gender	11	communities	41	workforce	8	workers	8	families	29	families	73	integrity	30	black	9	communities	92	local	29
labor	10	job	41	labor	8	women	8	religious	29	drug	71	bargaining	30	job	8	local	91	children	28
community	9	respect	31	gap	7	safety	8	drug	28	life	68	communities	30	workplace	8	respect	91	labor	28
drug	9	safety	29	respect	7	aids	8	healthcare	28	jobs	68	security	29	indigenous	8	quality	90	rights	28

Table IV.6 provides an overview of the 30 most frequently used governance words. Overall, across all shareholder categories, the words “board”, “shareholders”, “proposal” and “management” dominate, underscoring the importance of shareholder rights, board accountability and company management. This finding reflects the central role of governance issues in the AGM context. Notably, all shareholder groups appear to engage on governance-related topics, which contrasts with the environmental and social dimensions, where priorities vary more strongly across different shareholder types.

Table IV.6: **Top 30 Governance Words by Frequency**. This table reports the 30 most frequent governance-related words used by each shareholder type.

Top 30 Governance Words																			
Analyst	Freq.	Asset Manager	Freq.	Pub. Asset Mg.	Freq.	Rel. Asset Mg.	Freq.	Rel. Org.	Freq.	NGO	Freq.	Trade Union	Freq.	Proxy	Freq.	Indiv. Sh.	Freq.	(Form.) Emp.	Freq.
management	107	board	588	board	235	shareholders	161	shareholders	347	shareholders	453	board	794	proposal	157	shareholder	2450	board	284
board	104	shareholders	557	shareholders	206	board	131	board	306	board	414	shareholders	510	shareholders	150	shareholders	2414	shareholder	190
shareholders	76	pay	439	proposal	180	proposal	96	proposal	264	proposal	343	chairman	482	board	142	board	1957	directors	163
ceo	60	proposal	408	disclosure	105	investors	95	principles	157	policy	282	compensation	467	vote	94	proposal	1499	shareholders	137
investors	59	management	376	directors	102	report	75	shareholder	153	shareholder	265	proposal	442	shareholder	92	directors	1365	proposal	116
proposal	59	shareholder	321	proxy	95	lobbying	67	report	150	report	177	vote	331	proxy	90	management	960	management	106
pay	55	investors	298	retirement	87	management	63	investors	139	vote	142	shares	295	directors	68	chairman	923	compensation	97
revenue	54	vote	256	management	76	shareholder	63	responsibility	127	chairman	141	committee	241	management	65	vote	914	pay	92
shares	51	lobbying	255	chairman	68	disclosure	48	policy	114	directors	133	shareholder	234	pay	41	shares	877	statement	78
chairman	47	chairman	193	report	68	policy	44	disclosure	111	investors	132	pay	221	ceo	36	proxy	605	chairman	75
report	46	disclosure	192	shares	65	proxy	42	management	95	ceo	122	director	220	chairman	35	pay	534	cast	61
performance	39	report	176	policy	64	vote	40	lobbying	86	management	122	directors	207	director	34	director	469	report	56
shareholder	39	policy	155	lobbying	63	chairman	36	proxy	79	power	112	performance	205	statement	31	ceo	443	performance	56
tax	39	compensation	153	performance	60	directors	35	chairman	76	leadership	105	lobbying	200	report	28	independent	426	proxy	54
compensation	39	governance	148	shareholder	56	leadership	31	vote	73	accountability	100	ceo	185	policy	28	power	407	shares	50
equity	35	shares	140	spending	56	responsibility	26	directors	57	responsibility	99	independent	181	shares	28	voting	350	vote	48
lobbying	33	proxy	134	vote	55	statement	26	statement	55	statement	95	investors	171	investors	27	report	331	ceo	45
investor	28	directors	126	investors	49	spending	23	pay	53	pay	95	policy	161	governance	26	policy	326	committee	45
presentation	26	voting	109	ceo	48	transparency	22	transparency	52	disclosure	94	ownership	151	disclosure	24	dividend	312	conduct	43
policy	25	contributions	108	director	47	power	22	compensation	51	control	93	governance	147	equity	23	compensation	307	leadership	38
spending	22	leadership	104	independent	46	shares	19	independent	49	lobbying	89	management	143	committee	23	statement	305	retirement	35
proxy	22	ceo	99	compensation	45	director	16	leadership	42	tax	84	disclosure	138	independent	21	governance	299	dividend	31
dividend	21	spending	98	accountability	43	reporting	15	oversight	41	director	83	proxy	110	lobbying	20	votes	292	policy	29
directors	21	equity	94	pay	43	contributions	15	review	37	proxy	76	voting	108	performance	19	committee	247	power	28
vote	19	performance	92	governance	42	compensation	15	governance	36	compensation	69	equity	108	audit	19	performance	229	security	25
leadership	18	committee	91	transparency	37	regulatory	13	ceo	36	committee	64	audit	108	responsibility	18	dividends	197	dividends	25
statement	18	independent	85	disclose	35	principles	13	spending	35	transparency	64	stakeholder	104	votes	17	investors	183	director	25
regulatory	17	statement	78	contributions	32	governance	12	accountability	34	independent	55	election	103	leadership	15	investor	181	bonus	24
transparency	17	accountability	75	committee	31	pay	12	reporting	31	contributions	54	report	101	election	14	leadership	178	independent	24
voting	16	disclose	70	oversight	25	independent	12	committee	31	reports	51	accountability	88	transparency	14	election	161	paying	23

In a next step, we extend our exploratory analysis by examining how different types of shareholders contribute to the proportion of environmental, social or governance words used during the AGM dialogue. In Table IV.7, we report the results from estimating equation IV.2 where we regress the share of environmental, social and governance words in shareholder statements on dummy variables representing shareholder types. Since analyzing thousands of individual shareholder statements is more challenging with tf-idf adjustments due to the fragmented, highly variable, and often unstructured nature of these statements, we use the unadjusted share values as our dependent variables. This variability can make it harder to establish meaningful term weights because the context is less consistent, resulting in challenges such as noise dominating the analysis. The baseline used for comparison is the category of individual shareholders.

Column (1) presents the results for the share of environmental words in shareholder statements as our main variable of interest. Several shareholder types positively contribute to the share of environmental words compared to individual shareholders. Notably, the coefficients on *religious asset manager*, *religious organization*, *proxy*, *NGO*, *asset manager*, and *public asset manager* are positive and statistically significant at the 1% and 5% levels, indicating a stronger emphasis on environmental issues in AGM statements compared to individual shareholders. In contrast, the coefficient on *(former) employee* is negative and significant at the 1% level, suggesting that they downplay environmental issues compared to individual shareholders. The coefficient on *analyst* is also negative, but statistically insignificant, indicating that this shareholder category does not significantly differ from individual shareholders in this area. Similarly, the coefficient on *trade union* is comparatively small and statistically insignificant, suggesting no notable contribution to the share of environmental words in the AGM dialogue compared to individual shareholders.

Table IV.7: **Heterogeneity of shareholder ESG communication**. This table reports the coefficients from OLS regressions of the share of ESG communication on dummy variables that proxy the shareholder types. ENV Share, SOC Share and GOV Share denote the share of environmental, social and governance words in shareholder communication, respectively, and are calculated by dividing the number of environmental, social and governance words by the total word count in a statement. The variables *Analyst*, *(Former) Employee*, *Trade Union*, *Religious Organization*, *Religious Asset Manager*, *Public Asset Manager*, *NGOs* and *Proxy* are dummy variables which equal one if the statement was made by a shareholder from the respective category. The baseline group is *Individual Shareholder*. Control variables is a vector of firm-specific variables controlling for *firm size*, *total assets*, *leverage ratio*, *capex to total assets* and *fixed assets to total assets*. All specifications include time and industry fixed effects. Robust standard errors (in parentheses) are clustered by firm. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

	ENV Share	SOC Share	GOV Share
	(1)	(2)	(3)
(Former) Employee	-0.160***	0.082*	-0.030
	(0.055)	(0.046)	(0.069)
Analyst	-0.018	-0.025	-0.213*
	(0.082)	(0.094)	(0.128)
Asset Manager	0.618***	0.559***	0.964**
	(0.112)	(0.106)	(0.145)
NGO	0.778***	0.659***	0.289***
	(0.093)	(0.107)	(0.055)
Proxy	0.794***	0.442**	0.559***
	(3.59)	(1.97)	(2.43)
Public Asset Manager	0.350**	1.254***	1.690***
	(0.145)	(0.254)	(0.181)
Religious Asset Manager	1.148***	0.357***	0.771***
	(0.274)	(0.166)	(0.257)
Religious Organization	0.801***	0.551***	0.867***
	(0.167)	(0.115)	(0.122)
Trade Union	0.018	0.675***	0.896***
	(0.051)	(0.102)	(0.092)
Controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	5,940	5,940	5,940
Adjusted R-squared	0.226	0.118	0.258

Column (2) presents the results for the share of social words in shareholder statements as our main variable of interest. Most shareholder categories contribute positively

to the share of social words relative to individual shareholders. Public asset managers, trade unions, and NGOs stand out as the largest contributors, with coefficients that are statistically significant at the 1% level, suggesting that these groups place a stronger emphasis on social issues in their communication compared to individual shareholders. (Former) employees also contribute positively to the share of social words, but their contribution is more marginal, with a coefficient of 0.082 that is significant at the 10% level. In contrast, the coefficient on *analyst* is once again negative and statistically insignificant, suggesting that although analysts are rather vocal during AGMs (see Figure IV.1), their soft engagement is not strongly targeted at social issues.

The comparatively large coefficients in column (3) are consistent with our previous observations and in line with the notion that governance topics are a central aspect of AGMs. We find that the public asset managers, asset managers and trade unions contribute particularly strongly to the share of governance words compared to individual shareholders. This is shown by the large coefficients on *public asset manager*, *asset manager*, and *trade union*, which are all significant at least at the 5% level. In contrast, the coefficient on *analyst* is negative and statistically significant at the 10% level, indicating a weaker emphasis on governance issues in their statements. The coefficient on *(former) employee* is negative but statistically insignificant.

Overall, the analysis shows important differences in the extent to which different shareholder types engage on ESG issues at the AGM. Asset managers, public asset managers and religious asset managers consistently engage on all three ESG dimensions. NGOs also show strong contributions across all dimensions, with a particularly notable focus on environmental and social issues. Trade unions display significant engagement with social and governance matters. These findings indicate that institutional investors, with the exception of analysts, are particularly active in terms of soft en-

gagement related to ESG issues during AGMs, and more strongly so than individual shareholders.

IV.4.2 What is the role of the political environment for shareholder soft engagement on ESG issues?

In a next step, we examine the role of the political environment for shareholder soft ESG engagement. As outlined in Section IV.3, we exploit data on the geographical location of the shareholders in our sample. For individual shareholders who speak at the AGM on their own behalf, these locations are directly inferred from their AGM statements and typically correspond to their places of residence. For institutional shareholders, locations are assigned based on their company headquarters. In line with Di Giuli & Kostovetsky (2014), we assume that asset managers and other institutional shareholders spend significant time at their headquarters and are likely to make statements aligned with corporate policies, justifying our choice to use these locations.

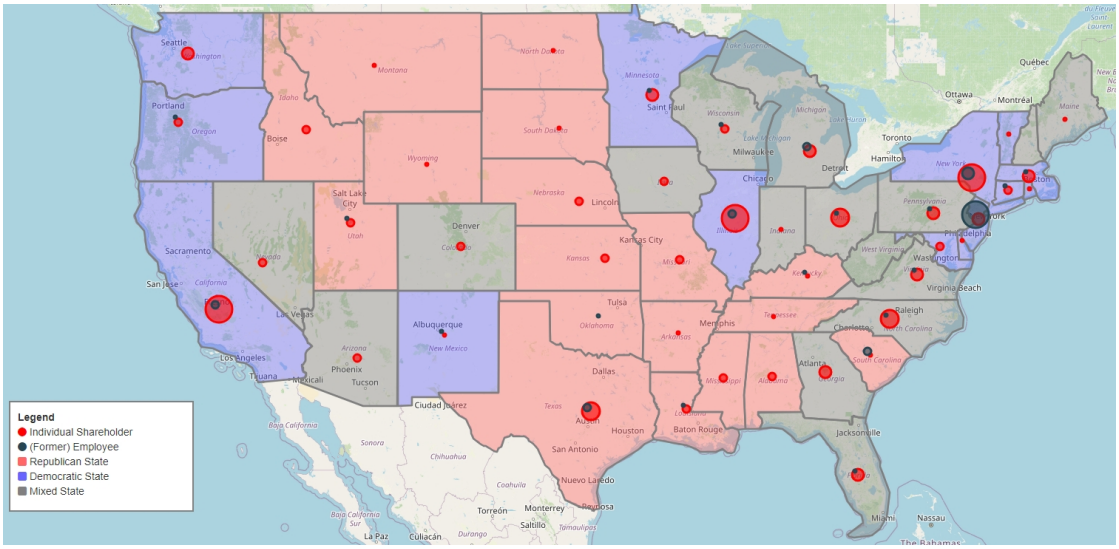
Figure IV.2 presents a map of the continental U.S., illustrating the geographical distribution of individual shareholders and (former) employees by state, based on their statements.[13] Red dots represent statements made by individual shareholders from that particular geographic location, while dark blue dots represent statements from (former) employees. Given the larger number of statements made by individual shareholder in our sample, the red dots stand out more on the map. The map shows that individual shareholders are widely distributed across the country and are represented in democratic (blue), republican (red) and swing (grey) states.[14] In contrast, Figure IV.3 presents

[13]The map does not include Alaska and Hawaii.

[14]States that alternated at least once between voting Democratic and Republican are categorized as "mixed states" because we consider the entire sample period in this map rather than a single year. We refer to these swing states as "mixed states" on purpose to highlight that their political orientation is

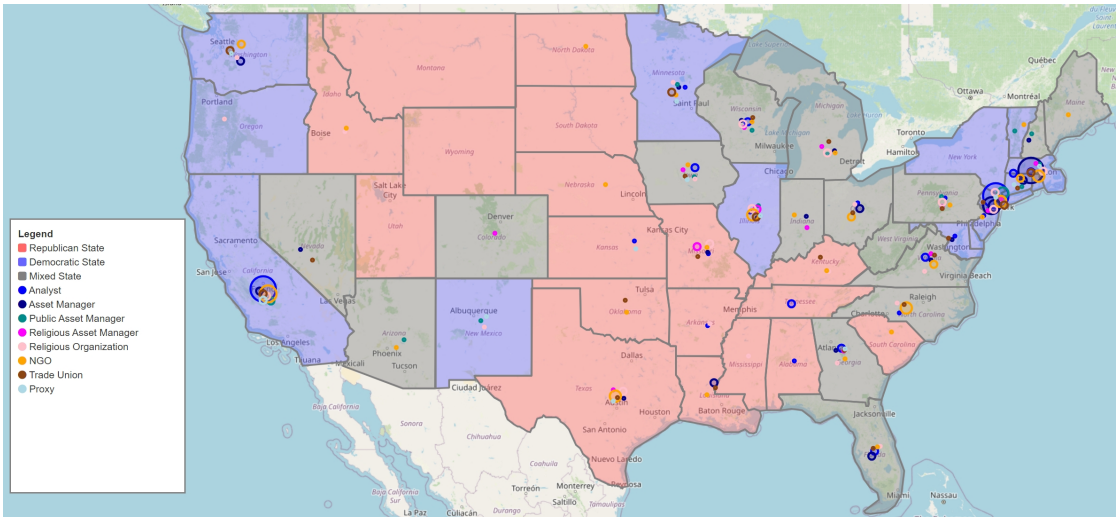
a similar map, this time illustrating the geographical distribution of institutional shareholders, based on their statements. The results indicate that institutional shareholders, especially asset managers, are more concentrated in democratic (blue) states, largely due to the clustering of financial firms and company headquarters on the East Coast and in the state of California.

