Doctoral Thesis

Essays on Sustainable Finance and Corporate Social Responsibility

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Chapter I

Introduction

This doctoral thesis consists of six academic papers and deals with international research on Corporate Social Responsibility (CSR) and Environmental, Social and Governance (ESG) topics from a corporate finance as well as an investors' perspective. While five papers have been accepted for publication in international peer reviewed journals, one paper is currently in a Revise & Resubmit process. The title page of each chapter provides information on the publication or peer review status including the journal's VHB-JOURQUAL3 rating as well as conference presentations.

Over the last decade, a major shift in corporate behavior and also investors' preferences towards the consideration and incorporation of sustainability into decision making has taken place. This shift has been triggered by climate change and environmental disasters such as the Deepwater Horizon oil spill in the Gulf of Mexico, social controversies, e.g. precarious working conditions in Asian textile factories, and corporate governance-related scandals such as the Volkswagen diesel scandal. These events, amongst others, particularly demonstrate the importance for firms and investors to intensively consider ESG aspects in management as well as in investment decisions. Nowadays, firms already acknowledge their societal purpose and role (United Nations, 2016) that significantly goes beyond simple profit maximization as postulated in the doctrine of Friedman (1970) but rather accelerates engagement in non-financial CSR projects to further facilitate corporate sustainability. What is more, even investors increasingly tend to explicitly consider ESG criteria within their investment decisions. In order to invest with regards to their social preferences, these investors are prepared to accept lower returns and even obtain non-financial utility from investing sustainably (Riedl and Smeets, 2017; Gutsche and Ziegler, 2019; El Ghoul and Karoui, 2017). The trend to sustainable investing as well as the intensive consideration of CSR criteria in firm processes requires a pronounced understanding of the implications of sustainability considerations for firms as well as capital market participants.

The doctoral thesis at hand delivers in-depth research on a variety of sustainability related topics that contribute to the international academic CSR and ESG literature. The following chapters investigate three specific aspects of CSR: (i) implications of firm CSR engagement with regards to investors' equity and credit risk assessments, (ii) stock return as well as value implications of (firm) CSR engagement for investors and fund managers, (iii) the impact of corporate ethics programs as subcategory of the corporate governance aspect of ESG on investors' equity and credit risk assessment.

Chapter II thematically starts with the implications of CSR for investors' equity risk assessment and builds on the well-established equity risk-reducing effect of CSR (e.g. Oikonomou et al., 2012; Monti et al., 2018; Albuquerque et al., 2020). It outlines the paper "Doing safe by doing good: Non-financial reporting and the risk effects of corporate social responsibility" that has been accepted for publication at *European Accounting Review*. It adds to the empirical CSR literature by investigating whether differences with regard to the risk-reducing effect of CSR between the U.S. and the European non-financial reporting regime occur. This is particularly relevant since U.S. firms are only required to report issues that are of material financial risk while EU regulation explicitly defines the content of CSR reporting. Indeed, the study shows that firm equity risk declines with firm CSR engagement under the content-based European disclosure regime but hardly under the risk-based U.S. system. Differences between both regimes can be explained with goal framing theory (Lindenberg, 2000, 2003; Lindenberg and Foss, 2011). In the U.S. risk-based disclosure system investors benefit only from firm CSR engagement in market phases characterized by high market volatility representing a gains-oriented goal. In comparison, the EU content-based system displays a normative goal as firm CSR engagement is particularly relevant for investors regardless of the respective stock market phase.

Chapter III extends the investigation of the risk-reducing effect of CSR for EU and U.S. firms on the credit risk side. The underlying paper "Corporate Social Responsibility and Credit Risk" has been accepted for publication in *Finance Research Letters*. The study finds a market based credit risk reducing effect of the environmental aspects of ESG for U.S. firms while European firms additionally demonstrate a risk reduction stemming from social aspects. In contrast to market based credit risks, agency based credit ratings do not reflect the same relationship.

In addition to an extensive risk assessment prior to an investment decision, investors are particularly interested in potential value implications from CSR engagement. The trend of sustainable investing channels capital flows into high ESG-rated stocks (Hartzmark and Sussman, 2019; Bialkowski and Starks, 2016) although the investment universe of high ESG-rated stocks is rather limited (El Ghoul and Karoui, 2017; Hoepner, 2017). This combination of high demand with a limited investment universe might affect firm valuation. The implications of firm CSR efforts for stock market (mis-)valuation are analyzed in chapter IV presenting the paper "Corporate social responsibility and market efficiency: Evidence from ESG and misvaluation measures" that has been accepted for publication in the *Journal of Banking & Finance*. The study's findings indicate that corporate CSR engagement affects misvaluation of U.S. firms. In detail, firm ESG engagement increases overvaluation and decreases undervaluation as compared to the true value. These valuation effects might be explained by the aforementioned strong interests of investors to invest according to ESG criteria. Analyzing the impact of ESG sentiment that reflects the relevance for and awareness of investors and society for sustainability topics underlines the findings by showing that higher ESG sentiment even strengthens the ESG-misvaluation relationship.

CSR induced misvaluation on stock markets as shown in the prior study might also impact valuations of mutual fund portfolios. Due to strong demand from investors for sustainability considerations in fund portfolios, active fund managers are inclined to pick sustainable stocks that might be overvalued as shown in chapter IV. Chapter V outlines the paper "The sustainability trap: Active fund managers between ESG investing and fund overpricing" that has been accepted for publication in *Finance Research Letters* and extends the research of chapter IV from the stock level to the mutual fund level. The study analyzes the impact of CSR for U.S. mutual funds on the Active Fund Overpricing (AFO) measure (Avramov et al., 2020) which tries to capture fund investment skill. The findings show that higher fund ESG ratings go along with higher overpricing in general as well as relative to the respective fund benchmark. Fund managers aiming to react to clients' sustainability preferences are thus picking potentially overpriced stocks for their portfolio. As a consequence, the AFO measure indicates poor investment skill only due to the fact that fund managers react to clients' preferences.

The previous chapters II - V concentrate on analyzing the overall ESG score as well as its pillars, Environment, Social and Governance. The last two chapters VI and VII, however, dig deeper into specific aspects of CSR. Chapter VI contains the paper "Zooming in on CSR: Which categories are relevant for companies' equity risk?" that has been conditionally accepted for publication at *Corporate Finance*. In order to understand the specific drivers behind the equity risk reducing effect of CSR, this chapter investigates the relationship between equity risk and the respective subcategories of CSR for a sample of European firms. The study identifies environmental innovation, human rights, community as well as a CSR strategy to be particularly relevant for the equity risk-reducing effect of CSR.

Finally, chapter VII investigates the impact of the corporate governance-related aspect of corporate ethics on equity as well as credit risk for a sample of publicly listed German firms. The paper "Corporate ethics programs: Reducing risks or wasting money? - Insights from the perspective of investors" first develops and collects the Corporate Ethics Program (CEP) score that measures firm processes to improve ethical firm behavior as well as employees to be compliant with rules. This score is then used to analyze the relationship between a firm's corporate ethics and equity as well as credit risks. While the results point to the fact that a CEP is associated with lower equity risks, credit risks seem to be positively related to the CEP. The study argues that the benefits of a CEP exceed its costs from an equity investors' perspective whereas debt investors perceive the costs to be larger than the benefits.

Chapter II

Doing safe by doing good:

Non-financial reporting and the risk effects of corporate social responsibility

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

Abstract

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

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

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

II.1 Introduction

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

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

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

differently, depending on the disclosure regime.

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

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

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

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

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

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

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

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

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

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

II.2 Background and hypotheses

II.2.1 Related literature

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

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

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

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

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

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

II.2.2 Hypotheses

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

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

More precisely, security laws require U.S. firms to disclose all financially material issues, irrespective of whether they pertain to CSR or not (Christensen et al., 2019, 2021). Regulation S-K, which sets out the ongoing reporting requirements of public companies, in this respect refers to those "trends or uncertainties that have had or [...] will have a material favorable or unfavorable impact on net sales or revenues or income from continuing operations" (Item 303). By emphasizing the effect on financial outcomes — sales, revenues, income — as the criterion for whether to report (non-financial) matters or not, the U.S. regulation can be seen as strongly *risk-focused*: Independent of a specific context, any aspect that conveys a financial risk has to be publicly disclosed.

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

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

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

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

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

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

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

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

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

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

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

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

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

II.3 Data and variables construction

II.3.1 Sample

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

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

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

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

Continued on next page

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

Table II.1 – continued from previous page

Total	9,266	100%	Total	8,928	100%

Panel B: Country composition

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

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

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

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

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

II.3.2 Variables construction

Dependent variables

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

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

Explanatory variables

We follow established practice and use the Refinitiv CSR ratings to approximate corporate sustainability activity as our main explanatory variable (Ioannou and Serafeim, 2012; Cheng et al., 2014; Dorfleitner et al., 2018; Breuer et al., 2018; Jackson et al., 2020; Flammer, 2021). The *CSR* score published by Refinitiv is allegedly one of the most comprehensive reflections of a company's sustainability activity and comprises individual environmental, social and governance pillars. Based on more than 400 measures collected annually from companies' and other public disclosures, the environmental component considers issues such as resource use, emissions, and innovation, the social component focuses on the workforce, human rights, community and product responsibility while the governance component is concerned with management issues, shareholder relations and CSR strategy (Refinitiv, 2020). CSR scores are typically published annually but may be adjusted in case of significant firm-specific events (Oikonomou et al., 2012; Berg et al., 2020).

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

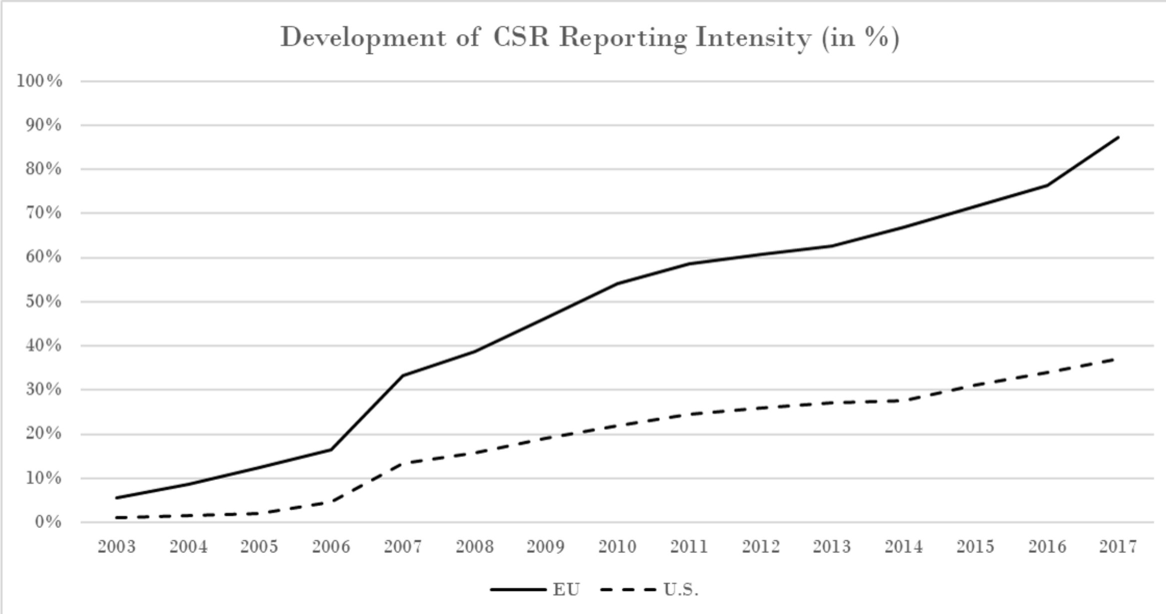
Moderating factors

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

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

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

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



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

Control variables

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

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

II.4 Research design

Even though the relation between CSR and risk may be less prone to endogeneity problems than the relation between CSR and firm value (Cheng et al., 2014), we nevertheless cannot exclude that biases may result from OLS or fixed effects panel estimations. Endogeneity can arise due to *(i)* measurement error in the explanatory variable (the CSR score in our case), *(ii)* omitted explanatory variables in the regression or *(iii)* reverse causality between the explanatory and the dependent variable (firm risk in our case). If not successfully dealt with, endogeneity may lead to inconsistent estimations so that standard inference testing will not allow a reliable verdict on the effect of interest (Roberts and Whited, 2013; Li, 2016).