Figure IV.2: **Geographical distribution of individual shareholders and (former) employees across continental U.S.**This figure shows the geographical location of individual shareholders and (former) employees as measured by number of statements per shareholder category per US state.



mixed and varies between a Democratic and a Republican orientation.

Figure IV.3: **Geographical distribution of institutional shareholders across continental U.S.** This figure shows the geographical location of institutional shareholders as measured by number of statements per shareholder category per US state.



Given the marked differences in the geographical distribution of shareholders, we examine whether their political environment, as measured by the political orientation of their state of establishment, affects their soft engagement on ESG issues at AGMs. To do so, we estimate equation IV.3 and report the results in Table IV.8. In Panel A, we focus on individual shareholders and use a dummy variable, which is equal to one if a statement was made by an individual shareholder and zero otherwise. In Panel B, we perform the same analysis, this time with a focus on institutional shareholders. Columns (1-3) display the results for the tf-idf adjusted shares of ESG communication, while columns (4-6) present the results for the non-adjusted shares as our main variables of interest.

Table IV.8: **Relationship between political environment and ESG communication**. This table reports coefficients from OLS regressions of different measures of the share of ESG communication by shareholders on the political environment and company characteristics. Panel A focuses on statements made by individual shareholders, while Panel B examines statements made by institutional shareholders. *Individual Shareholder* is a dummy that equals one if the statement was made by an individual shareholder and *REP* is a dummy variable that equals one if the individual shareholder lives in a U.S. state that voted Republican in the last presidential election. Control variables is a vector of firm-specific variables controlling for *firm size*, *total assets*, *leverage ratio*, *capex to total assets* and *fixed assets to total assets*. All specifications include time and industry fixed effects. Robust standard errors (in parentheses) are clustered by firm. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Panel A: Individual Shareholders						
	ENV $\text{Share}_{\text{tf.idf}}$	SOC $\text{Share}_{\text{tf.idf}}$	GOV $\text{Share}_{\text{tf.idf}}$	ENV Share	SOC Share	GOV Share
	(1)	(2)	(3)	(4)	(5)	(6)
REP × Individual Shareholder	-0.072	0.043	-0.519***	0.003	-0.011**	-0.025***
	(0.204)	(0.149)	(0.178)	(0.004)	(0.005)	(0.008)
Individual Shareholder	-0.441***	-0.502***	-0.262***	-0.006***	-0.008**	0.014***
	(0.078)	(0.089)	(0.099)	(0.001)	(0.004)	(0.005)
REP	-0.019	-0.089	-0.026	-0.004	0.011**	-0.004
	(0.157)	(0.150)	(0.134)	(0.003)	(0.005)	(0.004)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,876	2,876	2,876	4,321	4,321	4,321
Adjusted R-squared	0.171	0.085	0.200	0.134	0.021	0.118
Panel B: Institutional Shareholders						
	ENV $\text{Share}_{\text{tf.idf}}$	SOC $\text{Share}_{\text{tf.idf}}$	GOV $\text{Share}_{\text{tf.idf}}$	ENV Share	SOC Share	GOV Share
	(1)	(2)	(3)	(4)	(5)	(6)
REP × Institutional Shareholder	0.086	0.020	0.550***	-0.001	0.015***	0.028***
	(0.204)	(0.146)	(0.156)	(0.004)	(0.006)	(0.008)
Institutional Shareholder	0.510***	0.533***	0.307***	0.008***	0.007**	-0.010**
	(0.088)	(0.092)	(0.102)	(0.002)	(0.003)	(0.005)
REP	-0.081	-0.069	-0.523***	-0.001	-0.001	-0.028***
	(0.093)	(0.073)	(0.090)	(0.003)	(0.003)	(0.007)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,876	2,876	2,876	4,321	4,321	4,321
Adjusted R-squared	0.177	0.090	0.205	0.137	0.021	0.117

The results corroborate our previous findings from the exploratory analysis in SectionIV.4.1 and suggest that individual shareholders are less vocal about ESG issues in their AGM statements compared to institutional shareholders, potentially prioritizing

issues more directly tied to their own financial returns. In all specifications, except for column (6), the coefficient on *individual shareholder* is negative and significant at least at the 5% level. While this is particularly pronounced for the adjusted shares of environmental and social words, as shown by columns (1) and (2), a similar pattern can be observed for non-adjusted shares in columns (4) and (5), reinforcing the notion that individual shareholders emphasize environmental and social issues less strongly in their AGM statements compared to institutional shareholders. Overall, this is in line with prior research that highlights the important role played by institutional investors in promoting ESG considerations, and it aligns with the notion that both social and environmental issues have become important criteria for share ownership (see e.g., Guay et al. 2004, Krueger et al. 2020, von Meyerinck et al. 2018, Flammer 2021, Hoepner et al. 2023).

Next, we analyze the political environment as a potential mediator for the relationship between shareholder category and share of ESG communication. The coefficients on *REP* are negative across all specifications (except for column (5)), as expected, but are statistically insignificant. Turning to the interaction term in Panel A, we obtain a negative and statistically significant coefficient at the 1% level in columns (3) and (6), indicating that individual shareholders are even less vocal about governance topics when they reside in Republican states. A similar pattern can be observed in column (5), where the coefficient on the interaction term is negative and statistically significant at the 5% level, suggesting that individual shareholders are also even less vocal about social issues when they are located in Republican states compared to individual shareholders who live in Democratic states. In terms of environmental share, we obtain in both column (1) and (4) an insignificant coefficient for the interaction term. Thus, we conclude that individual shareholders' engagement on environmental issues, as measured by the

share of related words, does not depend on whether they reside in a Republican state. While their overall engagement on environmental issues is lower than that of institutional shareholders, this difference does not appear to be significantly influenced by their political environment.

Further, Panel B shows that institutional investors actively engage on ESG issues in their AGM statements, and that this engagement is not significantly constrained when their headquarters are located in Republican-leaning states. Focusing on the interaction term, we obtain an insignificant coefficient in columns (1), (2) and (4). At the same time, the coefficients in columns (3), (5) and (6) are positive and significant at the 1% level, suggesting that institutional shareholders are even more vocal on governance and social issues when they are located in Republican-leaning states compared to institutional investors who are headquartered in Democratic states. In sum, while the political environment has some influence, it does not appear to be a decisive factor in limiting the ESG communication of institutional shareholders. Nevertheless, it is also worth noting that while some states such as Texas began directing their agencies to divest from investment firms perceived as hostile to fossil fuels as early as 2021, publishing a list of specific list of banned funds (Rajgopal et al. 2023), the broader wave of "ESG backlash" in Republican states occurred later on, i.e., in 2022–2023. Consequently, its effects may not be fully captured within the timeframe considered in this study.

IV.4.3 Which firms are targeted by shareholder soft engagement on ESG issues?

In a next step, we turn to the firms in our sample and examine whether their ESG performance influences shareholder soft engagement at AGMs. As discussed in Section

IV.1, AGMs provide shareholders with a platform to interact with management, raise concerns, and discuss corporate policies and strategies. Shareholders may be especially inclined to engage with firms that exhibit weaker performance, including in ESG areas. For example, prior research shows that soft engagement at AGMs may be triggered by shareholder discontent with the firm's financial performance (Dimitrov & Jain 2011). Thus, soft engagement appears to be particularly directed toward firms for which shareholders perceive a greater need to address deficiencies and push for improvements.

Building on this, we examine whether ESG performance influences shareholder soft engagement. To do so, we estimate equation (IV.4), where we regress the proportion of environmental, social and governance words in shareholder communication at AGMs on the firms' overall ESG scores and their individual pillar scores. The results of this analysis are presented in Table IV.9.

Table IV.9: **Relationship between sustainability performance and ESG communication (Industry adjusted ESG score and pillar scores)**. This table reports coefficients from OLS regressions of different measures of the share of ESG communication by shareholders on ESG scores and company characteristics. $ENV\ Share_{tf.idf}$, $SOC\ Share_{tf.idf}$ and $GOV\ Share_{tf.idf}$ denote the share of E, S and G words in shareholder communication, respectively. All three measures are adjusted by their term frequency and their inverse document frequency. Control variables is a vector of firm-specific variables controlling for *firm size*, *total assets*, *leverage ratio*, *capex to total assets* and *fixed assets to total assets*. All specifications include time and industry fixed effects. Robust standard errors (in parentheses) are clustered by firm. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

	ENV $\text{Share}_{\text{tf.idf}}$	SOC $\text{Share}_{\text{tf.idf}}$	GOV $\text{Share}_{\text{tf.idf}}$	ENV $\text{Share}_{\text{tf.idf}}$	SOC $\text{Share}_{\text{tf.idf}}$	GOV $\text{Share}_{\text{tf.idf}}$
	(1)	(2)	(3)	(4)	(5)	(6)
ESG Score_t	-0.058***	-0.045***	-0.043**			
	(0.021)	(0.016)	(0.018)			
Environmental Score_t				-0.023		
				(0.019)		
Social Score_t					-0.064**	
					(0.021)	
Governance Score_t						-0.047*
						(0.026)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,419	1,419	1,419	1,419	1,419	1,419
Adjusted R-squared	0.471	0.331	0.428	0.462	0.330	0.426

In line with our expectations, we find a negative relationship between a firm's ESG performance and the prominence of ESG-related words in shareholder communication during AGMs. Columns (1)–(3) focus on the overall ESG scores as independent variable, while columns (4)–(6) provide a more detailed examination of the individual pillar scores. The coefficients on *ESG score* in columns (1)–(3) are all negative and statistically significant at the 1% or 5% level. Overall, we find that the better a firm's sustainability performance, as measured by its ESG rating, the lower the level of shareholder engagement on ESG issues at AGMs, based on the proportion of environmental, social and governance words. One plausible explanation for these findings is that shareholders are less likely to raise questions or make comments about ESG issues when they perceive the firm to be performing well in these dimensions. Conversely, shareholders are more likely to engage and voice concerns when they perceive a misalignment between the firm's ESG practices and their expectations or interests.

Looking at individual ESG pillar scores, we continue to observe a negative relationship with the proportion of environmental, social and governance terms in shareholder communication, although the effect is statistically weaker. The coefficient on *social score* is negative and statistically significant at the 5% level. In the same vein, the coefficient on *governance score* is negative and statistically significant at the 10% level. At the same time, we obtain a statistically insignificant coefficient on *environmental score*. Overall, while a higher social and governance performance thus tend to go along with a reduction in the use of related language, the relationship is not systematic and perfectly aligned. Specifically, although firms may exhibit high environmental performance, this does not appear to translate into a corresponding decrease in the use of environmental language employed by shareholders. There may be several reasons for this. First, the overall ESG performance may be particularly relevant to shareholders, and their percep-

tion of the underlying issues at hand may vary, leading to different levels of engagement with respect to environmental, social and governance issues at AGMs. Second, it is important to recall that the overall ESG scores in our analyses are an industry-adjusted measures, while the individual pillar scores are not. As a result, the ESG scores may better capture how firms fare compared to their peers, which may also matter to shareholders. Furthermore, figure IV.1 already highlighted the importance of the social and governance dimensions for shareholders in their AGM statements, and our results further align with our initial observations.

Next, we break down the analysis further by regressing the share of shareholder ESG communication against the ESG sub-scores (or "theme" scores) that belong to the individual environmental, social and governance pillars. This analysis allows us to examine whether specific themes emerge as particularly important and relevant for shareholder soft engagement on ESG issues. The results are reported in Table IV.10.

Table IV.10: **Relationship between sustainability performance and ESG communication (theme scores)**. This table reports coefficients from OLS regressions of different measures of the share of ESG communication by shareholders on ESG scores and company characteristics. $ENV\ Share_{tf.idf}$, $SOC\ Share_{tf.idf}$ and $GOV\ Share_{tf.idf}$ denote the share of E, S and G words in shareholder communication, respectively. All three measures are adjusted by their term frequency and their inverse document frequency. Control variables is a vector of firm-specific variables controlling for *firm size*, *total assets*, *leverage ratio*, *capex to total assets* and *fixed assets to total assets*. All specifications include time and industry fixed effects. Robust standard errors (in parentheses) are clustered by firm. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

	ENV $\text{Share}_{\text{tf.idf}}$	ENV $\text{Share}_{\text{tf.idf}}$	ENV $\text{Share}_{\text{tf.idf}}$	ENV $\text{Share}_{\text{tf.idf}}$	ENV $\text{Share}_{\text{tf.idf}}$	SOC $\text{Share}_{\text{tf.idf}}$	SOC $\text{Share}_{\text{tf.idf}}$	SOC $\text{Share}_{\text{tf.idf}}$	GOV $\text{Share}_{\text{tf.idf}}$	GOV $\text{Share}_{\text{tf.idf}}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Environmental Opportunities score_t	-0.061									
	(0.092)									
Waste Management score_t		-0.138***								
		(0.050)								
Natural Resources Usage score_t			-0.102***							
			(0.037)							
Log(Scope 1)$_t$				0.039*						
				(0.022)						
Climate Change Score_t					0.010					
					(0.019)					
Product Safety Score_t						-0.033				
						(0.023)				
Human Capital Score_t							-0.033*			
							(0.019)			
Social Opportunities Score_t								-0.042		
								(0.047)		
Corporate gov. score_t									-0.014	
									(0.021)	
Business Ethics score_t										-0.063*
										(0.037)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	362	528	1,008	1,363	1,366	825	1,151	294	1,157	824
Adjusted R-squared	0.267	0.324	0.394	0.582	0.582	0.259	0.261	0.253	0.377	0.347

In columns (1)–(5), we examine the adjusted share of environmental words as our main variable of interest, followed by the adjusted share of social words in columns (6)–(8) and the adjusted share of governance words in columns (9)–(10). We obtain a negative and significant coefficient at the 1% level on both *waste management score* and *natural resources usage score*. The results indicate that a stronger environmental performance, particularly in these areas, is associated with a lower proportion of environmental terms in shareholder statements during AGMs (columns (2) and (3)). In contrast, higher levels of scope 1 greenhouse gas emissions are linked to a marginally significant increase in the share of environmental language, as shown by the positive and significant coefficient on *log(scope 1)* in column (4). While this effect is weaker both in terms of size and statistical significance (10% level) than the ones in columns (2) and (3), it suggests that shareholders are more likely to engage on this issue when a firm's direct emissions are higher (column (4)). These findings are consistent with prior studies that emphasize the attention paid to greenhouse gas emissions, particularly by institutional investors (**?**Bolton & Kacperczyk 2023). However, we obtain no statistically significant coefficient for the climate change theme score (Column 5), which may be due to the score's dual focus on both a firm's exposure to climate change and its efforts to manage that exposure.[15]

In the social dimension, we find in column (7) a negative and significant coefficient at the 10% level on *human capital score*, underscoring the relationship between shareholder engagement on social issues, as measured by the proportion of social words, and human capital. This is consistent with the notion that issues such as employee well-

[15]For example, the theme score incorporates factors such as a firm's vulnerability to climate change, as well as its exposure to and management of environmental risks. Depending on the specific aspect considered, we would expect the share of environmental words in shareholder statements to either increase or decrease.

being, but also the ability of firms to attract, retain and develop a highly skilled workforce, are of concern to shareholders. This relationship may also be partly explained by the presence of employees and trade unions among the shareholders in the sample. Finally, business ethics emerges as a relevant factor for governance-related shareholder engagement, with a negative and significant coefficient observed on *business ethics score* in column (10). This suggests that shareholders pay particular attention to issues such as a company's oversight and management of fraud, executive misconduct, corruption, money laundering or antitrust violations. When these issues are managed effectively, shareholders are thus less likely to address them during AGMs.