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

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

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

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

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

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

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

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

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

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

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

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

II.5 Results

II.5.1 Descriptive statistics

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

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

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

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

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

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Table II.3 – continued from previous page

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

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

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

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

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

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

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

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

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Table II.4 – continued from previous page

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

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

The interaction term of the CSR score with the U.S. dummy, however, shows a strongly significant, positive coefficient, indicating that for firms under the U.S. reporting framework the risk-reducing effect of CSR is much weaker. Indeed, comparing the coefficient sizes we have to conclude that with the exception of idiosyncratic risk there is hardly any negative impact of CSR on equity risk in the U.S.: In most regressions, the positive coefficient of the interaction term simply counterbalances the negative coefficient of the CSR score. The significantly negative coefficient of the U.S. dummy per se supports our earlier observation that the U.S. firms in our sample in general show smaller equity risk than the European companies. It should be furthermore noted that the test statistics for the system GMM estimation, reported in the lower part of Table II.4, validate the reliability of the overall identification: Our instruments are exogenous (according to the Hansen J-test for over-identifying restrictions) and our estimation does not suffer from serial correlation (AR(2) test of second-order serial correlation in the residuals).

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

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

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

larly to our earlier results, the interaction term with the U.S. dummy shows a positive coefficient which however loses significance only in the regressions for idiosyncratic risk and value at risk.

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

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

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Table II.5 – continued from previous page

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

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

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

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

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

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

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

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

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Table II.6 – continued from previous page

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

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

We finally consider hypothesis 1 also in a globalized capital market context and test whether the mediating role of the reporting regime is independent of the investors' country of origin. This is important as the investors' origin might also shape their risk perceptions, e.g. for cultural reasons (Hofstede, 1980; Oyserman et al., 2002). Controlling for such investor origin should allow us to further narrow down the observed risk effect to the disclosure system that rules the investment firms. We therefore repeat our initial analysis and include the fraction of domestic (EU or U.S.) relative to foreign

(EU or U.S.) stock holders per company as another variable of interest. We interact this *Domestic Ownership* variable with the CSR score, the U.S. dummy and also build a three-way interaction of the variables.

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

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

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

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Table II.7 – continued from previous page

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

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Table II.7 – continued from previous page

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

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

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

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

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

Table II.8 presents the system-GMM estimation results. As before, we observe a consistently negative coefficient of the CSR score, a negative coefficient of the U.S. dummy and a positive coefficient of their interaction term. Due to the design of the estimation model referred to above, these need to be interpreted slightly more restrictive as describing the effects in years with zero surrounding market volatility. Most importantly, however, we observe that the interaction term of the CSR score with the market volatility shows a highly significant, positive coefficient while the interaction term of the

CSR score with the market volatility and the U.S. dummy shows a highly significant, negative coefficient that is even larger in absolute size. In sum, this indicates that a more volatile market decreases the risk-reducing effect of CSR under the EU reporting framework but strongly increases it under the U.S. system. Taking together the effect of the base variables with the interaction terms, we find that higher CSR activity induces investors to perceive a risk-reducing effect under the U.S. disclosure regime only for sufficiently high volatility of the surrounding market. This clearly supports hypothesis 2a.[15]

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

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

Continued on next page

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

Table II.8 – continued from previous page

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

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Table II.8 – continued from previous page

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

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

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

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

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

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Table II.9 – continued from previous page

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

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Table II.9 – continued from previous page

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

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

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

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

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

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

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

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

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

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Table II.10 – continued from previous page

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

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

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

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

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

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

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

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

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

the following regression for each quintile portfolio using monthly portfolio returns:

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

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

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

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

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

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

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

Continued on next page

Table II.11 – continued from previous page

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

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

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

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

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

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

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

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

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

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

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

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

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

II.6 Conclusion

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

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

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

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

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

Chapter III

Corporate Social Responsibility and Credit Risk

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Corporate Social Responsibility and Credit Risk

Abstract

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

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

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

III.1 Introduction

Corporate social responsibility (CSR) has become an increasingly important aspect for equity investing, as there is mounting evidence that CSR strategies allow to reduce equity-related risks (e.g. Oikonomou et al., 2012). Sustainable firm strategies appear particularly effective in reducing extreme equity risks (e.g. Kim et al., 2014; Ilhan et al., 2021), which supports the idea of CSR acting as "moral capital" (Godfrey et al., 2009) insuring firms against stakeholders' sanctions in case of negative events. Much less is known, however, about the impact of CSR on firms' credit risk. This is also recognized by the EU's 2018 Sustainable Finance Action Plan (European Commission, 2018) that calls for more research on the relation between environmental, social and governance (ESG) activities and credit risk. More precisely, Action 6 of the EU Action Plan calls for "better integrating sustainability in ratings and market research" and the EU has commissioned the European Securities and Markets Authority to assess in how far sustainability issues are already incorporated in credit ratings.

There are many reasons to believe that credit risk could be related with CSR. First, credit risk also exhibits certain extreme-risk characteristics as it refers to a company becoming insolvent, i.e. unable to pay its debts, which happens rarely. Following the same arguments as for equity risk, credit risk should therefore be influenced by the fact that strong CSR activities help to insulate firms' profits against extreme changes in consumer tastes or regulatory interventions due to environmental or societal crises (e.g. Albuquerque et al., 2019). The ensuing CSR reputation (Soppe et al., 2011), however, also creates incentives to employ CSR in order to cover up corporate misbehavior (Diemont et al., 2016), which might be linked with agency conflicts (e.g. over- or underinvestment) and potentially even lead to insolvency. As a consequence, credit risk might also increase along with stronger CSR scores. Relatedly, reporting on CSR facets with particularly strong attention levels might lead both equity and debt investors to react either positively or negatively if their expectations are exceeded or disappointed (Benlemlih et al., 2018), with corresponding effects on market-based measures of risk.[1]

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

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

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

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

III.2 Data

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

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

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

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

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

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

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

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

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

III.3 Methodology and results

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

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

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

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

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

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

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

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

Table III.2: ESG effects on credit risk.

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

Continued on next page

Table III.2 – continued from previous page

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

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

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

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

Based on our main and auxiliary analyses, we hence conclude that stronger environmental activity goes along with lower market-based credit risk for both European and U.S. firms, and the association is even slightly stronger for U.S. companies. The social component of CSR, in contrast, only displays a negative association with market-based credit risk for European but not U.S. firms. These findings might be seen as a reflection of the fact that social issues have traditionally played a more important role for European firms and their investors, due to both governance and disclosure regulations (Verbeeten et al., 2016; Grewal et al., 2019).[8] Environmental issues, in contrast, have featured strongly in the public discussion both in the U.S. and Europe in recent years (Alok et al., 2020; Ilhan et al., 2021).

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

III.4 Conclusion

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

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

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

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

Chapter IV

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

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

Abstract

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

JEL Classification: G14; G32; M14; Q5

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

IV.1 Introduction

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

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

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

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

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

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

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

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

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

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

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

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

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

IV.2 Literature review and hypotheses development

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

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

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

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

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

Hypothesis 1: *CSR engagement affects firms' misvaluation*

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

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

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

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

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

Hypothesis 2a: *CSR increases existing overvaluation*

Hypothesis 2b: *CSR decreases existing undervaluation*

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

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

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

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

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

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

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

IV.3 Sample description and methodological approach

IV.3.1 Data and variables description

Main explanatory variable — ESG score

We study a sample of 1,817 U.S. firms from 2004 to 2017 given that prior research shows that potential inefficiencies arise due to growth in sustainable investing after 2003 (Cao et al., 2021). We obtain time series company *ESG scores* from the ASSET4 database provided by Refinitiv (formerly Thomson Reuters). The ASSET4 data on ESG are well-established in the literature (Flammer, 2021; Hawn and Ioannou, 2016; Cheng et al., 2014; Ioannou and Serafeim, 2012).

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

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

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

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

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

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

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

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

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

Dependent variables — misvaluation measures

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

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

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

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

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

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

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

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

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

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

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

Information asymmetry variables

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

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

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

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

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

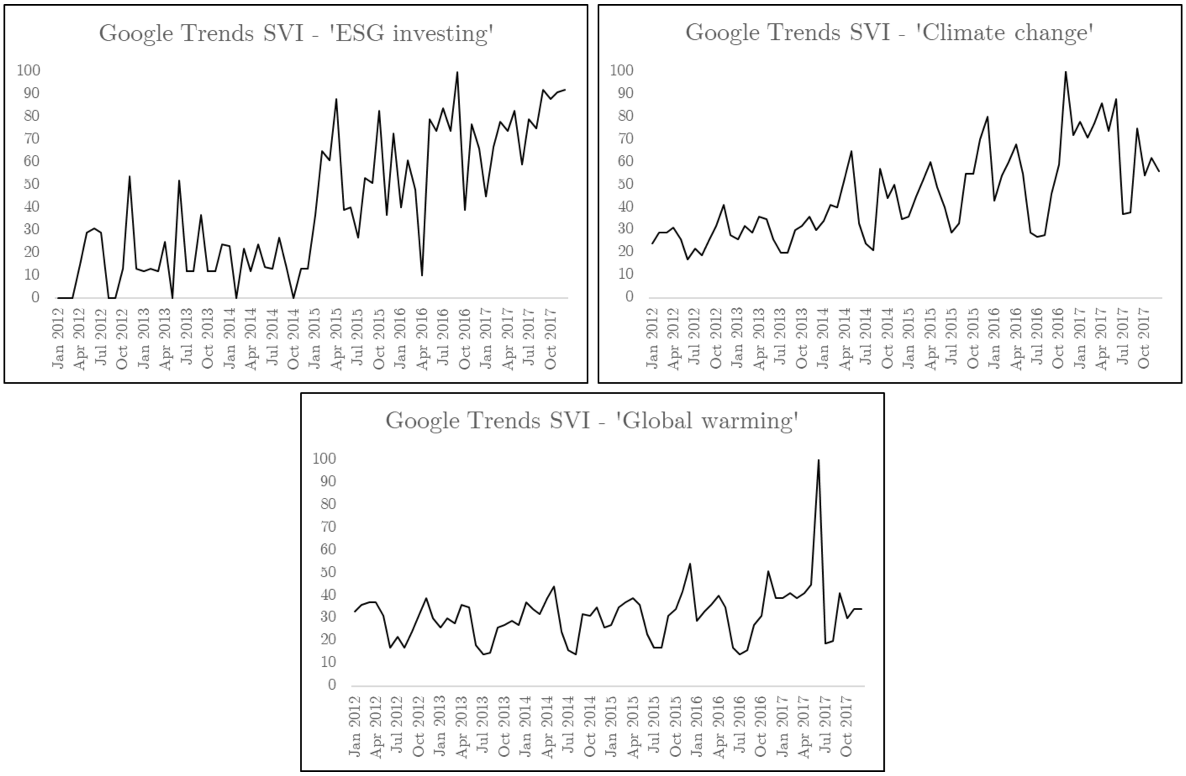
The *Forecast* σ is measured as the standard deviation of all I/B/E/S analysts' earnings forecasts available at the last month of the fiscal year end (Krishnaswami and Subramaniam, 1999). It represents the deviation of a consensus estimate between the analysts. Stronger disagreement between analysts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

Google search volume index

As we are interested in effects of market sentiment in the context of ESG and misvaluation, we apply Google Trends search volumes as a proxy. Google Trends provides data on the amount of searches in specific regions at a specific point in time with regards to every possible search term. Additionally, the database offers time series data on the occurrence of the predefined search terms in its search volume index (SVI). These data have been used in several studies investigating asset prices in a more general context (e.g. Da et al., 2015; Preis et al., 2013) and the impact of sustainability in a corporate finance and asset management setting (e.g. Choi et al., 2020; Brøgger and Kronies, 2021). We therefore collect the proxy variables for *Sentiment* towards sustainability (employed in the analysis in section IV.4.4) from Google Trends' SVI. With increasing relevance of sustainable investing from 2012 on (e.g. USSIF, 2020), we download the monthly data from Google Trends' SVI search topic for the time span of 2012 to 2017 to cover the more recent sample period and build yearly averages, restricting the search region to the U.S.

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

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



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

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

Control variables

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

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

IV.3.2 Empirical methodology

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

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

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

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

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

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

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

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

IV.3.3 Summary statistics

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

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

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

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

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

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

IV.4 Results

IV.4.1 ESG and firm misvaluation relationship

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

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

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

Continued on next page

Table IV.3 – continued from previous page

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

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

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

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

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

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

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

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

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

For this reason, we analyze the most over- and undervalued companies within the sample based on the degree of misvaluation in the preceding period to trace out effects for over- and undervaluation separately. The group of overvalued companies comprises the 20% of companies with the highest misvaluation ratio according to the respective measure. The mean misvaluation ratio for the group of overvalued firms is 5.868

(RES^{MSV}) and 2.666 (RRV^{MSV}). Correspondingly, the companies with the lowest misvaluation ratio belong to the group of undervalued companies. These are the 20% of companies that are most undervalued with means of 1.059 (RES^{MSV}) and 0.563 (RRV^{MSV}), respectively.[12] This subdivision allows to interpret the effects of ESG with regards to the respective existing misvaluation.