Overall, while these findings underscore the importance of ESG performance in shaping shareholder soft engagement at AGMs, they once again also highlight the complexity of this relationship. As noted earlier, we do not find a systematic correspondence between a firm's performance in a specific theme and the proportion of shareholder communication related to that exact same theme. Instead, the overall ESG performance and the management of specific issues appear to drive shareholder soft engagement, and thus, the share of environmental, social and governance language in AGM statements.

IV.4.4 What is the tone of shareholder soft engagement on ESG issues?

As discussed in Section IV.4.3, ESG performance influences shareholder soft engagement on ESG issues, shaping the *content* of shareholder statements, as measured by the share of environmental, social and governance words. In a next step, we analyze the *tone* of such statements. Isolating the tone allows us to go beyond the analysis of *what* is being said to focus on *how* it is being said (Price et al. 2012). The underlying

expectation is shareholders may engage on sustainability issues to address perceived deficiencies, voice concerns, or express discontent with a poor sustainability track record. Thus, the better the ESG performance of a firm, the lower the soft engagement of shareholders in the form of negative questions and comments at the respective AGM. We expect this dynamic to be reflected in the proportion of negative words in shareholder statements during AGMs. To do so, we estimate equation IV.5 by regressing the tone of shareholders on the overall ESG score along with firm controls as well as year and industry fixed effects. The results are presented in Table IV.11.

Table IV.11: **Relationship between ESG Performance and HAR & LMD Tone**. This table reports coefficients from OLS regressions of different measures of shareholder tone on ESG scores and company characteristics. $LMD^{-}_{tf.idf}$ is the negativity of a transcript according to the Loughran and McDonald (2011) dictionary weighted by their term frequency and inverse document frequency. $HAR^{-}_{tf.idf}$ is the negativity of a transcript according to the Harvard IV-4 psychosocial dictionary weighted by their term frequency and inverse document frequency. Control variables is a vector of firm-specific variables controlling for *firm size*, *total assets*, *leverage ratio*, *capex to total assets* and *fixed assets to total assets*. All specifications include time and industry fixed effects. Robust standard errors (in parentheses) are clustered by firm. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

	$HAR^{-}_{tf.idf}$	$HAR^{-}_{tf.idf}$	$LMD^{-}_{tf.idf}$	$LMD^{-}_{tf.idf}$
	(1)	(2)	(3)	(4)
ESG Score$_t$	-0.063***		-0.069***	
	(0.024)		(0.025)	
Environmental Score$_t$		-0.029		-0.032
		(0.021)		(0.023)
Social Score$_t$		-0.057**		-0.069***
		(0.024)		(0.025)
Governance Score$_t$		-0.051		-0.055*
		(0.031)		(0.033)
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	1,360	1,360	1,360	1,360
Adjusted R-squared	0.472	0.471	0.422	0.421

Building on Hillert et al. (2023), we consider tf.idf adjusted negativity measures derived from the Harvard-IV dictionary in columns (1)-(2) and include adjusted negativity measures based on the LMD dictionary in columns (3)-(4). As expected, we obtain, both in columns (1) and (3), negative and statistically significant coefficients at the 1% level on *ESG score*. The magnitude of the coefficients is comparable across both specifications and suggest that a higher overall ESG performance is associated with a less negative tone of shareholder statements, as captured by the LMD and Harvard-IV dictionaries. Once again, we use industry-adjusted ESG scores, which capture particularly well how a firm is performing relative to its industry peer group.

When substituting the overall ESG score with individual pillar scores, the results in columns (2) and (4) indicate that the social score has a more pronounced effect on reducing the negativity of shareholders' tone during AGMs. Specifically, we obtain negative and statistically significant coefficients at the 1% or 5% level on *social score* in both columns, which underscores the importance of the social dimension for shareholders and corroborates our earlier findings. Furthermore, we find some evidence suggesting that the governance performance is associated with a marginal reduction in the proportion of negative words in shareholder statements, as shown by the negative and significant coefficient on *governance score* in column (4). Overall, the results once again underscore the importance of the overall ESG performance, and they also underscore the importance of the social and governance dimensions (in line with figure IV.1) for the tone of shareholders at AGMs in the form of negative statements.

In Table IV.12, we extend our analysis by disaggregating the pillar scores into their respective theme scores. In Panel A, we employ adjusted negativity measures based on the Harvard-IV dictionary as our main variables of interest, while in Panel B, we perform the same analysis using the LMD dictionary. The results show that, irrespective

of the dictionary used, issues related to the use of natural resources, waste management, human capital and business ethics are negatively associated with the negative tone of shareholder statements at AGMs. Notably, these themes corroborate our prior findings in Table IV.10 and underscore that when shareholders engage on these issues, they do so with a negative tone. These results are also in line with the results for the regression specifications in columns (1) and (3) in Table IV.11, but contrast with columns (2) and (4) of the same table, where we found no strong statistical evidence for the link between the environmental score and shareholder negative tone. This further highlights that not all aspects of sustainability influence shareholder tone in the same way, underscoring the complex relationship between ESG performance and shareholder soft engagement on ESG issues at AGMs.

Table IV.12: **Relationship between ESG Performance and HAR & LMD Tone**. This table reports coefficients from OLS regressions of different measures of shareholder tone on ESG scores and company characteristics. Panel A focuses on the tone as measured by the Harvard IV-4 psychosocial dictionary, while Panel B examines the tone as measured by Loughran and McDonald dictionary. $LMD^{-}_{tf.idf}$ is the negativity of a transcript according to the Loughran and McDonald (2011) dictionary weighted by their term frequency and inverse document frequency. $HAR^{-}_{tf.idf}$ is the negativity of a transcript according to the Harvard IV-4 psychosocial dictionary weighted by their term frequency and inverse document frequency. Control variables is a vector of firm-specific variables controlling for *firm size*, *total assets*, *leverage ratio*, *capex to total assets* and *fixed assets to total assets*. All specifications include time and industry fixed effects. Robust standard errors (in parentheses) are clustered by firm. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Panel A: Harvard-IV Dictionary										
	$HAR^{-}_{tf.idf}$	$HAR^{-}_{tf.idf}$	$HAR^{-}_{tf.idf}$	$HAR^{-}_{tf.idf}$	$HAR^{-}_{tf.idf}$	$HAR^{-}_{tf.idf}$	$HAR^{-}_{tf.idf}$	$HAR^{-}_{tf.idf}$	$HAR^{-}_{tf.idf}$	$HAR^{-}_{tf.idf}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Environmental Opportunities Score$_t$	-0.066									
	(0.051)									
Waste Management Score$_t$		-0.059**								
		(0.027)								
Climate Change Theme Score$_t$			0.003							
			(0.018)							
Natural Resource Usage Score$_t$				-0.062**						
				(0.025)						
Log(Scope 1)					0.020					
					(0.021)					
Product Safety Score$_t$						-0.038				
						(0.028)				
Human Capital Score$_t$							-0.031*			
							(0.017)			
Social Opportunities Score$_t$								-0.054		
								(0.046)		
Corporate gov. Score$_t$									-0.003	
									(0.020)	
Business Ethics Score$_t$										-0.062*
										0.036
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	341	506	1,098	966	1304	794	1,093	289	1099	773
Adjusted R-squared	0.460	0.572	0.499	0.524	0.550	0.511	0.502	0.476	0.499	0.515
Panel B: Loughran and McDonald Dictionary										
	$LMD^{-}_{tf.idf}$	$LMD^{-}_{tf.idf}$	$LMD^{-}_{tf.idf}$	$LMD^{-}_{tf.idf}$	$LMD^{-}_{tf.idf}$	$LMD^{-}_{tf.idf}$	$LMD^{-}_{tf.idf}$	$LMD^{-}_{tf.idf}$	$LMD^{-}_{tf.idf}$	$LMD^{-}_{tf.idf}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Environmental Opportunities Score$_t$	-0.032									
	(0.039)									
Waste Management Score$_t$		-0.056**								
		(0.026)								
Climate Change Theme Score$_t$			0.000							
			(0.018)							
Natural Resource Usage Score$_t$				-0.066***						
				(0.025)						
Log(Scope 1)					0.021					
					(0.023)					
Product Safety Score$_t$						-0.037				
						(0.030)				
Human Capital Score$_t$							-0.037**			
							(0.017)			
Social Opportunities Score$_t$								-0.051		
								(0.046)		
Corporate gov. Score$_t$									0.006	
									(0.021)	
Business Ethics Score$_t$										-0.073*
										0.040
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	355	514	1,139	992	1,341	819	1,134	293	1140	816
Adjusted R-squared	0.395	0.550	0.455	0.483	0.410	0.455	0.459	0.447	0.455	0.482

IV.4.5 Do shareholders walk the talk?

We have established the relationship between firm ESG performance and the share of ESG-related language in shareholder statements on the one hand, and the relationship between firm ESG performance and tone of shareholder statements at AGMs on the other. In a final step, we explore the implications of shareholder tone at AGMs for both company management and other forms of shareholder engagement. Our focus is on proposals, specifically two key categories: management proposals initiated by the company's leadership and shareholder proposals submitted by shareholders. The underlying premise is that shareholders perceiving a gap between their expectations and the firm's track record may engage during AGMs not only through verbal criticism, but also by signaling their discontent via their voting behavior — either by opposing management-sponsored proposals or by strongly supporting shareholder proposals.

We begin by examining the relationship between shareholder tone and voting outcomes for management-sponsored proposals. The core idea is that shareholders may express their opinions not only through direct criticism during AGMs, but also by "walking the talk", i.e., expressing reduced support for management-sponsored proposals. Specifically, voting on management-sponsored proposals may provide shareholders with an additional channel to express discontent and exert pressure on management. For example, some of these management proposals, such as say-on-pay proposals, are non-binding and highly symbolic (Fisch et al. 2018, Cuñat et al. 2015). Consequently, we expect a degree of "alignment" between the overall tone of shareholders at the AGM and voting behavior, as measured by voting outcomes for management proposals.[16] To do so, we estimate equation IV.6 and report the results in Table IV.13.

[16] We acknowledge that some votes may be cast before the AGM and may not temporally result directly from the AGM dialogue. We therefore emphasize the notion of alignment.

Table IV.13: **Relationship between Shareholder Tone and Shareholder Votes against Management Proposals**. This table reports the coefficients from OLS regressions of shareholder approval rates on the negativity of shareholder communication. *Votes against* denotes either the mean or the median of the votes against management proposals for each AGM. $HAR^{-}_{tf.idf}$ is the negativity of a transcript from the respective AGM according to the Harvard IV-4 psychosocial dictionary weighted its term frequency and inverse document frequency. $LMD^{-}_{tf.idf}$ is the negativity of a transcript according to the Loughran and McDonald (2011) dictionary weighted by its term frequency and inverse document frequency. Control variables is a vector of firm-specific variables controlling for *firm size*, *total assets*, *leverage ratio*, *capex to total assets* and *fixed assets to total assets*. All specifications include time and industry or firm fixed effects. Robust standard errors (in parentheses) are clustered by firm. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

	Votes against (mean)	Votes against (median)	Votes against (mean)	Votes against (median)	Votes against (mean)	Votes against (median)	Votes against (mean)	Votes against (median)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$HAR^{-}_{tf.idf}$	0.319**	0.251*	0.280	0.221				
	(0.154)	(0.143)	(0.171)	(0.151)				
$LMD^{-}_{tf.idf}$					0.335**	0.294**	0.247*	0.248**
					(0.132)	(0.126)	(0.142)	(0.121)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	Yes	Yes	No	No	Yes	Yes
Industry FE	Yes	Yes	No	No	Yes	Yes	No	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,302	1,302	1,302	1,302	1,337	1,337	1,337	1,337
Adjusted R-squared	0.392	0.498	0.554	0.573	0.398	0.490	0.533	0.548

In columns (1), (3), (5), and (7), the main variable of interest is the mean percentage of votes cast against management proposals at a given AGM. To address potential outliers, columns (2), (4), (6), and (8) focus on the median percentage of such votes. The negative tone at the AGM is measured based on adjusted negativity scores derived from the Harvard IV-4 and LMD dictionaries. With the exception of columns (3) and (4), all coefficients on $LMD^{-}_{tf.idf}$ and $HAR^{-}_{tf.idf}$ are positive and significant at the 5 or 10% level. We therefore find evidence for the relationship between shareholder negative tone at AGMs and the voting outcomes of management-sponsored proposals. More specifically, an increase of one standard deviation in the negativity of shareholder communication is associated with an increase of around 0.28 percentage points (on average)

in votes against management proposals, when considering the average of the statistically significant coefficients.

We extend our analysis by considering a specific category of management proposals, namely the ones related to the election or re-election of directors, and use them as a proxy for gauging management support. Several studies underscore that votes on directors are used by shareholders are a way to express their dissent (see e.g., (Cai et al. 2009, Yermack 2010, Van der Elst 2011)). Given the importance of director proposals in the context of shareholder activism, we examine the relationship between negative tone and director approval rates, as reported in Table IV.14. Compared to the findings in Table IV.13, the regression coefficients in this analysis are both larger in magnitude and statistically significant across all specifications, expect for column (3). Notably, the coefficients on $LMD^{-}_{tf.idf}$ in columns (5) and (6) are positive and statistically significant at the 1% level, while the coefficients on $HAR^{-}_{tf.idf}$ in columns (1) and (2) are similarly positive and significant at the 5% level. Since nearly every AGM includes at least one director proposal, this allows for a comparison of the magnitude of the coefficients between Table IV.13 (which also contains proposals on directors) and Table IV.14. The results indicate that, on average, an increase in the negativity of shareholder tone is associated with higher disapproval rates for director proposals compared to other management proposals. When comparing the averages of statistically significant coefficients from Table IV.14 to those in Table IV.13, the results indicate an average increase of 0.33 basis points in votes against directors associated with a more negative tone of shareholders, compared to an average increase of 0.28 basis points in votes against management proposals.

Table IV.14: **Relationship between Shareholder Tone and Shareholder Votes against Directors**. This table reports the coefficients from OLS regressions of shareholder approval rates on the negativity of shareholder communication. *Votes against* denotes either the mean or the median of the votes against director proposals for each AGM. $HAR^{-}_{tf.idf}$ is the negativity of a transcript from the respective AGM according to the Harvard IV-4 psychosocial dictionary weighted its term frequency and inverse document frequency. $LMD^{-}_{tf.idf}$ is the negativity of a transcript according to the Loughran and McDonald (2011) dictionary weighted by its term frequency and inverse document frequency. Control variables is a vector of firm-specific variables controlling for *firm size*, *total assets*, *leverage ratio*, *capex to total assets* and *fixed assets to total assets*. All specifications include time and industry or firm fixed effects. Robust standard errors (in parentheses) are clustered by firm. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

	Votes against (mean)	Votes against (median)	Votes against (mean)	Votes against (median)	Votes against (mean)	Votes against (median)	Votes against (mean)	Votes against (median)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$HAR^{-}_{tf.idf}$	0.364**	0.346**	0.282	0.251*				
	(0.163)	(0.149)	(0.172)	(0.151)				
$LMD^{-}_{tf.idf}$					0.404***	0.389***	0.289*	0.294**
					(0.146)	(0.135)	(0.148)	(0.126)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	Yes	Yes	No	No	Yes	Yes
Industry FE	Yes	Yes	No	No	Yes	Yes	No	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,298	1,298	1,298	1,298	1,334	1,334	1,334	1,334
Adjusted R-squared	0.469	0.483	0.612	0.590	0.471	0.480	0.598	0.574

While we have established that stronger ESG performance is associated with a reduction in the negativity in tone, we acknowledge that the negativity captured in the analysis above may not solely or directly result from poor ESG performance. Other factors may contribute to the negative tone, such as poor financial performance (see e.g., Dimitrov & Jain 2011), or the fact that a firm has paid its CEO more compensation than expected (see e.g., Yermack 2010). As a next step, we therefore turn to shareholder-sponsored proposals and examine whether we find a relationship between shareholder tone expressed at AGMs, the share of ESG communication, and the voting outcomes for ESG-related proposals. The rationale behind this analysis is that an increased use of ESG-related language, coupled with a negative tone, may signal heightened shareholder

concerns about ESG issues. These heightened concerns may be associated with higher approval rates for ESG proposals submitted by shareholders. We estimate equation IV.7 and report the results in Table IV.15. This time, the main variable of interest in each specification corresponds to the approval rates for ESG-related proposals, captured either by the mean or median percentage of votes in favor of such proposals at each AGM. Once again, we include the median percentage of votes to account for potential outliers.