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

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

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

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

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

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

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

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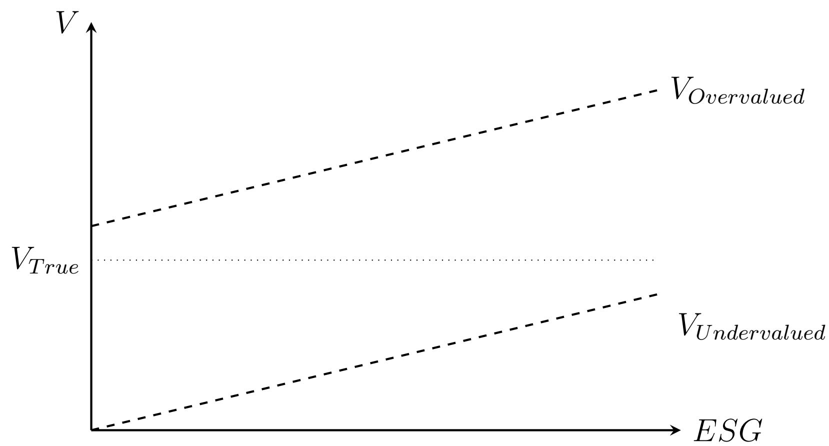
Table IV.4 – continued from previous page

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

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

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



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

IV.4.3 Information asymmetry

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

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

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

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

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

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

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

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

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

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

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Table IV.5 – continued from previous page

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

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

IV.4.4 The increasing relevance of CSR

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

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

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

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

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

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

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Table IV.6 – continued from previous page

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

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

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

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

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

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

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

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

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

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Table IV.7 – continued from previous page

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

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

IV.5 Additional analyses

IV.5.1 Endogeneity

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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Table IV.8 – continued from previous page

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

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Table IV.8 – continued from previous page

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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Table IV.10 – continued from previous page

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

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

IV.5.4 ESG pillar analysis

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

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

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

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

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

Continued on next page

Table IV.11 – continued from previous page

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

IV.6 Conclusion

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

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

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

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

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

IV.5.3. Furthermore, companies in general should engage in CSR to profit from the trend of sustainable investing and attract additional capital flows as investors shift their investment preferences towards sustainability (BlackRock, 2020).

Chapter V

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

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(VHB-JOURQUAL3: B)

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

Abstract

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

JEL Classification: G11, G23, M14, Q56

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

V.1 Introduction

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

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

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

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

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

V.2 Data and methodology

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

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

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

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

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

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

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

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

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

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

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

V.3 illustrates this calculation:

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

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

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

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

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

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

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

correspondingly takes on a small negative average value.

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

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

We analyze the association between sustainability and fund overpricing using fixed-effects panel estimations. This allows to mitigate potential endogeneity effects stemming from time-constant variables on fund investment skills. As Avramov et al. (2020) furthermore reports persistence of fund overpricing over time, we include the respective lagged dependent variable (*L.dep. var.*) as an additional regressor in the regression model:

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

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

V.3 Results

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

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

In order to examine the relation between a fund's sustainability rating and the fund investment skill, approximated by the mispricing in the fund relative to the fund's benchmark, the regressions in Panel B consider the AFO as dependent variable. As

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

can be seen from the highly significant coefficient of the *Excess Fund ESG* rating in all regression models, higher sustainability of the fund's portfolio is associated also with higher overpricing of the fund relative to its benchmark.

Table V.2: Fund sustainability and mispricing.

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

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

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

Arellano and Bond (1991). The results remain qualitatively the same.[11]

V.4 Conclusion

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

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

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

Chapter VI

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

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

Abstract

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

JEL Classification: G32; G34; O16; Q56

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

VI.1 Introduction

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

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

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

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

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

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

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

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

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

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

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

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

VI.2 Data

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

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

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

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

Table VI.1 – continued from previous page

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

In order to investigate the impact of CSR pillar categories on equity risk, we employ a variety of equity risk measures: we consider standard risk variables, i.e. the stock volatility σ as well as the idiosyncratic risk σ_ϵ. Annual stock volatility is calculated as the standard deviation of daily stock returns. To calculate the idiosyncratic risk we use the capital asset pricing model to estimate yearly firm betas. Consequently, the idiosyncratic risk contains the proportion of firms' stock return volatility (σ) that is not attributable to a firm's beta. In addition to these two standard equity risk measures, our analysis aims to recognize that CSR-related risks may be extreme in nature (Monti et al., 2018; Hoepner et al., 2021). We also capture these extreme risks in the form of value at risk (VaR) and expected shortfall or conditional value at risk (CVaR). The VaR measures the predicted maximum loss of a firm over a given horizon within a specific confidence interval (Jorion, 2007). We follow Monti et al. (2018) and calculate it as the 0.05-quantile of the empirical distribution of daily stock returns in the specific year. The CVaR corresponds to the mean value of returns below the VaR-threshold.

In the same vein as Hoepner et al. (2021) we also capture downside risks via lower partial moments (LPMs) of the second and third order (LPM(0,2) and LPM(0,3)). In order to be able to compare our results metrically, we calculate the square root of the LPM(0,2) and the cube root of LPM(0,3). We include a set of control variables found to be relevant in the investigated context (Sharfman and Fernando, 2008; El Ghoul et al., 2011; Hoepner et al., 2021; Bannier et al., 2021).

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

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

Table VI.2: Descriptive statistics.

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

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Table VI.2 – continued from previous page

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

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

VI.3 Methodology and results

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

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

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

effect is economically significant as an increase of the innovation score by one standard deviation (0.321) decreases the *Conditional Value at Risk* by 0.14% which refers to 3% of the average *CVaR* value in our sample.

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

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

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

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

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

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

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Table VI.3 – continued from previous page

	(1) σ	(2) σ_ϵ	(3) VaR	(4) CVaR	(5) LPM(0,2)	(6) LPM(0,3)
	(0.160)	(0.131)	(0.267)	(0.349)	(0.154)	(0.227)
Profitability	-0.283	-0.894***	0.246	0.503	0.199	0.340
	(0.239)	(0.191)	(0.386)	(0.513)	(0.222)	(0.292)
Size	0.007	-0.021	0.033	0.205**	0.078**	0.178***
	(0.040)	(0.033)	(0.067)	(0.091)	(0.039)	(0.053)
Sales Growth	0.124**	0.046	0.255***	0.268**	0.130**	0.121
	(0.056)	(0.041)	(0.094)	(0.127)	(0.055)	(0.074)
Dividend Yield	0.036***	0.026***	0.052***	0.044***	0.027***	0.024***
	(0.007)	(0.006)	(0.011)	(0.016)	(0.007)	(0.009)
Constant	1.431	1.733**	1.888	-0.916	-0.139	-1.939
	(0.918)	(0.746)	(1.521)	(2.083)	(0.897)	(1.214)
Firm-year Obs.	7,711	7,711	7,711	7,711	7,711	7,711
Obs.	776	776	776	776	776	776
R^2	0.038	0.047	0.037	0.024	0.027	0.018

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

VI.4 Conclusion

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

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

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

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

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

Chapter VII

Corporate ethics programs: Reducing risks or wasting money? - Insights from the perspective of investors

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Corporate ethics programs: Reducing risks or wasting money? – Insights from the perspective of investors

Abstract

Is there an association between a firm's corporate ethics program (CEP) and investors' assessments of firm risk? Which particular factors of a firm's CEP drive this relationship? We explore these questions by examining the CEPs of 150 publicly listed German firms from 2014 to 2018. To do so, we create a *CEP index* by aggregating 24 clearly identifiable items - based on publicly available corporate reports - and make three main contributions: i) The detailed descriptive statistics of the developed index allow managers to benchmark their firms' CEPs. *ii)* We find that a higher CEP index reduces downside equity risk but increases credit risk. This indicates that the decreased likelihood of extreme losses but increased day-to-day costs that result from a relatively comprehensive CEP benefit equity investors at the expense of debt investors. *iii)* Based on a factor analysis, we observe that internally institutionalized CEP items drive this equity risk-reducing effect, while credit risk only decreases via external auditors' involvement. Supplemental analyses demonstrate that investors suspect that soft CEP items are pure lip service, as there is no strong relation between these items and risk. Moreover, the implementation of additional CEP items is shown to be particularly beneficial for firms that already have comprehensive CEPs in place. Finally, we observe some indication that the equity risk-decreasing effect outweighs the debt risk-increasing effect.

JEL Classification: G32; G34; M14; M4

Keywords: Corporate ethics programs, investors' risk assessments, non-financial reporting

VII.1 Introduction

Newspapers report unethical firm behavior on a nearly daily basis. In 2020, financial institutions alone paid more than $10.4 billion in fines for unethical firm behavior (Jaeger, 2020). Wirecard – a global German fintech company – went into bankruptcy in June 2020 after reporting that €1.9 billion in cash was inexplicably missing. However, firms also invest tremendous amounts of resources to implement comprehensive corporate ethics programs (CEPs) to prevent and detect unethical firm behavior. In 2019, financial firms dedicated 10-15% of their total workforce to ensure regulatory compliance (Somananth, 2019). Crain and Crain (2010) estimate the expenses of U.S. firms related to complying with the Sarbanes-Oxley Act to be as much as $8,086 per employee annually. These investments are made even though behavioral research indicates that controls can crowd out ethical considerations and even increase rule-breaking behavior (e.g., Ewelt-Knauer et al., 2020). Thus, a comprehensive CEP may induce two opposing effects: On the one hand, it may reduce the risk of unethical firm behavior and the corresponding losses, fines, and penalties. On the other hand, not only high costs related to implementation and maintenance but also indirect costs such as those related to opportunistic employee behavior or decreases in employees' motivation and creativity may be incurred.

Against the backdrop of this trade-off between the costs and benefits of corporate ethics programs, our first research question examines whether equity and debt investors value firms' CEPs differently when making their risk assessments. As its owners, equity investors are the residual claimants on a firm's free cash flow. They face the full downside risk induced by unexpected unethical firm behavior and, hence, might especially value a comprehensive corporate ethics program. Accordingly, we hypothesize that there is a negative association between the comprehensiveness of a firm's CEP and its equity investors' risk assessments, namely, a comprehensive CEP is associated with a decrease in downside equity risks. In contrast, debt investors receive fixed repayments based on a predetermined interest rate. Thus, debt investors' payments are not immediately impacted by an unethical firm's behavior as long as the firm does not fall into bankruptcy. However, debt investors might fear that the ongoing costs of a broad CEP decrease the free cash flows available to a firm for debt services, therefore influencing the firm's credit standing negatively and correspondingly affecting the market value of their debt. Hence, we reason that there is a positive association between the comprehensiveness of a firm's CEP and its debt investors' risk assessments: A comprehensive CEP is associated with an increase in debt risk. In our second research question, we analyze whether specific CEP items - which we combine to form individual factors - drive the relation between CEPs and investors' risk assessments. Finally, in our supplemental analyses, we try to proxy the net effect of a broad CEP by combining the equity- and credit-risk effects and determine when it is particularly beneficial for management to further invest in their firm's CEP.

To answer our research questions, we develop a detailed index – the CEP index – to measure the comprehensiveness of firms' corporate ethics programs. Corporate ethics programs encompass all processes and actions intended to increase ethical firm behavior and employee compliance with rules (e.g. Weber and Wasieleski, 2013). Based on 24 distinguishable items, we evaluate the CEPs of the largest 150 publicly listed German firms between 2014 and 2018. To construct the CEP index, we consider information from any publicly available corporate reports, such as (1) annual reports, (2) management commentaries/management discussions and analyses, and (3) CSR reports. For instance, we analyze the firms' compliance organizations and determine, i.a., whether an ethical committee and a chief compliance/ethical officer are in place. Moreover, we critically evaluate whether the top management of each firm exerts an effort to implement an ethical tone at the top and an ethical culture within these firms, to mention further examples. We also consider whether the CEPs are institutionalized on all organizational levels and throughout the entire supply chain, for example, via codes of conduct or ethical trainings, or whether (un)ethical behavior is incentivized (sanctioned). In addition to considering CEP items intended to prevent unethical firm behavior, we consider whether each firm has implemented CEP items intended to detect misconduct. Thus, we examine, for instance, whether whistleblowing facilities, ombudspersons, or internal/external compliance audits are in place. Finally, we acknowledge that firms' environments are dynamic, making ongoing ethical risk assessments and evaluations of their compliance culture necessary, and we consider these to be additional CEP items.