Table IV.15: **Relationship between Shareholder Tone, ESG Communication and Shareholder Votes for ESG Proposals**. This table reports the coefficients from OLS regressions of shareholder approval rates on the negativity of shareholder communication. *Votes for* denotes either the mean or the median of the votes for shareholder ESG proposals for each AGM. $HAR^{-}_{tf.idf}$ is the negativity of a transcript from the respective AGM according to the Harvard IV-4 psychosocial dictionary weighted its term frequency and inverse document frequency. $LMD^{-}_{tf.idf}$ is the negativity of a transcript according to the Loughran and McDonald (2011) dictionary weighted by its term frequency and inverse document frequency. $ENV_{tf.idf}$, $SOC_{tf.idf}$ and $GOV_{tf.idf}$ are the shares of environmental, social and governance words weighted by their term frequency and inverse document frequency, respectively. Control variables is a vector of firm-specific variables controlling for *firm size*, *total assets*, *leverage ratio*, *capex to total assets* and *fixed assets to total assets*. All specifications include time and industry or firm fixed effects. Robust standard errors (in parentheses) are clustered by firm. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

	votes for (mean)	votes for (median)	votes for (mean)	votes for (median)	votes for (mean)	votes for (median)	votes for (mean)	votes for (median)	votes for (mean)	votes for (median)	votes for (mean)	votes for (median)	votes for (mean)	votes for (median)	votes for (mean)	votes for (median)	votes for (mean)	votes for (median)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
$HAR^{-}_{tf.idf}$	-0.003	-0.003					-0.001	-0.001			0.001	0.001			0.004*	0.004*		
	(0.002)	(0.002)					(0.003)	(0.003)			(0.002)	(0.002)			(0.002)	(0.002)		
$LMD^{-}_{tf.idf}$			-0.003*	-0.003**					-0.003	-0.003			0.001	0.000			0.005**	0.004
			(0.002)	(0.002)					(0.003)	(0.002)			(0.002)	(0.002)			(0.002)	(0.002)
$ENV_{tf.idf}$					0.001	0.001	0.003	0.002	0.003	0.002	0.002	0.001	0.002	0.002	0.002	0.001	0.002	0.001
					(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$SOC_{tf.idf}$					-0.003**	-0.002	-0.002*	-0.002	-0.002	-0.001	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002
					(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
$GOV_{tf.idf}$					-0.002	-0.002	-0.002	-0.002	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002	-0.001	-0.001	-0.001	-0.001
					(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)
$HAR^{-}_{tf.idf} \times ENV_{tf.idf}$							0.000	0.000										
							(0.000)	(0.000)										
$LMD^{-}_{tf.idf} \times ENV_{tf.idf}$									0.000	0.000								
									(0.000)	(0.000)								
$HAR^{-}_{tf.idf} \times SOC_{tf.idf}$											-0.001	-0.001						
											(0.001)	(0.001)						
$LMD^{-}_{tf.idf} \times SOC^{-}_{tf.idf}$													-0.001	-0.001				
													(0.001)	(0.001)				
$HAR^{-}_{tf.idf} \times GOV_{tf.idf}$															-0.002***	-0.002***		
															(0.001)	(0.000)		
$LMD^{-}_{tf.idf} \times GOV_{tf.idf}$																	-0.002***	-0.002***
																	(0.001)	(0.001)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1298	1298	1334	1334	1357	1357	1286	1286	1319	1319	1286	1286	1319	1319	1286	1286	1319	1319
Adj. R-squared	0.422	0.425	0.422	0.424	0.392	0.399	0.425	0.427	0.425	0.427	0.427	0.429	0.427	0.428	0.432	0.433	0.432	0.433

Overall, the results provide little support for our hypothesis. In most specifications, a more negative shareholder tone is associated with a statistically insignificant decrease in support for ESG proposals. In columns (3) and (4), we obtain a statistically negative and significant coefficient at the 10% level on $LMD^{-}_{tf.idf}$. The coefficients for ESG communication in columns (5) and (6) vary between positive and negative values and are predominantly statistically insignificant. Lastly, the results in columns (15)–(18) fail to establish a clear pattern. Consequently, we cannot infer from these results that increased shareholder soft engagement on ESG issues is aligned with higher approval rates for ESG-related shareholder proposals. While some shareholders who raise ESG concerns verbally during AGMs might also be more inclined to vote in favor of such proposals (see e.g., Dikolli et al. 2022), this engagement does not appear to have a mobilizing effect and generate broader support for shareholder proposals. There could be several explanations for this results. First, these findings are not entirely surprising given the limited number of ESG-related shareholder proposals that pass with majority votes (see e.g., Berkman et al. (2024). Furthermore, as highlighted in this study, AGMs attract a diverse array of shareholders with varying interests, emphasizing the need to look beyond proposal voting as the sole indicator of shareholder engagement.

IV.5 Conclusion

Although shareholders' right to speak at AGMs is a public and cost-effective avenue for shareholder engagement, little is known about the content and tone of their questions and comments in interacting with management. In particular, the relationship between this form of soft engagement and sustainability concerns has not yet been explored. Using a large sample of AGM transcripts, this paper aims to address this gap by examining

the dynamics of shareholder soft engagement on ESG issues.

By analyzing the spectrum of sustainability issues raised and examining how different types of institutional and non-institutional shareholders engage on these topics, our study sheds light on the role of AGMs as an important platform for shareholder soft engagement. Overall, we show that sustainability topics are an integral part of shareholder communication at AGMs for all shareholder categories. This is, however, particularly true for institutional shareholders. These findings are consistent with prior research highlighting the role of shareholders serving as "norm promoters" on capital markets (Sjöström 2009). In addition, our study provides robust evidence of the relationship between the proportion of words on sustainability aspects and the negative tone at shareholder meetings, suggesting that shareholders who address sustainability issues do so by adopting a negative tone. Finally, we also show that shareholders align to some degree their words with actions, in particular by being less supportive of management-sponsored and directors proposals.

Our findings also have important implications for practice. First, they underscore that aside from the questions and comments raised, the sentiment expressed by shareholders during AGMs can serve as an important barometer of firm's ability (or inability) to meet certain shareholder, and in a broader context, societal expectations. By identifying and analyzing these patterns, firms can better understand the concerns of their diverse shareholder base and adapt their strategies accordingly. Second, the relevance of sustainability-related topics reflects an increasing expectation towards firms to focus more on explicitly and effectively on ESG performance. As such, AGMs as more than procedural gatherings. They are strategic opportunities to demonstrate accountability and progress in sustainability efforts. While the emergence of an "ESG backlash" beginning in 2022–2023 may alter this dynamic, firms and their management teams should

carefully reflect on what these shifting sentiments mean for their ESG positioning at AGMs and adapt accordingly.

IV.6 First Appendix

Table IV.16: **Variable definitions.** This table provides a description of the variables used in this study.

Variable	Definition	Data Source
Panel A: Key Dependent Variables		
$HAR^{-}_{tf.idf}$	Term frequency and inverse document frequency weighted negativity of a transcript according to the Harvard IV-4 psychosocial dictionary. The weight of negative word i is its term frequency times the log of the number of transcripts in the sample divided by the number of transcripts containing word i. The variable is standardized to unit variance.	Refinitiv, Self-estimated
$LMD^{-}_{tf.idf}$	Term frequency and inverse document frequency weighted negativity of a transcript according to the Loughran and McDonald (2011) dictionary. The weight of negative word i is its term frequency times the log of the number of transcripts in the sample divided by the number of transcripts containing word i. The variable is standardized to unit variance.	Refinitiv, Self-estimated
ENV $\text{Share}_{\text{tf.idf}}$	Term frequency and inverse document frequency weighted environmental communication of a transcript according to our own dictionary. The weight of environmental word i is its term frequency times the log of the number of transcripts in the sample divided by the number of transcripts containing word i. The variable is standardized to unit variance.	Refinitiv, Self-estimated
SOC $\text{Share}_{\text{tf.idf}}$	Term frequency and inverse document frequency weighted social communication of a transcript according to our own dictionary. The weight of social word i is its term frequency times the log of the number of transcripts in the sample divided by the number of transcripts containing word i. The variable is standardized to unit variance.	Refinitiv, Self-estimated
GOV $\text{Share}_{\text{tf.idf}}$	Term frequency and inverse document frequency weighted governance communication of a transcript according to our own dictionary. The weight of governance word i is its term frequency times the log of the number of transcripts in the sample divided by the number of transcripts containing word i. The variable is standardized to unit variance.	Refinitiv, Self-estimated
ENV Share	Fraction of environmental communication of a transcript according to our own dictionary.	Refinitiv, Self-estimated
SOC Share	Fraction of social communication of a transcript according to our own dictionary.	Refinitiv, Self-estimated
GOV Share	Fraction of governance communication of a transcript according to our own dictionary.	Refinitiv, Self-estimated
Panel B: Key Independent Variables		
ESG Score	Weighted average of the environmental, social and governance pillar scores that is normalized by industry.	MSCI
Environmental Pillar Score	The Environmental Pillar Score measures the management of and exposure to key environmental risks and opportunities.	MSCI
Social Pillar Score	The Social Pillar Score measures the management of and exposure to key social risks and opportunities.	MSCI
Governance Pillar Score	The Governance Pillar Score measures the management of and exposure to key governance risks and opportunities.	MSCI
Environmental Opportunities Score	This score summarizes issues regarding the opportunities in clean tech, in green building and in renewable energies.	MSCI
Climate Change Score	This score summarizes issues regarding carbon emissions, the carbon footprint, financing environmental impact and climate change vulnerability.	MSCI
Waste Management Score	This score summarizes issues regarding toxic emissions, packaging materials and electronic waste.	MSCI
Natural Resource Usage Score	This score summarizes issues regarding water stress, biodiversity, land use and sourcing of raw materials.	MSCI
Human Capital Score	This score summarizes issues regarding the development of human capital, labor management, health and safety and supply chain standards.	MSCI
Product Safety Score	This score summarizes issues regarding the privacy and security of data, product quality and chemical safety.	MSCI
Social Opportunities Score	This score summarizes issues regarding the access to finance, communications and health care for the society.	MSCI
Business Ethics Score	This score summarizes issues regarding business ethics and tax transparency.	MSCI
Log(Scope 1)	Natural log of scope 1 carbon emissions.	MSCI
REP	Dummy variable that equals one if the individual shareholder lives in a US state or the institutional investor is headquartered in a US state that voted Republican in a presidential election.	Self-estimated
Panel C: Key Control Variables		
RoA	The net income of the company divided by total assets of the company.	Refinitiv
Ln(Total Assets)	Natural log of total assets.	Refinitiv
Fixed Assets to Total Assets	The total fixed assets of the company divided by total assets of the company.	Refinitiv
Leverage Ratio	The total debt of the company divided by total assets of the company.	Refinitiv
Capex to Total Assets	The total capital expenditures of the company divided by total assets of the company.	Refinitiv

IV.7 Second Appendix

- **Individual Shareholder:** Hi. My name is David Sims. I own 15 shares. And as has been mentioned before we've had a good last three or four years and made about $8.8 billion profit since 2008. And, yes, as you have said before, Mr. Hay, you have paid taxes. This company has paid taxes has in accordance with the law. Everything you have done has been in accordance with federal tax policy, yet even though we have I think the fact that this company has had a net remittance from the government of $174 million in taxes, not only didn't we pay anything, but the government has paid, I think that's against the intent of federal tax policy. And even though you didn't break the law and even though you have invested a lot of money to build new plants and that's why you have written off taxes, had a tax write off, I think that's not – that's against the intent and it's really not right. A company with this large earnings should pay its fair share and you should not, we should not ask for a rate hike from the rate payers, from the electricity users until we start paying a reasonable share of taxes. Thank you.

- **(Former) Employee:** I'm Gary Patton. I'm a 21-year employee with The Home Depot out of Greenville, South Carolina. I appreciate the last question that was asked, and I wanted to ask you something specific also. I'm having a hard time figuring it out completely. How is the implementation of the Affordable Care Act which should be fully implemented in January I believe of next year affecting us employees here with The Home Depot in our deductions, our medical coverage, and all of that, can you foresee or share with me in layman's terms how that might be affecting us? (...). My name is Len Corky. I'm a Baxter retiree and I have Baxter stock. I was with Baxter from 1955 to 1986. I have a suggestion that

Baxter consider the use of solar panels and we can – it would be good PR because we can boast that we can save the lives of people, but we're also improving the environment by using a less contaminating source of energy. Thank you.

- **Trade Union:** Good morning. My name's Michael Hogan. I'm a labor organizer for the International Brotherhood of Teamsters. I work in Boston, Massachusetts. And I have two questions, Mr. Chairman. My first question - and if I can pose it this way - I've met with some of your front-line workers in my home state and there's a problem when some of the workers are afraid to organize because they're afraid that your supervisors or your managers, through their intimidation and the fear that the make their employees feel, they're afraid that they'll lose their job. So, what I'd like to see today is a commitment from you, that you'd sit down with our general president, James P. Hoffa and negotiate a neutrality agreement so that, in the future, any workers that may feel suppressed or angered or that they have some problems, that if they come to a labor organization such as ours, that they may organize without fear of losing their jobs.

- **Asset Manager:** Luke Berman, portfolio manager and shareholder, just some brief comments and questions. First, congratulations to your move to a new high-tech HQ, for the hands-down number one premium quantitative financial company in the world. As compared to other stocks, our stock, MHFI, have outperformed the general broad spectrum of stocks in the averages and then in our peer category group. In fact, MHFI is one of the only iconic companies which has not had revenue or earnings problems this year and has fully recovered its momentum moving now to higher highs up to the general market malaise in February and this deep decline that we had. You stated that we are primarily finished with

restructuring the move up to the J.D. Power sales completed later in the fall. As we now seem to be at an inflection point in the economy and the stock market, it will be harder to achieve double-digit earnings gains unless the extrapolate – extrapolated economic expansion by the Federal Reserve continues which has two different interest rate increases projected for 2016. Now that you have a firm handle on the pulse of the Company, do you – how do you expect the organic growth to materialize that it'd be very difficult over the next few years?

- **Analyst:** All right, Mike Mayo, Wall Street analyst. What a difference a year makes. Again, I come to these Annual Meetings, it's the only chance – once a year chance so I can ask questions of the Independent Directors, and have the Independent Directors be publicly held accountable. So James hopefully, you can give an answer to my question. If Erskine Bowles can also respond, that would be great too. But my question is, what is the degree of confidence that Morgan Stanley can transition from restructuring to growth and why? And on the one hand the good news, since last year, you mentioned, revenue is flat, profits of $1 billion. That's good. Consensus Wall Street estimates have you meeting your financial target – your ROE target, this year. That's good. And certainly the stock price has gone from $26 to over $40 since last year's Annual Meeting. But the issue is, the restructuring seems to be in the later stages. Company-specific factors propel growth. They seem to be in the later stages. And there are some headwinds that you know about in terms of fixed revenues way above your target range, it'll probably be coming down. Your equity market share, you're a victim of your success. How much more share can you get? And then your wealth management assets have been showing kind of sluggish growth over time. You've made it work

through the restructuring, but the restructuring is in late stages. How do you get that revenue growth to propel your earnings growth going forward? And how confident can you be in getting that?