Since the CEP index treats each item equally, we employ a factor analysis in our additional tests to account for the fact that firms may view specific items within a corporate ethics program as more beneficial than others. Additionally, certain relations between the different CEP items may exist – some may be a part of groups or, on the contrary, be seen as substitutes for others. Our analysis identifies five factors. The first factor encompasses the CEP items that institutionalize activities intended to prevent or detect unethical firm behavior at all the organizational levels within a firm, such as codes of conduct or ethical trainings with a clear reporting line to top management via a chief compliance officer. The second factor refers to externally oriented CEP items, namely, impulses from outside a firm that enhance its CEP, such as the application of the externally provided COSO framework or a firm's commitment to follow the principles of the United Nations Global Compact. The third factor focuses on external auditors' involvement in compliance audits or certifications of firms' CEPs based on auditing standards. The fourth factor captures the softer cultural elements of a firm's CEP, such as its compliance culture or management's ethical tone. The fifth factor focuses on additional organizational mechanisms, such as job rotations, that further ensure that employees at all hierarchical levels contribute to ethical firm behavior.

To capture investors' risk assessments, we employ four different proxies of the downside risks of equity investors[1]: value at risk, conditional value at risk, and two lower partial moments (of the second and third order). To proxy debt investors' risk assessments, we consider single-name credit default swap spreads over 1- and 5-year periods, the probabilities of default over 12 months and 60 months, and the distance to default. We analyze the association between firms' CEPs and investors' risk assessments for all the firms listed on the German DAX30, MDAX, TecDAX, and SDAX. In our

[1]It should be noted that an equity claim on a firm's cashflows entails both an upside chance and a downside risk. Clearly, to address the question at hand, we are mostly interested in the loss potential, so we focus on the downside risk of equity in our main analyses. However, we also consider the association between the CEP index and investors' upside chances in our supplemental analyses.

supplemental analyses, we consider financial firms separately as a prime example of the importance of corporate ethics programs.

Studying the relationship between the scope of a firm's CEP, as measured with the CEP index, and firm risk raises endogeneity concerns, particularly regarding reverse causality (e.g., El Ghoul et al., 2011). From a theoretical perspective, it is unclear whether a broad CEP decreases firm risk, in line with "good management theory" (e.g., Jones et al., 2018), or whether firms with low risk have the resources available to finance a comprehensive CEP, which would be supported by the "slack resource theory" (e.g., Waddock and Graves, 1997). Hence, we frame our hypotheses conservatively and refer only to the association between a firm's CEP and investors' risk assessments. Nevertheless, we try to at least narrow down an actual causal effect by choosing our empirical methodology accordingly. More precisely, we follow Angrist and Pischke (2009) and employ two independent estimation approaches that consider different angles of a potential endogeneity issue: (1) a fixed-effects estimation procedure and (2) a dynamic generalized method of moments (GMM) approach. As a further robustness test, in line with El Ghoul et al. (2018) and Breuer et al. (2018), we apply a relatively conventional approach by conducting two-stage least squares instrumental variables regressions. Hence, we are overall confident that our extensive statistical testing provides at least indicative evidence of a causal relationship between firms' CEPs and investors' risk assessments. However, we interpret our findings relatively conservatively.

Our analyses yield the following six sets of results and contribute to previous literature and practice from different perspectives. First, to the best of our knowledge, we are the first to compile a comprehensive measure of firms' CEPs based on publicly available information sources. The previous related research mainly relies on qualitative case studies or survey data (e.g., Jannat et al., 2021; Hartmann et al., 2018; Hutter, 2001; Parker and Nielsen, 2009). Other analyses focus solely on specific areas, such as conformance with environmental or health and safety regulations (e.g., Coglianese and Lazer, 2003; McKendall et al., 2002; Potoski and Prakash, 2005). Additionally, others only consider specific elements of a CEP (e.g., Erkmen et al., 2014; Read and Rama, 2003). Second, each CEP item is theoretically embedded and thoroughly described, providing a current comprehensive overview of the scope and design of firms' CEPs using a representative sample of German firms from over the past several years. Hence, our detailed descriptive statistics should enable managers to benchmark their firms' CEPs against the respective market standard.

Third, we provide insights into the association between a firm's CEP and investors' risk assessments. Our results indicate that there is a negative association between the scope of a firm's CEP and firm risk from the perspective of equity investors – this effect is particularly strong in our subsample of financial institutions.[2] Thus, it seems that equity investors appreciate the benefits of a broad CEP more than they dislike the associated costs when making their risk assessments. Our factor analysis further reveals that CEP items that are clearly anchored within a firm drive this effect particularly strongly. Fourth, for debt investors, the costs of a broad CEP appear to outweigh the benefits since debt investors' risk assessments are positively associated with the scope of a firm's CEP. According to our factor analysis, only external auditors' involvement in the firms' CEPs reduces credit risks. Fifth, and especially interestingly, the softer CEP items, such as a compliance culture or an ethical tone at the top of a firm, seem to not be esteemed by investors, even though previous research continuously stresses the importance of those items (e.g., Krawiec, 2003; Parker and Nielsen, 2009; Rosen, 2003). In support of this issue, further analyses on whether the breadth or depth of a firm's CEP drives investors' risk assessments indicate that investors especially value CEP items that are implemented firm-wide, as these items are highly visible and thus verifiable from the outside.

Sixth, in our supplemental analyses, we add to the general discussion about the effectiveness of corporate ethics programs by evaluating the net effect of an additional CEP item from the perspective of investors. Indeed, we find evidence that the risk reduction for equity investors outweighs the risk increase faced by debt investors. Furthermore, quartile regressions reveal that adding further CEP items reduces equity risk

[2] We include financial firms in our main analyses but also consider them separately as a robustness check because the financial industry, due to its strict regulations, may be expected to show even more extreme effects from comprehensive CEPs.

particularly for firms with a broad CEP in place. Finally, to paint a fair picture of the costs and benefits of a CEP, we show that a broad CEP reduces equity investors' downside risks and upside chances comparably.