- **Public Asset Manager:** My name is Cindy Ernberg and I'm here as the deputy to California State Controller, John Chiang. I'd like to speak briefly to the election of board of directors, which I didn't have an opportunity to speak on earlier. The controller does support the election of directors this year, but with reservations, as he has some concerns regarding the company's long-term strategy to sustain its performance and the board's role in improving the Company's image with the public, with its own investors, and with regulators. Controller Chiang is a trustee of the California Public Employees' Retirement System and the California State Teachers' Retirement System, the nation's first and second largest public pension funds, with over $400 billion in assets. Together, these funds own $4 billion of Exxon Mobil. So many Californians have a substantial financial stake in the Company's long-term success. The board's most important role to provide independent oversight of management is compromised, we believe, when the CEO serves as chairman of the board. Combining these two roles has interfered with effective communications between shareowners and directors and has likely affected the Company's at least former positions in statements on climate change. Shareholders are happy today, but, frankly, until Mr. Tillerson's presentation, we hadn't seen the Company having a sustainable strategy for maintaining its high earnings. As Mr. Tillerson's presently surprising remarks acknowledge, the Company is under pressure like no other time in its history to meet growing global energy demands, but to do it in a less carbon intensive way. While we

support the candidates this year, by next year, the controller hopes to see evidence that the board is improving relationships with its shareholders, really positioning itself to reduce emissions, and earning our support by overseeing management. And as you continue to think about new members, are you seeking expertise with these challenges that I mentioned? Thank you for your time.

- **Religious Asset Manager:** My name is John Wilson. I'm with Christian Brothers Investment Services we're a shareholder of ExxonMobil. I want to follow-up on the question that was just asked and point to the fact that the Sarbanes-Oxley law strengthens requirements, the corporation has disclosed to shareholders in Securities filings, risk controls for material issues. Now our company has acknowledged that greenhouse gases cause global warming and that action is needed to prevent harm to the ecosystem. We differ with you in that we believe that it is a material risk to our business. In fact there are many uncertainties surrounding the future of an energy demand. Every day in the news we hear of new [inaudible] for new laws, regulations and technologies designed to reduce our reliance on oil and gas. Our ability to predict future demand for oil is clearly in doubt. Surely this is a material issue for shareholders of an oil company. Yet the company confidently predicts that oil and gas will continue to supply 60% of the world energy needs up until 2030, even as demand grows, and derives all of its strategic decisions from this particular prediction. No where does the company explain to shareholders what it plans to do if the future does not turn out exactly as it expects. In contrast, many of our competitors have reported their strategies to respond to climate change. Nowhere has ExxonMobil reported on any scenario planning to manage these risks. So my question is for Mr. Houghton and for the auditors, what risk

controls has the company established to mitigate the risk of climate change and how can shareholders evaluate the effectiveness of these controls? Thank you.

- **NGO:** Hello. My name is Susan Okie, and I'm here on behalf of People for the Ethical Treatment of Animals, and our more than 2 million members and supporters worldwide. Our members are all consumers who strongly object to the cruel treatment of animals. ExxonMobil has worked well with PETA on animal testing issues over the past few years and I hope we'll have the same cooperative and productive relationship on this animal and entertainment issue. Last year, ExxonMobil pledged $1.25 million in funding over the next five years for educational materials that promote the Iditarod to school children. The Iditarod, as many of you know, is a 1,150 mile course over which dogs are forced to run more than 100 miles per day for almost two weeks straight. The dogs must pull heavy sleds through some of the worst weather conditions on the planet and, as a result, they routinely die on the course. Many dogs used in the Iditarod suffer from pulled muscles, stress fractures, diarrhea, dehydration, intestinal viruses, or bleeding stomach ulcers. Mushers ride, eat, and sleep on the sleds while the dogs continue to run. One dog collapsed and died from gastric ulcers during this year's Junior Iditarod. And in 2009, six dogs died, including two who were believed to have frozen to death. The Iditarod Trail Committee rarely punishes abusive mushers, even those who have been caught beating exhausted dogs in order to keep them running. Mushers participate in the race because of the prize money, not because they believe the dogs enjoy it. Dogs used in the Iditarod are treated as if they are outdoor equipment. They aren't allowed inside the house with the family and then never get to play a game of catch. The vast majority of dogs who

are used to pull sleds live at the end of a very short chain. Their entire world can be measured in a few muddy feet. Iditarod sponsorship and prize money has declined over the past few years and, in an attempt to increase support, event organizers have shamelessly marketed this punishing ordeal as an event that benefits dogs. And now, one that benefits students as well. ExxonMobil could easily fund educational materials for students across the country that excludes the Iditarod. My question is this. Can consumers hear that ExxonMobil will commit to refusing to renew its sponsorship of the Iditarod, a dwindling industry that promotes and causes egregious animal suffering?

- **Religious Organization:** Yes, it is. My name is Michael Crosby. I'm an Capuchin Franciscan Friar from Milwaukee. And I wasn't planning on asking the question, just presenting a resolution. But there was a young man that raised a question that has been a question with us, I know you're international and not domestic, but our ministries are highly invested among poor people in Detroit and Milwaukee through the most economically depressed areas. And the data does show that in economically depressed less educated communities, there?s a higher rate of smoking. I think his question was related to that on a global basis and I don't think you were able – I was not able – but you didn't answer another element of his question. How do you deal with that fact if it is a fact globally, are less educated, poor people tend to be outside, I know data for the United States, it is, but what is it for outside in your market, are the majority of your smokers, less educated, poor, I just would like to know the data that's all? Would you have data on it?.

- **Proxy:** Mark Nickerson, proxy holder. With the growth you've seen in retail

volume, do you anticipate rolling out more weekly options, for example, Tuesday and Thursday S&P option? Or making the universal settlement times for C, B options for buy options instead of different – Wednesdays, Fridays?

IV.8 Third Appendix

- **ENV:** 2-degree, abatement, acidification, agriculture, air, align, aligning, alignment, alternative, animal, animals, annihilation, arctic, atmosphere, aware, awareness, batteries, battery, below, biodiversity, biofuel, biofuels, biological, biomass, biphenyls, building, buildings, burn, burning, capture, car, carbon, carbon-free, carbon-intensive, carbon-neutral, carbon-related, cars, catastrophe, catastrophes, catastrophic, CDP, celsius, chain, change, chemical, chemicals, chronic, circular, clean, clean-energy, cleaner, cleanup, climate, climate-change, climate-friendly, climate-related, CO2, CO2-emitter, CO2-footprint, coal, coastal, combustion, commitment, conservancy, conservation, conserve, consumption, contaminat, contaminated, contamination, COP, COP21, curb, curbing, cyclones, decarbonize, deforestation, degradation, degrade, degrees, diesel, dioxide, dirty, disasters, disclosure, disposal, drill, drilling, drought, eco-activis, ecocide, eco-friendly, ecological, ecosystem, ecosystems, efficiency, efficient, electric, electricity, electrify, emission, emissions, emit, energy, energy-efficiency, energy-efficient, environment, environmental, epa, erosion, ETS, exploration, externalities, extraction, fire, fires, flood, flooding, floods, footprint, forest, fossil, fracturing, freshwater, fuel, fuel-efficient, fuel-eficien, fuels, future, gas, gases, generation, generations, geothermal, ghg, ghgs, glacial, global, goal, goals, goas, green, greener, greenewashing, greenhouse, greenpeace, green-tech, GRI, grid, groundwater, habitat, hazardous, heat, heatwave, heatwaves, householding, hurricane, hurricanes, hybrid, hydraulic, hydro, hydroelectric, ice, IEA, impact, impacts, innovation, intensity, Kyoto, land, leak, lithium, low-carbon, melting, metals, methane, minerals, mitigate, mitigation, mobility, natural, nature, negative, net, net-zero, neu-

tral, neutrality, nitrogen, nitrous, non-renewable, nuclear, ocean, oil, oxide, ozone, packaging, Paris, pesticide, pesticides, petrol, petroleum, planet, planetary, plants, plastic, poison, poisoned, pollut, pollutants, pollute, polluted, pollution, positive, power, precipitation, preservation, prevention, PRI, produce, production, protect, protecting, protection, rain, rainforest, recycl, recycle, recycling, reduce, reducing, reduction, refineries, refinery, reforestation, renewable, resilience, resource, resource-efficient, resources, resource-saving, responsible, rise, SBTI, scarce, scarcity, scenario, SDG, sea, smoke-free, snow, snowmelt, soil, solar, sourcing, species, storage, storm, storm-related, storms, sulfur, sustainability, sustainable, target, targets, taxonomy, TCFD, technologies, technology, temperature, temperatures, threat, threatened, tidal, toxic, traceability, transformation, transition, transitioning, transport, transportation, UN, upcycl, utilities, vehicle, vehicles, vulnerability, vulnerable, warming, waste, waste-reduced, wastes, waste-to-energy, water, water-saving, wave, waves, weather-related, welfare, wetland, wetlands, wilderness, wildlife, wind, wind, wood, zero, zero-carbon

- **SOC:** abortion, abus, abuse, access, accessibility, accident, accidents, accountability, addiction, addictive, advocacy, affordable, african-american, aid, aids, alleviate, antidiscrimination, anti-racism, anti-union, asian, assault, assistance, bargaining, benevolent, black, black americans, blacks, blue-collar, bribe, brutality, cancer, care, caregiver, caring, charit, charitable, charities, charity, child, childbirth, childcare, children, citizen, citizens, citizenship, civic, civil, colleagues, collective, communit, communities, community, compassion, conditions, conflict, conflicts, contract, contractor, contractors, corruption, cultural, custody, data, death, deaths, decent, democracy, demographic, departure, departures, deporta-

tion, die, died, dignity, disabilities, disability, disabled, disadvantaged, discriminate, discriminated, discriminating, discrimination, dislocated, dismissal, dismissals, disparity, displace, diverse, diversity, divide, domestic, donate, donated, donates, donating, donation, donations, donors, drinkable, drug, educate, educated, educates, educating, education, educational, elder, elderly, empathy, employ, employee, employee-friendly, employees, employer, employment, empower, empowerment, endowment, endowments, entrepreneurship, epidemic, equal, equality, equity, ethic, ethical, ethnic, ethnically, ethnicities, ethnicity, exhausted, exhaustion, exploitation, expression, fair, fairness, families, family, female, females, forced, freedom, friendly, fundamental, gap, gay, gays, gender, genders, genero, genocide, gift, gifts, gun, harassment, harmony, hate, health, healthcare, healthier, healthy, hire, hired, hires, hiring, hispanic, hispanic-american, hiv, homeless, homelessness, homosexual, hours, housing, human, humanit, humanitarian, humanity, humankind, hunger, ill, illness, ilo, immigra, immigrant, immigrants, immigration, inclusion, inclusive, income, indigenous, inequal, inequality, injuries, injury, integrity, intoxication, intoxications, job, jobs, judicial, justice, labor, labour, latino, latinos, layoff, layoffs, learning, lesbian, lesbians, lgbt, lgbtq, lgbtq+, life, life-transforming, literacy, livelihood, lives, living, local, low-income, low-paying, low-wage, malnutrition, mankind, marginalized, marriage, maternity, medicaid, medicare, medicine, medicines, mental, microcredit, microfinance, microfnance, migrant, migrants, migration, minorit, minorities, minority, moral, multiculturalism, nations, nondiscrimination, nonprofit, non-profit, nonviolence, nourish, occupation, occupational, opportunities, oppression, orientation, origin, overtime, paid, pandemic, parental, peace, pension, people, philanthropic, philanthropy, police, poor, poorest, population, populations, poverty,

prejudice, prevention, privacy, profiling, profits, profit-sharing, promote, pro-social, prosperity, protection, protest, protests, public, quality, race, racial, racism, racist, refuge, refugee, refugees, religion, religious, respect, restructure, restructuring, retiree, retirees, retiring, right, rights, robotization, safe, safety, satisfaction, scholarships, second-class, security, servitude, sex, sexism, sexual, sick, sickness, skill, skilled, skills, skin, slave, slavery, slaves, social, socially, societal, society, solidarity, sourcing, staffing, standardization, stress, strike, strikes, suicide, suicides, teaching, teamwork, traceable, trade, trafficking, training, transgender, transparency, underpaid, underprivileged, underrepresented, unemployment, unfair, union, unionization, universal, unrest, veteran, veteran-owned, veterans, violate, violence, vocational, volunteer, vulnerable, wage, wages, war, welfare, wellbeing, well-being, wellness, woman, women, women-owned, worker, worker-friendly, workers, workforce, working, work-life, workplace, workplace, workplaces, young, youth

- **GOV:** accountability, accounting, agenda, anti-competitive, anti-corruption, anti-voting, antivoting, audit, audited, auditing, auditor, auditors, audits, authority, autonomy, award, awarded, awarding, awards, ballot, ballots, board, bonus, bonuses, bribery, bureaucracy, bylaw, bylaws, cash-bonus, cast, censorship, CEO, CFO, chairman, charter, charters, checks, clawback, collusion, committee, committees, compensate, compensated, compensates, compensating, compensation, compliance, composition, conduct, conflict, conflicts, conformity, constitution, contributions, control, controlling, controls, corrupt, corruption, coso, cost-benefit, cuts, decentralization, decision-making, delegation, diligence, director, directors, disclose, disclosed, discloses, disclosing, disclosure, disclosures, dividend, divi-

dends, duty, elect, elected, electing, election, elections, elects, embezzlement, empowerment, enforcement, engagement, equity, ethics, evasion, executive, expert, expertise, extortion, federalism, fee, feedback, fees, fiduciary, fiscal, fraud, fraudulent, governance, governing, grassroots, guidelines, hotline, incentive, incentives, independence, independent, influence, influences, influencing, inform, information-sharing, innovation, insider, insiders, inspector, inspectors, integrity, interdependence, internal, investor, investors, laundering, leadership, legitimacy, litigation, litigations, lobbied, lobbies, lobby, lobbying, lobbyist, lobbyists, long-term, malus, management, meritocracy, misappropriation, misconduct, monitor, monitoring, monitors, nepotism, networking, nominate, nominated, nomination, nominations, nominee, nominees, non-executive, non-financial, norm, norms, notice, oligarchy, oversee, overseeing, oversees, oversight, ownership, parachute, parachutes, pay, pay-for-performance, paying, payout, payouts, pay-to-play, performance, pill, planning, poison, policy, policy-making, power, presentation, presentations, presidency, press, principles, privatization, procedure, procedures, procurement, proponent, proponents, proposal, proposals, pro-shareholder, proxies, proxy, qualification, qualifications, quorum, quota, recruit, recruiting, recruitment, reform, regulation, regulatory, remuneration, report, reporting, reports, representation, reputation, reputational, resign, resignation, resigned, responsibility, retain, retainer, retainers, retaining, retention, retirement, revenue, review, reviewed, reviewing, reviews, reward, rewarding, rewards, risk-management, rotation, rule, rules, salary, sanction, sanctions, say-on-pay, scrutiny, secrecy, security, self-determination, self-governance, separation, shareholder, shareholders, shares, short-term, sovereignty, spending, stability, stakeholder, stakeholders, statement, statements, statute, subsidiarity, succession, supervision, super-

visory, talent, talented, talents, tax, taxes, tenure, track-record, training, transparency, transparent, vacancies, vacancy, vested, vesting, vests, violation, vote, voted, votes, voting, voting rights, whistleblower, whistleblowers, whistleblowing

Chapter V

The ESG Trade-off

Coauthors:

Peter Limbach

P. Raghavendra Rau

Relative share:

60%

The ESG Trade-off

Abstract

We provide evidence indicating that firms must trade trade-off costly investments in the three ESG pillars. Using MSCI ratings, we find that the S(ocial) pillar has a negative relationship with both the E(nvironmental) and G(overnance) pillar. Results for the E pillar are driven by scores for climate change and environmental opportunities. They are more pronounced for firms with financial constraints and greater exposure to climate risk. We exploit the Paris Climate Agreement and the Dodd-Frank Act as shocks necessitating investments in the E and G pillar, respectively. Results suggest that firms prioritize environmental and governance investments at the expense of social initiatives, particularly in the face of regulatory pressures and resource limitations.

Keywords: Climate change, Corporate sustainability, ESG, Investments, Trade-off

JEL-Codes: G11, G30, G34, M14

V.1 Introduction

The increasing importance of environmental, social, and governance (ESG) factors in corporate decision-making reflects a growing recognition of the interconnectedness between corporate sustainability and long-term firm value. In recent years, stakeholders—including investors, policymakers, and the general public—have increasingly demanded that firms not only prioritize profitability but also demonstrate responsible behavior toward the environment, society, and their own governance structures. This shift has led to the widespread adoption of ESG frameworks as critical components of strategic decision-making, compelling firms to allocate resources across these three pillars to enhance their sustainability profiles. However, despite the conceptual appeal of integrated ESG strategies, implementing a balanced approach in practice presents significant challenges. This paper examines the interplay between the E, S, and G dimensions, exploring whether firms can effectively invest in all three pillars simultaneously or if they face trade-offs that require prioritization among them. Prior research highlights that resource constraints, varying stakeholder demands, and sector-specific pressures can lead firms to prioritize certain aspects of ESG over others. For example, companies heavily exposed to climate risk or operating in industries with high environmental impact may allocate disproportionate resources to the environmental pillar, potentially neglecting social or governance dimensions. Contrarily, firms under intense scrutiny for governance issues may divert attention from environmental initiatives to focus on improving board oversight, compliance, and ethical conduct. These trade-offs imply that pursuing an optimal ESG strategy is not merely a matter of implementing best practices but rather involves complex decision-making processes influenced by external and internal pressures. This study addresses a critical gap in the ESG literature by systematically

analyzing the trade-offs between the E, S, and G pillars using a comprehensive dataset of U.S. firms from MSCI ESG Ratings, covering the period from 2013 to 2019. By examining firm-level ESG scores and sub-scores, we investigate whether firms are able to invest uniformly across the three pillars or if they exhibit patterns of prioritization that reveal underlying trade-offs. Specifically, we focus on the relationship between the social pillar and the environmental and governance pillars, hypothesizing that firms with high environmental and governance scores may exhibit lower social scores, and vice versa. Such trade-offs are particularly relevant for firms facing financial constraints, as limited resources may necessitate a zero-sum allocation among competing sustainability priorities. To explore these relationships, we combine cross-sectional analyses with the use of exogenous shocks to isolate causal effects. We begin by examining the basic correlations between the E, S, and G pillars across firms, controlling for a battery of firm-specific factors. Our baseline findings suggest a negative relationship between the S pillar and both the E and G pillars, indicating that firms often prioritize environmental and governance investments at the expense of social initiatives. This effect persists across various sub-components of the S pillar, including Human Capital, Product Safety, and Social Opportunities, suggesting that the observed trade-offs are not limited to a single aspect of social sustainability but rather permeate multiple dimensions. Further, we extend our analysis by examining heterogeneity across firms based on their financial constraints and industry characteristics. We find that, financially constrained firms, defined as those with high leverage ratios or a high SA index score as proposed by Hadlock and Pierce (2010), exhibit a trade-off between environmental and social sustainability that is significantly stronger, as limited financial resources restrict their ability to invest broadly in sustainability initiatives. In these cases, firms often prioritize the pillar that is most directly linked to their strategic goals or the one that presents the highest im-

mediate regulatory or reputational risk. For example, firms in high-risk sectors such as energy and utilities, which are subject to stringent environmental regulations, are more likely to invest heavily in the environmental pillar at the expense of social and governance aspects. This prioritization is further exacerbated for younger firms, which tend to face greater capital constraints and have less developed internal governance structures.

Given the potential endogeneity concerns in examining ESG trade-offs, we adopt a quasi-experimental design by leveraging two major regulatory events: the Paris Climate Agreement in 2015 and the Dodd-Frank Wall Street Reform and Consumer Protection Act in 2010. These events serve as exogenous shocks that altered firms' incentives to invest in environmental and governance dimensions, respectively, providing a natural experiment to test how firms reallocated resources in response. The Paris Agreement heightened the regulatory and reputational risks associated with climate change, compelling firms to enhance their environmental profiles. Similarly, the Dodd-Frank Act imposed stricter governance requirements on firms, increasing the costs of maintaining or improving governance structures. By comparing ESG investment patterns before and after these regulatory shocks, we provide robust evidence on how firms adjusted their ESG strategies, thereby confirming trade-offs between the pillars. Our results show that, the average firm's trade-off between E and S increased during the period between the ratification of the Paris Agreement and the withdrawal. Further, the results suggest that the average firm's S decline after the adoption of the Paris Agreement possibly due to a increased focus on the environmental sustainability of firms. Especially firms which belong to the most sustainable firms in our sample experienced a stronger decrease of their S scores after November 2015 Conversely, the implementation of the Dodd-Frank Act was associated with an increase in governance scores, accompanied by a similar decline in social scores, particularly for firms that were previously lagging in governance

practices. These findings underscore the difficulty firms face in balancing competing ESG priorities when external pressures elevate the importance of specific pillars. To isolate the effects of climate-related risks on ESG trade-offs, we also explore the role of exogenous environmental shocks, such as hurricanes, using data from the National Centers for Environmental Information (NCEI). Firms headquartered in regions that experienced significant hurricane damage in the preceding year are more likely to shift resources toward environmental investments, often at the cost of social initiatives. The heightened salience of climate risks in these firms' strategic considerations appears to drive a reallocation of ESG resources, providing further evidence that firms adjust their ESG priorities in response to external shocks, even when doing so undermines other sustainability objectives.

Finally, we explore the potential consequences of these trade-offs for firm performance and stakeholder outcomes. Firms that prioritize environmental or governance initiatives at the expense of social sustainability may experience unintended negative outcomes, particularly in terms of employee satisfaction and retention. Using Glassdoor data on employee perceptions, we find that firms with low social scores tend to receive lower ratings on work-life balance and employee benefits, suggesting that the neglect of social initiatives can adversely affect workplace culture and employee morale. Furthermore, firms with higher social scores are more likely to be included in the list of the 100 Best Companies To Work For in America, indicating that social investments are not merely altruistic but can enhance a firm's attractiveness to top talent and contribute to long-term competitiveness. Conversely, firms that deprioritize social investments may face reputational risks and higher turnover, which could undermine the potential gains from environmental or governance initiatives.

The remainder of this paper is organized as follows. Section V.2 describes the data

collection procedure and our empirical methodology and provides descriptive statistics for our sample. Section V.2 presents the results of our trade-off analysis. Finally, Section 4 concludes.

V.2 Data, Methodology and Summary Statistics

To examine a potential trade-off between the different ESG pillars for U.S. companies, we rely on ESG data from MSCI ESG Ratings, one of the top 3 ESG rating providers. MSCI ratings are frequently used in practice and constitute the most commonly used ESG data in the academic literature. We gather ESG data for all U.S. companies included in the MSCI ESG database for each quarter during the time period between Q1 2013, when MSCI's data coverage increased sharply, and Q4 2019. Besides retrieving data on each pillar score (i.e., E, S, and G), we also retrieve data on the four subcomponents of the S pillar, namely Human Capital, Product Liability, and Social Opportunities. The sub-component Human Capital measures the performance for labour management, health and safety of employees, the development of human capital as well as the compliance with standard supply chain standards. Product Liability measures a company's efforts with regard to product safety and quality, chemical safety, privacy and data security, and the financial protection of consumers. Social Opportunities captures how well a company provides access to finance, communication, health care, and nutrition. Additionally, we also obtain data on the sub-components of the E (i.e. Environmental Opportunities, Climate Change, Waste Management and Natural Resource usage) and of the G (i.e. Corporate Governance and Corporate Behavior) pillar. MSCI ESG Ratings uses a scale from 0 (least sustainable) to 10 (most sustainable). MSCI calculates each company's exposure to key ESG risks based on a granular breakdown

of a company's business: its core product or business segments, the locations of its assets or revenues, and other relevant measures, e.g., outsourced production. MSCI takes into account the extent to which a company has developed robust strategies and has demonstrated a strong track record in managing its specific level of risks or opportunities. Ongoing or structural controversies occurring within the last three years lead to a deduction from the score. Lastly, we use the list of the 100 Best Companies To Work For In America, as provided by Alex Edmans (https://alexedmans.com/data/) and used in Edmans (2011) and Edmans (2012), among others. For the U.S. firms covered by MSCI ESG Ratings, we retrieve firm specific data from Refinitiv Eikon. This accounting data includes net income to total assets, price to book ratios, total assets, total debt to total assets as well as the age of the company (in quarters, since incorporation). We winsorize these variables at the 1st and 99th percentiles. Appendix A provides an overview and detailed definitions of all variables used in the paper. Further, we assign each company to its respective industry based on 3-digit SIC codes. We end up with a quarterly firm panel including ca. 59,000 observations for almost 3,000 firms with available accounting and sustainability data. For our cross-sectional analyses, we complement this sample with additional data. First, to proxy a firms exposure to climate risk, we use the climate-change exposure measure, CCE, proposed by Sautner et al. (2023*a*). The measure is based on 86,152 transcripts of quarterly earnings conference calls across 10,673 firms from 34 countries between 2002 and 2021. To accommodate the dynamic nature of climate change-related vocabulary, the authors rely on a machine learning based keyword algorithm proposed by King et al. (2017). Based on a small list of initial bigrams the algorithm constructs a model that predicts whether a sentence is related to climate change. CCE is the sum of climate change-related bigrams scaled by the total number of bigrams in the corresponding transcript. Furthermore, to exploit ex-

ogenous variations, we obtain data on state-level climate change adaption plans (SCAP) in different U.S. states from He et al. (2023) as a plausible exogenous increase in the perceived climate regulatory risks of local firms. Lastly, we follow Fich & Xu (2023) and collect data on hurricanes from the National Centers for Environmental Information (NCEI). For each hurricane, we obtain information on the start and end dates, state and zone FIPS codes, and the estimated damage value. We exclude all hurricanes which have an inflation adjusted damage value below $50 million.

V.2.1 Empirical Methodology

To examine a potential ESG trade-off in the cross-section of firms, we conduct regressions in the form of equation (1):

$$SocialPillarScore_{i,t} = \beta_1 * EnvironmentalPillarScore_{i,t} + \beta_2 * GovernancePillarScore_{i,t} + \gamma_2 * CONTROLs_{i,t-1} + \mu_t + \alpha_i \quad \text{(V.1)}$$

We regress the S score, i.e., $Social\ Pillar\ Score_{i,t}$, on the two other ESG scores, $Environmental\ Pillar\ Score_{i,t}$ and $Governance\ Pillar\ Score_{i,t}$, along with firm controls $CONTROLS_{i,t-1}$ which is a vector of firm-level accounting variables including firm age and size (i.e., ln(total assets)), leverage, market to book ratio, and return on assets. Further, we use firm (α_i) and quarter fixed effects (α_t) to control for unobserved heterogeneity. All control variables enter the regressions with one lag. All regressions include an intercept and an error term. In all regressions, we cluster standard errors at the firm level. We re-estimate equation V.1 using the sub-components of the S score, i.e., Human Capital, Product Liability, and Social Opportunities, as the dependent variable and the sub-components of the E score (i.e. Environmental Opportunities, Climate Change,

Waste Management and Natural Resource usage) and of the G score (i.e. Corporate Governance and Corporate Behavior) as independent variables. If firms trade off investments in environmental and social sustainability, we expect to find a negative coefficient on $Environmental\ Pillar\ Score_{i,t}$ when used to explain $Social\ Pillar\ Score_{i,t}$, and vice versa. On the contrary, if the average firm invests broadly in ESG, we expect to find a positive relation between the two above variables. The same logic should apply to the sub-components of the E,S and G scores.

Furthermore, if a trade-off between E and S scores exists, we expect it to be particularly strong for financially constrained firms, which tend to lack the resources to simultaneously invest in E and S. In this regard, Cheng et al. (2014) provide evidence that younger and highly leveraged companies usually do not have sufficient funding to take care of all three ESG dimensions. To test whether a potential trade-off between E and S is more pronounced for financially constrained firms, we interact the variable $Environmental\ Pillar\ Score_{i,t}$ with the indicator variable $Financially\ Constrained\ Firms_{i,t}$. We define a firm as financially constraint if either the leverage ratio is higher than the sample median or if the SA index as proposed by Hadlock & Pierce (2010) is higher than the median sample. If financial constraints reinforce the trade-off, we should expect to find a negative coefficient on the interaction term.

While we analyze an endogenous investment process, we still attempt to mitigate endogeneity concerns following the approach on Sautner & Starks (2023). More specifically, we exploit two related events that caused exogenous variation in firms' ESG preferences. The first event is the Paris Agreement, a legally binding international treaty on climate change adopted by numerous countries (including the U.S.) in December 2015. One can expect this event to increase firms' and investors' awareness for climate, or more generally, environmental issues. The idea is that with the Paris Agreement firms

and investors face higher regulatory and moral standards and risks, forcing them to increase their investments in environmental sustainability and ultimately their E scores. The second event is the U.S. withdrawal from the Paris Agreement announced by former President Donald Trump in June 2017. This event should, at least in part, lower firms' and investors' regulatory and moral standards and risks in terms of environmental sustainability, reducing their efforts to increase their E scores. This back-and-forth shift in U.S. policy provides us with a unique quasi-natural setting where both shocks refer to the same instrument.

We extend our trade-off analysis by examining the relationship between a companies' social score and it's exposure to climate change since climate-related issues are the main drivers of the E score. First, we interact the variable $Environmental\ Pillar\ Score_{i,t}$ with the indicator variable $Climate\ Change\ Exposure_{i,t}$ which measures the relative frequency with which climate change bigrams occur in earnings calls and is based on the dataset from Sautner et al. (2023*a*). We expect to find a negative coefficient on the interaction term since firms that have a greater exposure to climate change should invest more into the E pillar and thus neglect social aspects. As a second identification strategy, we use hurricane strikes that hit a companies' headquarter. Firms that directly experience the consequences of climate change may be more likely to focus environmental issues and thus disregard social aspects. We test this by interacting a companies's E score with their hurricane experience, $Hurricane_{t-4}$, which is a dummy variable and takes the value 1 if a hurricane occurred in the county where firm i was headquartered in the previous year. Lastly, we provide evidence on potential implications of the ESG trade-off for firms. Since the S score reflects how employees are treated, we expect companies with a high social score to have a higher satisfaction among its employees. To test whether firms with higher S scores indeed perform better with regard to employee

satisfaction, we regress Glassdoor ratings for average work-life balance (Avg. Work-life Balance) as well as for average company benefits (Avg. Company Benefits) on the S score, controlling for the other ESG pillars and the firm accounting controls described before. As an alternative dependent variable, we use the indicator Best Companies To Work For, which equals one if a firm is in the list of the 100 Best Companies To Work For In America Edmans (2011)).

V.2.2 Summary Statistics

Table V.1 presents summary statistics for the variables described above. In terms of the E, S and G pillar scores, which take on values between 0 and 10, the average is about 4.50, 4.20 and 5.40, respectively. Median values for the three ESG scores are almost identical, implying that the distribution of the scores is not skewed. Regarding the growth of the E, S and G score, both the E and the G score show positive cumulative annual growth rates over our sample period, while the S score has declined, both in the full unbalanced panel and when we focus only on those firms that have ESG ratings over the full sample period (i.e., the balanced panel). In terms of firm's accounting data, the average firm's size (i.e. the natural log of total assets) is 22.00, while firm age since incorporation is 30 years (120 quarters). Firms have a mean leverage of 63%, return on assets (RoA) of 2%, and a mean market-to-book ratio of 3.36. These numbers compare well to extant studies (e.g. Welch & Yoon (2023)).

Table V.1: **Summary Statistics**. This table reports summary statistics of the quarterly ESG variables and quarterly firm characteristics for the MSCI dataset. The sample period is Q12013-Q42019. All pillar scores and all sub-scores range from 0 to 10. All firm characteristics are winsorized at the 1% and 99% level.

Variable	No. of observations	Median	Mean	Std. dev.
ESG Pillar Score				
Environmental Pillar Score	59,921	4.500	4.500	2.100
Social Pillar Score	59,933	4.100	4.200	1.600
Governance Pillar Score	59,921	5.300	5.400	2.000
Environmental Sub-Scores				
Environmental Opportunities Score	22,286	3.800	4.000	1.500
Climate Change Score	54,850	6.000	5.500	2.600
Waste Management Score	35,087	5.400	5.300	2.500
Natural Resource Usage Score	36,088	4.200	4.300	2.300
Social Sub-Scores				
Human Capital Score	57,724	4.000	4.100	1.900
Product Safety Score	38,625	4.400	4.500	2.300
Social Opportunities Score	15,124	2.900	3.100	1.400
Governance Sub-Scores				
Corporate Governance Score	59,858	5.600	5.700	2.100
Corporate Behavior Score	20,982	4.400	4.500	2.000
Firm Characteristics				
Climate Change Exposure	51,807	0.000	0.001	0.003
Ln(Total Assets)	59,926	22.000	22.000	1.700
Total Debt / Total Assets	57,861	0.610	0.630	0.320
Return on Assets (RoA)	57,846	0.030	0.020	0.150
Market to Book	59,494	2.300	3.400	6.100
SA Index	59,926	-0.250	4.100	0.470

V.3 The trade-off between E, S, and G

V.3.1 Baseline results

Turning to the cross-section, table V.2 reports the results from regressions of equation V.1, i.e., we regress each firm's E, S and G score, respectively, on the two other ESG scores along with firm controls as well as firm and time fixed effects. Explaining the independent variable $Social\ Pillar\ Score_{i,t}$ via the contemporaneous environmental and

governance pillar scores in column (1), the coefficients on $Environmental\ Pillar\ Score_{i,t}$ and $Governance\ Pillar\ Score_{i,t}$ are negative and significant at the 1% level. More generally, the results in columns (1) and (2) suggest that firms appear to trade off investments in environmental and governance vs. social sustainability. Columns (3) to (7), which report results with various fixed effects and lagged pillar scores as independent variables mirror the results in column (1).

Table V.2: **The Relation between E, S and G**. This table reports coefficients from quarterly regressions of social pillar scores on other ESG scores with controls for company characteristics (for the previous period). The dataset uses an unbalanced panel. The sample period is Q12013-Q42019. Robust standard errors (in parentheses) are based on standard errors clustered by company. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Dependent variable	Social Pillar Score						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Environmental Pillar Score$_t$	0.073***	-0.073***		-0.049***	-0.063***	-0.070***	-0.054***
	(0.012)	(0.012)		(0.006)	(0.011)	(0.012)	(0.013)
Governance Pillar Score$_t$	-0.036***	-0.035***		-0.035***	-0.021***	-0.034***	-0.037***
	(0.008)	(0.008)		(0.004)	(0.006)	(0.008)	(0.009)
Environmental Pillar Score$_{t-1}$			0.035***				
			(0.008)				
Social Pillar Score$_{t-1}$				0.621***			
				(0.006)			
Governance Pillar Score$_{t-1}$			-0.018***				
			(0.006)				
Market to Book$_{t-1}$		0.001	0.001	0.001	0.003*	0.001	0.002
		(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)
Total Debt / Total Assets$_{t-1}$		-0.011	-0.002	0.011	-0.009	0.017	-0.001
		(0.045)	(0.046)	(0.019)	(0.042)	(0.046)	(0.050)
RoA$_{t-1}$		-0.023	-0.041	-0.013	0.026	0.024	-0.032
		(0.095)	(0.099)	(0.038)	(0.088)	(0.097)	(0.105)
Ln(Total Assets$_{t-1}$)		-0.166***	-0.175***	-0.063***	-0.110**	-0.136***	-0.117**
		(0.046)	(0.049)	(0.018)	(0.043)	(0.048)	(0.053)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	No	No	No
Time x Industry FE	No	No	No	No	Yes	No	Yes
Time x State FE	No	No	No	No	No	Yes	Yes
Observations	59,554	57,315	54,130	53,846	57,315	56,323	56,323
Adjusted R-squared	0.688	0.690	0.701	0.825	0.730	0.693	0.741

Further, panel A of table V.3 show results from regressions of the S score sub-components (i.e., Human Capital, Product Liability, and Social Opportunities) on the environmental and governance scores and the same controls and fixed effects. Again consistent with firms trading off environmental vs. social sustainability, we find a significantly negative coefficient on the variable *Environmental Pillar Score*$_{i,t}$ in all three columns. The findings indicate that a potential trade-off between E and S is not driven by individual social aspects but rather persists for all dimensions of S. Furthermore, the coefficient on *Governance Pillar Score*$_{i,t}$ is negative and significant when used to explain the two sub-components Human Capital and Product Liability. Yet, the relation between the G score and the s Social Opportunities is insignificantly positive. While this finding may point to a trade-off between investments in corporate governance and social sustainability, it may also simply reflect more shareholder orientation (e.g., more profit maximization) at the detriment of employees and customers of firms with high G scores.

Table V.3: **The Relation between E, G and S Sub-Scores**. This table reports coefficients from quarterly regressions of social sub-score on other ESG scores with controls for company characteristics (for the previous period). The dataset uses an unbalanced panel. The sample period is Q12013-Q42019. Robust standard errors (in parentheses) are based on standard errors clustered by company. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Panel A: Relation between Social Sub-Scores and E & G			
Dependent variable	Product Safety	Human Capital	Social Opportunities
	(1)	(2)	(3)
Environmental Pillar Score$_t$	-0.083***	-0.034**	0.117***
	(0.020)	(0.014)	(0.023)
Governance Pillar Score$_t$	-0.054***	0.034***	0.003
	(0.013)	(0.009)	(0.014)
Market to Book$_{t-1}$	0.004*	-0.004*	0.001
	(0.003)	(0.002)	(0.002)
Total Debt / Total Assets$_{t-1}$	0.072	-0.071	0.012
	(0.077)	(0.055)	(0.053)
RoA$_{t-1}$	0.227	-0.154	-0.034
	(0.159)	(0.122)	(0.080)
Ln(Total Assets$_{t-1}$)	0.048	-0.232***	0.107*
	(0.071)	(0.052)	(0.056)
Firm FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Observations	36,897	55,177	14,372
Adjusted R-squared	0.723	0.678	0.788

Panel B: Relation between Social and E & G Sub-Scores						
Dependent variable	Social Pillar Score					
	(1)	(1)	(3)	(4)	(5)	(6)
Environmental Opportunities Score$_t$	-0.174***					
	(0.027)					
Climate Change Score$_t$		-0.022**				
		(0.009)				
Waste Management Score$_t$			0.019			
			(0.013)			
Natural Resource Usage Score$_t$				0.009		
				(0.014)		
Corporate Governance Score$_t$					-0.018***	
					(0.007)	
Corporate Behavior Score$_t$						-0.139***
						(0.018)
Environmental Pillar Score$_t$					-0.071***	-0.053**
					(0.012)	(0.024)
Governance Pillar Score$_t$	-0.016	-0.038***	-0.020**	-0.019**		
	(0.014)	(0.008)	(0.010)	(0.010)		
Market to Book$_{t-1}$	0.009**	0.001	0.001	0.002	0.001	0.000
	(0.004)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)
Total Debt / Total Assets$_{t-1}$	-0.029	-0.019	-0.033	0.060	-0.012	-0.141**
	(0.095)	(0.049)	(0.055)	(0.066)	(0.045)	(0.063)
RoA$_{t-1}$	-0.036	-0.044	-0.064	-0.310*	-0.031	-0.144
	(0.269)	(0.106)	(0.100)	(0.159)	(0.095)	(0.111)
Ln(Total Assets$_{t-1}$)	-0.245**	-0.201***	-0.156***	-0.147**	-0.166***	-0.256***
	(0.096)	(0.050)	(0.054)	(0.066)	(0.046)	(0.067)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	21,331	52,421	33,614	34,550	57,175	19,904
Adjusted R-squared	0.674	0.698	0.695	0.699	0.690	0.734

In panel B of table 3 we analyze in which specific ESG dimensions companies might face a trade-off and regress the social pillar score against the environmental and governance sub-components. Columns (1) to (4) suggest that environmental opportunities and aspects regarding carbon emissions, the carbon footprint, financing environmental impact and climate change vulnerability, which are all captured by the variable $Climate\ Change\ Score_{i,t}$ are negatively related to the social score whereas the coefficients on the $Waste\ Management\ Score_{i,t}$ and $Natrual\ Ressource\ Usage\ Score_{i,t}$ do not indicate any significant relationship. Moreover, columns (5) and (6) show that companies with a good corporate governance and corporate behavior have lower social scores. Next, we examine heterogeneity in the cross-section of firms to provide more evidence in support of a trade-off between environmental and social sustainability. To this end, we use two measures, $High\ Leverage_{i,t-1}$ and $High\ SA\ Index_{i,t-1}$ to identify financially constrained firms. If firms really trade of the E and S pillars then those firms with financial constraints, which lack the resources to invest in both environmental and social sustainability, should exhibit a particularly pronounced negative relation between the variables $Environmental\ Pillar\ Score_{i,t}$ and $Social\ Pillar\ Score_{i,t}$. In this regard, several studies document financial constraints affect ESG decisions (e.g.,Cheng et al. (2014); Zhang et al. (2019); El Ghoul et al. (2011)). To test our empirical prediction, we re-estimate the regressions shown in columns (1) and (2) of table 2, adding two interaction terms of the two variables $Environmental\ Pillar\ Score_{i,t}$ and $High\ Leverage_{i,t-1}$ and $Environmental\ Pillar\ Score_{i,t}$ and $High\ SA\ Score_{i,t-1}$. The results are shown in table V.4. They suggest that the trade-off between environmental and social sustainability is significantly stronger for financially constrained firms. More specifically, the coefficients on the interaction terms are negative and significant in all regressions.

Table V.4: **The Relation between E, S and G for Financially Constrained Firms**. This table reports coefficients from quarterly regressions of social pillar scores and social sub-score on other ESG scores with controls for company characteristics (for the previous period). The dataset uses an unbalanced panel. The variable *High Leverage* is a dummy and takes the value 1 if the leverage ratio is higher than the median of the sample. The variable *High SA index* is a dummy and takes the value 1 if the SA Index as proposed by Hadlock and Pierce (2010) is higher than the median of the sample. The sample period is Q12013-Q42019. Robust standard errors (in parentheses) are based on standard errors clustered by company. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Dependent variable	Social Pillar Score			
	(1)	(2)	(3)	(4)
Environmental Pillar Score$_t$	-0.045***	-0.043***	-0.071***	-0.073***
	0.014	0.016	0.012	0.012
Governance Pillar Score$_t$	-0.032***	-0.035***	-0.035***	-0.038***
	0.008	0.008	0.009	0.009
High Leverage$_{t-1}$	0.298***		0.024	
	0.072		0.075	
Environmental Pillar Score$_t$ x High Leverage$_{t-1}$	-0.052***			
	0.014			
Governance Pillar Score$_t$ x High Leverage$_{t-1}$			0.007	
			0.014	
High SA Index$_{t-1}$		0.360***		0.073
		0.108		0.093
Environmental Pillar Score$_t$ x High SA Index$_{t-1}$		-0.056***		
		0.019		
Governance Pillar Score$_t$ x High SA Index$_{t-1}$				0.007
				0.013
Market to Book$_{t-1}$	0.001	0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)
Total Debt / Total Assets$_{t-1}$1	-0.015	-0.013	-0.016	-0.012
	(0.053)	(0.045)	(0.054)	(0.045)
RoA$_{t-1}$	0.015	-0.032	0.019	-0.028
	(0.124)	(0.094)	(0.124)	(0.094)
Ln(Total Assets$_{t-1}$)	-0.178***	-0.181***	-0.179***	-0.181***
	(0.055)	(0.047)	(0.054)	(0.047)
Firm FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Observations	47,797	57,315	47,797	57,315
Adjusted R-squared	0.668	0.690	0.668	0.690

Overall, the evidence provided in this section supports the notion that firms trade off investments in the E, S and G pillars, particularly E vs. S. On the one hand, we find that firms' E scores have increased between 2013 and 2019, whereas their S scores have declined. This time series pattern is stronger for firms with high E scores and those with financial constraints, which are likely to lack the resources to invest in E and S simultaneously. On the other hand, we find a significantly negative relation between E

and S scores in the cross-section of firms. This relation is also significantly stronger for financially constrained firms.

V.3.2 External factors driving the ESG trade-off

In the following, we attempt to answer the question of why firms focus on environmental sustainability at the expense of social sustainability. On the one hand, firms have been subject to direct public as well as regulatory pressure to focus more on environmental issues. On the other hand, institutional investors have put increasing pressure on firms to become more environmentally responsible because they themselves have been subject to public and regulatory pressure.

In this regard, we follow Sautner & Starks (2023) and exploit the 2015 Paris Agreement as an exogenous event to examine whether direct public and regulatory pressure to consider environmental sustainability drives firms' trade-off between environmental and social sustainability. In this regard, Seltzer et al. (2022) use the Paris Agreement as a shock to expected climate risk regulations and provide evidence that climate regulatory risks causally affect bond credit ratings and yield spreads. Further, the media climate change concerns index by Ardia et al. (2023) shows a sharp increase after the Paris Agreement was sealed. We analyze how the ratification and the later withdrawal by the U.S. relates to firms' E and S scores using the following variables of interest: $Post\ Paris_t$ is an indicator variable that equals one for all quarters after the adoption date of the Paris Agreement in December 2015, whereas $Post\ Paris\ and\ Pre\ Withdrawal_t$ is an indicator variable that equals one for the quarters between the adoption of the Paris Agreement in November 2015 and the withdrawal. We use these variables along with firm fixed effects and the same firm-level controls as in table V.2 to explain the

dependent variable $Social\ Pillar\ Score_{i,t}$. Column (1) in table V.5 presents the results from regressing $Social\ Pillar\ Score_{i,t}$ on $Post\ Paris\ and\ Pre\ Withdrawal_t$. The coefficient on the interaction term is negative and significant at the 5% level, indicating that the average firm's trade-off between E and S increased during the period between the ratification of the Paris Agreement and the withdrawal. This finding is consistent with the increased pressure to consider environmental sustainability that came with the Paris Agreement. Further, the results in column (2) in table V.5 suggest that the average firm's S decline after the adoption of the Paris Agreement possibly due to a increased focus on the environmental sustainability of firms. Especially firms which belong to the most sustainable firms in our sample experienced a stronger decrease of their S scores after November 2015 indicated by the negative coefficient on the interaction term $Environmental\ Leader_{i,t}$ x $Post\ Paris_t$.

Table V.5: **The Relation between E, S and Climate Change**. This table reports coefficients from quarterly regressions of social pillar scores and social sub-score on other ESG scores and climate change risk variables with controls for company characteristics (for the previous period). The dataset uses an unbalanced panel. The variable *Climate change exposure* measures the relative frequency with which climate change bigrams occur in earnings calls and is based on the Sautner et al. (2023*a*). The variable *Hurricane* is a dummy and takes the value 1 if a hurricane occurred in the county where firm *i* is headquartered in the previous year. The dummy *Post Paris and Pre Withdrawal* takes the value 1 for the period after the adoption date of the Paris Agreement in December 2015 and before Donald Trump announced the withdrawal from the Paris agreement in June 2017 and otherwise 0. The dummy *Post Paris* takes the value 1 for the period after the adoption date of the Paris Agreement in December 2015 and otherwise 0. The sample period is Q12013-Q42019. Robust standard errors (in parentheses) are based on standard errors clustered by company. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Dependent variable	Social Pillar Score			
	(1)	(1)	(3)	(4)
Environmental Pillar Score$_t$	-0.070***		-0.007	0.065***
	0.012		0.013	0.013
Governance Pillar Score$_t$	-0.035***	-0.021***	0.014	-0.035***
	0.008	0.007	0.009	0.008
Environmental Pillar Score$_t$ x Post Paris and Pre Withdrawal$_t$	-0.015**			
	0.006			
Environmental Leader$_t$ x Post Paris$_t$		-0.135***		
		0.047		
Environmental Pillar Score$_t$ x Hurriance$_{t-4}$			-0.040***	
			0.015	
Environmental Pillar Score$_t$ x Climate Change Exposure$_t$				-7.280***
				2.614
Post Paris$_t$		-0.066**		
		0.032		
Environmental Leader$_t$		-0.118**		
		0.049		
Climate Change Exposure$_t$				38.981***
				13.156
Market to Book$_{t-1}$	0.001	0.001	0.000	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Total Debt / Total Assets$_{t-1}$	-0.010	-0.011	-0.038	-0.003
	(0.045)	(0.045)	(0.061)	(0.049)
RoA$_{t-1}$	-0.020	0.000	-0.139	-0.076
	(0.095)	(0.095)	(0.125)	(0.105)
Ln(Total Assets$_{t-1}$)	-0.166***	-0.153***	-0.129**	-0.206***
	(0.046)	(0.046)	(0.056)	(0.052)
Firm FE	Yes	Yes	Yes	Yes
Time FE	Yes	No	Yes	Yes
Observations	57,315	57,315	53,365	50,674
Adjusted R-squared	0.690	0.813	0.614	0.688

Further, Krueger et al. (2020) provide survey evidence that the majority of institutional investors believe that climate risks can have a negative impact on the performance of the companies in their portfolios. Some of these risks, especially regulatory ones, have already begun to materialize. Sautner et al. (2023*b*) identify a risk premium associated with the climate-change exposure of firms. We, thus, use the climate-change exposure measure, as proposed by Sautner et al. (2023*a*), and interact it with the $Environmental\ Pillar\ Score_{i,t}$. We find that an increase in firms climate change exposure is associated with a higher trade-off between E and S. This might be due to the fact that firms with a higher degree of climate change exposure need to invest more of their resources into lowering their carbon emissions and their carbon footprint reduction or are firms which are at the forefront of the climate transition which do not focus on their social issues. To gain further robustness to this result, we also use data on the hurricane damage in counties in which companies are headquartered. We interact the variable $Social\ Pillar\ Score_{i,t}$ with the dummy $Hurricane_{i,t-4}$which takes the value 1 if a hurricane occurred in the county where firm i was headquartered in the previous year. The negative coefficient of the interaction term confirm our results indicating that firms which are directly affected by hurricanes tend to have a stronger trade-off compared to firms which do not experience any hurricane damages. The fact that managers actively see and feel and impact of climate change in neighborhood might lead to a higher awareness for climate-related issues.

Similarly, the Dodd-Frank Act imposed stricter governance requirements on firms, increasing the costs of maintaining or improving governance structures. Thus, we expect firms which have a high exposure to governance risks to exhibit a more pronounced trade-off. The results of the regression analysis examining the impact of the Dodd-Frank Act on governance and social pillar scores are summarized in Table V.6. Columns (1) to

(3) analyzes the full sample of firms whereas columns (4) to (6) examines only financial firms as they have the highest exposure to governance risks and were most affected by the Dodd-Frank Act. The implementation of the Dodd-Frank Act is associated with a significant increase in governance scores across firms in the full sample. This result reflects the Act's primary objective of strengthening corporate governance and accountability. However, this governance improvement comes at a cost: social scores decline significantly during the same period. These findings indicate a clear trade-off between investments in governance and social dimensions, where the prioritization of governance improvements under regulatory pressure negatively impacts social sustainability efforts. The coefficients in column (5) shows a stronger decline in social scores for financial firms, reflecting the sector-specific focus of the Act and indicating that financial firms were more significantly impacted by the governance and social trade-offs triggered by the Dodd-Frank Act. Finally, the coefficients on the interaction terms in columns (3) and (6) show that the trade-off between governance and social scores is particularly pronounced for financial firms under the Dodd-Frank Act. Financial institutions that were already performing well in governance face higher pressures to reallocate resources from social initiatives, due to the regulatory focus on governance.

Table V.6: **Shock to G**. This table reports coefficients from quarterly regressions of company social and governance scores on company (for the previous period). Columns (1) - (3) the full sample, whereas columns (4) - (6) cover only SIC 6 industry (financials) companies. The dummy *Dodd-Frank* takes the value 1 for the period after 2009 and otherwise 0. The sample period is Q12007-Q42019. Robust standard errors (in parentheses) are based on standard errors clustered by company. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

	Full Sample			Financials		
Dependent variable	Governance	Social	Social	Governance	Social	Social
	(1)	(2)	(3)	(4)	(5)	(6)
Dodd-Frank$_t$	0.543***	-0.692***		0.451***	-0.701***	
	(0.075)	(0.067)		(0.166)	(0.133)	
$Dodd-Frank_t \times Governance\ Pillar\ Score_t$			-0.411***			-0.430***
			(0.041)			0.080)
Market to Book$_{t-1}$	0.003	-0.001	0.001	0.001	-0.006	-0.008
	(0.003)	(0.002)	(0.002)	(0.011)	(0.007)	(0.005)
Total Debt / Total Assets$_{t-1}$	-0.189***	-0.054	-0.027	0.024	-0.155	-0.055
	(0.068)	(0.053)	(0.051)	(0.140)	(0.135)	(0.133)
Environmental Pillar Score$_t$	-0.023	-0.020	-0.030**	-0.081***	-0.080***	-0.066***
	(0.015)	(0.012)	(0.012)	(0.028)	(0.024)	(0.023)
Governance Pillar Score$_t$		0.005	0.394***		-0.020	0.362***
		(0.007)	(0.041)		(0.019)	(0.080)
Social Pillar Score$_t$	0.012			-0.042		
	(0.017)			(0.039)		
RoA$_{t-1}$	0.885***	0.006	-0.055	0.484	-0.819	-0.453
	(0.148)	(0.106)	(0.104)	(0.564)	(0.522)	(0.493)
Ln(Total Assets$_{t-1}$)	-0.217***	-0.112***	-0.118**	0.009	-0.533***	-0.247**
	(0.046)	(0.041)	(0.046)	(0.104)	(0.102)	(0.114)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	Yes	No	No	Yes
Observations	70,052	70,052	70,052	14,956	14,956	14,956
Adjusted R-squared	0.385	0.598	0.625	0.391	0.571	0.608

Lastly, we in table V.7 study the potential real implications for firms that neglect social issues and thus have low S scores. One possible outcome is that employee satisfaction may decrease since a declining S may indicate a below-average treatment of employees, which in turn may lead to a decreasing performance, as suggested by Edmans (2011). We examine the relation between the S score and firms' probability of being listed among the 100 Best Companies To Work For In America. To this end, we again estimate a lead-lag approach regressing the indicator variable Best Companies To Work For on the variable $Social\ Pillar\ Score_{i,t}$ along with the same controls as used in V.2. Furthermore, we use time and either firm or industry fixed effects. In-

dependent of the use of firm or industry fixed effects, we find a positive coefficient on $Social\ Pillar\ Score_{i,t}$, which is significant at the 1% level. Thus, firms with greater S scores are more likely to be rated among the best companies to work for in the U.S. Consistent with our previous evidence, Simon & DeVaro (2006) show that firms on the Fortune Magazine's lists of Best Companies earn higher customer satisfaction ratings than firms not on the list.

Table V.7: **Best Companies to Work For**. This table reports coefficients from quarterly regressions of employee satisfaction on ESG pillar scores with controls for company characteristics (both for the previous period). The dependent dummy *Best companies to work for* equals one if the companies was listed on the best companies to work of list in year *t*. Column 1 and column 2 show the results for firm and industry fixed effects, respectively. The sample period is Q12013-Q42019. Robust t-statistics (in parentheses) are based on standard errors clustered by company. ***, **, * denote statistical significance at the 1%, 5% and 10% level, respectively.

Dependent variable	Best companies to work for	
	(1)	(2)
Social Pillar Score$_{t-1}$	0.004**	0.263***
	0.002	0.029
Environmental Pillar Score$_{t-1}$	0.002**	0.073***
	0.001	0.023
Governance Pillar Score$_{t-1}$	-0.001	-0.060***
	0.001	0.021
Market to Book$_{t-1}$	0.001***	0.041***
	(0.000)	(0.006)
Total Debt / Total Assets$_{t-1}$	-0.004	-0.194
	(0.007)	(0.183)
RoA$_{t-1}$	0.013*	2.823***
	(0.007)	(0.541)
Ln(Total Assets$_{t-1}$)	0.010***	0.605***
	(0.002)	(0.031)
Time FE	Yes	Yes
Industry FE	Yes	Yes
Observations	54,147	54,147
Model	OLS	Logit

V.4 Conclusion

In this paper, we explore the dynamics between environmental, social, and governance (ESG) investments within firms, using a comprehensive dataset spanning from 2013 to 2019. We hypothesize that firms must trade trade-off costly investments in the three ESG pillars. We find consistent evidence that firms exhibit a significant trade-off between environmental and social scores, indicating that investments in environmental sustainability often come at the expense of social initiatives. This trade-off is not only evident in the aggregate E and S scores but also persists across various sub-components of the S score, including Human Capital, Product Liability, and Social Opportunities. Notably, the environmental and governance scores negatively correlate with social scores, suggesting that firms prioritizing environmental and governance aspects might do so at the detriment of social sustainability. Moreover, our study examines the heterogeneity among firms, suggesting that financially constrained firms and firms with a greater exposure to climate risk experience a more pronounced trade-off between environmental and social pillars. Our results are robust to the inclusion of extensive sets of control variables, as well as to a battery of robustness tests. We exploit the Paris Climate Agreement, hurricane damage and the Dodd-Frank Act as exogenous shocks necessitating investments in the E and G pillar, respectively. Importantly, we also find that the negative relation between S and E is particularly strong for firms which are directly affected by hurricanes and for the period between the ratification of the Paris Agreement and the withdrawal from it by the U.S. Additionally, we show the implications of neglecting social issues, illustrating that firms with lower S scores face real consequences, including decreased employee satisfaction. Conversely, firms with higher S scores are more likely to be recognized as desirable workplaces, underscoring the tangible benefits of

investing in social sustainability. In conclusion, our research underscores the complex interplay between environmental, social, and governance pillars within firms. While the push towards environmental sustainability is understandable in the face of regulatory and public pressures, our findings caution against overlooking the social dimension of sustainability. The trade-off, particularly for financially constrained firms, highlights the need for a more balanced approach to ESG investments. As firms navigate these trade-offs, policymakers and stakeholders must consider mechanisms to support a more holistic approach to sustainability, ensuring that the pursuit of environmental goals does not undermine social well-being.

V.5 First Appendix

Table V.8: **Variable Definitions**. This table provides a description of the variables used in this study.

Variable	Definition	Data Source
Panel A: Key Dependent Variables		
Environmental Pillar Score	The Environmental Pillar Score measures the management of and exposure to key environmental risks and opportunities.	MSCI
Social Pillar Score	The Social Pillar Score measures the management of and exposure to key social risks and opportunities	MSCI
Governance Pillar Score	The Governance Pillar Score measures the management of and exposure to key governance risks and opportunities.	MSCI
Panel B: Key Independent Variables		
Environmental Opportunities Score	This score summarizes issues regarding the opportunities in clean tech, in green building and in renewable energies.	MSCI
Climate Change Score	This score summarizes issues regarding carbon emissions, the carbon footprint, financing environmental impact and climate change vulnerability.	MSCI
Waste Management Score	This score summarizes issues regarding toxic emissions, packaing materials and electronic waste.	MSCI
Natural Resource Usage Score	This score summarizes issues regarding water stress, biodiversity, land use and sourcing of raw materials.	MSCI
Environmental Leader	A dummy that is 1 if the Environmental Pillar Score is higher than the median of the sample and 0 otherwise.	MSCI
Human Capital Score	This score summarizes issues regarding the development of human capital, labor management, health and safety and supply chain standards.	MSCI
Product Safety Score	This score summarizes issues regarding the privacy and security of data, product quality and chemical safety.	MSCI
Social Opportunities Score	This score summarizes issues regarding the access to finance, communications and health care for the society.	MSCI
Corporate Governance Score	This score summarizes issues regarding ownership, board members, pay and accounting.	MSCI
Corporate Behavior Score	This score summarizes issues regarding business ethics and and tax transparency.	MSCI
Climate Change Exposure	Measures the relative frequency with which climate change bigrams occur in earnings calls and is based on Sautner et al. (2023)	Sautner et al. (2023)
High Leverage	A dummy that is 1 if the leverage ratio (total debt / total assets) is higher than the median of the sample and 0 otherwise.	Refinitiv
High SA Index	A dummy that is 1 if the SA Index as proposed by Hadlock and Pierce (2010) is higher than the median of the sample and 0 otherwise.	Hadlock and Piece (2010) and Refinitiv
Post Paris	A dummy that is 1 for the period after the effective date of the Paris Agreement in November 2016 and 0 otherwise.	
Post Paris Pre Withdrawal	A dummy that is 1 for the period after the effective date of the Paris Agreement in November 2016 and before Donlad Trumo announced the withdrawal in June 2017 and 0 otherwise.	
Hurricane	A dummy that his 1 if a hurricane occurred in the county where a firm is headquartered in the previous year.	
SCAP	SCAP is an Indicator for whether the firm's historical headquarter state finalized the State Climate Adaption Plan	He et al. (2023)
Dodd-Frank	A dummy that is 1 for the period after 2009 and 0 otherwise.	
Panel C: Control Variables		
RoA	The net income of the company divided by total assets of the company.	Refinitiv
Ln(Total Assets)	Natural log of total assets.	Refinitiv
Market to Book	The market value of the ordinary (common) equity divided by the balance shseet value of the ordinary (common) equity in the company.	Refinitiv
Total Debt	Represents all interest bearing and capitalized lease obligations. It is the sum of long and short term debt.	Refinitiv
Total Assets	Represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net proporety plant and equipment and other assets.	Refinitiv

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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.

14.12.2024

Signature author

Date

Submitted Papers:

1. Martin G. Becker, Fabio Martin and Andreas Walter, "The power of ESG transparency: The effect of the new SFDR sustainability labels on mutual funds and individual investors". Finance Research Letters, 47, (Chapter I).

2. Alix Auzepy, Christina E. Bannier and Fabio Martin (2023), "Are sustainability-linked loans designed to effectively incentivize corporate sustainability? A framework for review". Financial Management, 52, 643-675 (Chapter II).

3. Paul Eubel, Fabio Martin and Andreas Walter (2024), "Beyond carbon emissions: Is climate change exposure priced?". Working Paper (Chapter III)

4. Alix Auzepy, Christina E. Bannier and Fabio Martin (2024), "Raising their Voices: Soft Shareholder Engagement on ESG at Annual General Meetings". Working Paper (Chapter IV)

5. Peter Limbach, Fabio Martin and P. Raghavendra Rau (2023), "The ESG Trade-off". Working Paper (Chapter V)