The remainder of the paper proceeds as follows. Section VII.2 presents a brief background and develops the hypotheses that we set out to test. We then detail the CEP index construction and describe its cross-sectional and temporal characteristics before using a factor analysis to consider the relations between the individual CEP items. Additionally, we note the discretionary choices that we make in constructing the CEP index. Section VII.3 describes the dataset, and Section VII.4 portrays the econometric methodology used to examine the relationship between a firm's CEP and investors' risk assessments, which is explained in more detail in the Appendix V. Section VII.5 presents the main results from examining the CEP index overall and its different factors. In Section VII.6, the relationship between the firms' CEPs and investors' risk assessments is scrutinized via further analyses. Section VII.7 provides additional analyses for the relationship between the CEP index and investors' risk assessment. Section VII.8 concludes with a discussion of the results, implications for practice, and an outlook on future research.

VII.2 Background and hypotheses

Background

Unethical firm behavior is an extreme but firm-specific risk. While in general, firm-specific risks in an investor's portfolio can be mitigated through diversification, extreme risks are notoriously difficult for investors – particularly for small investors – to account for (Huang, 2018; Switzer et al., 2017). Again, during the Wirecard scandal, investors were aware of the risks in Wirecard's market strategy, but the surprisingly fraudulent behavior of its top management team still came as a shock to most investors. Thus, the risk of unethical firm behavior as an extreme and often unforeseeable event is difficult to mitigate in investors' portfolios. A comprehensive CEP should help to reduce these extreme firm-specific risks, though not without costs of its own. In the following section, we argue how investors may anticipate the comprehensiveness of a firm's CEP when making their risk assessments.

Investors can provide either equity or debt capital to a firm. As its owners, equity investors are the residual claimants on a firm's free cash flows and are therefore subject to both upside chances and downside risks. Debt investors, in contrast, have a senior claim over equity investors regarding agreed-upon interest and the repayment of their debts' face value. Accordingly, the debt investors of a firm do not carry an immediate risk concerning unethical firm behavior as long as the firm does not fall into bankruptcy. Nevertheless, a higher likelihood of insolvency may reduce the value of their debt claims on capital markets even before a state of bankruptcy is realized. Moreover, as their claim on the firm's cash flow is fixed, debt investors do not benefit from a firm's upside potential. Due to these diverging claims, debt and equity investors might evaluate the comprehensiveness of a firm's CEP differently when making their risk assessments.

Equity investors

A comprehensive CEP entails costs – costs of implementation as well as ongoing costs of maintenance. In Germany, firms with more than 10,000 employees spend, on average, €7.4 million per year for compliance, and this figure is trending upward (PWC, 2018). Additionally, a comprehensive CEP can impact the firm's entire supply chain, thereby incurring further costs. For example, Apple and Nike introduced a 60-hour maximum standard working rule for their suppliers (Apple, 2019; Locke et al., 2007), even though their supplier prices subsequently increased. There might also be indirect costs related to a comprehensive CEP. According to the locus of control theory (Rotter, 1966), employees can feel restricted by a strongly formalized and omnipresent CEP. For instance, controls can hamper employees' creativity and job satisfaction. Specifically, when employees have the ability to determine their actions and behaviors, they perceive that they can influence their performance through their abilities, skills, and efforts. In contrast, intensively controlled and regulated employees perceive that external factors beyond their influence restrict their performance (e.g., for a meta-analysis, see Avey et al. (2011)). In this vein, previous research reveals that even internal auditors, who are used to strict rules, have higher job satisfaction and job performance when they can personally influence their work routines (e.g., Donnelly et al., 2003; Patten, 2005). Furthermore, behavioral research has shown that an awareness of controls can crowd out ethical considerations and increase opportunistic employee behavior (e.g., Ewelt-Knauer et al., 2020).

On the other hand, a less-comprehensive CEP increases the likelihood of unethical firm behavior, which may decrease future free cash flows. First, if a firm has a noncomprehensive CEP, its cash outflows may be higher than initially expected because it faces fines, penalties, and payments of damages. For example, as of May 2019, Volkswagen AG had paid more than $30 billion in fines for their Dieselgate (e.g., Kable, 2019), while Deutsche Bank was ordered to pay $2.5 billion in conjunction with their LIBOR scandal (e.g., Jaeger, 2015). The European Commission imposed fines of over €990 million on firms that engaged in lift and escalator cartels (e.g., European Commission, 2007). Second, a firm's cash inflows can be reduced by unethical firm behavior. Ethical scandals harm a firm's reputation from the perspective of its customers and increase the risk of customer boycotts (e.g., Dimitriou and Schwepker, 2019). Moreover, ethical scandals can decrease employee loyalty e.g., (e.g., Demirtas and Akdogan, 2015; Elçi et al., 2012) and induce black listing, which can, for instance, exclude a firm from public tendering or procurement (e.g., Eggenberger, 2018).

Against this background, a question arises: Which of these two effects is predominant in terms of equity investors' risk assessments? While a study of the Ponemon Institute LLC (2017) reports that it is 2.71 times more costly for firms to break the rules than to ensure ethical firm behavior, a full evaluation of this tradeoff goes beyond a simple comparison of expected costs and free cash flow levels. Rather, and maybe even more importantly, it also has to be considered that the cost of a broad CEP tends to be predictable and is therefore easily accounted for by investors. The risks of unexpected unethical firm behavior stemming from a noncomprehensive CEP and the corresponding losses, in contrast, are much less predictable, as they may contain many different facets, such as long-term reputation damages, that go over and above the specified fines and penalties. Given the residual character of equity investors' claims on a firm's free cash flows, we expect the reduced uncertainty from a comprehensive CEP to outweigh the increased costs related to implementing and maintaining such a program. In other words, the more comprehensive a CEP is, the lower the downside risks that equity investors face from the extreme event of unethical firm behavior. Based on these arguments, we posit the following association between CEPs and equity investors:

Hypothesis 1: *A broad corporate ethics program (CEP) is negatively associated with equity investors' risk assessments.*

As it would be beneficial for management to know which CEP items are especially valued by investors, we also study which factors particularly influence the association between a firm's CEP and equity investors' risk assessments. Therefore, we state the following research question, which is based on hypothesis 1:

Research Question 1: *Which factors of a firm's corporate ethics program (CEP) have a particularly strong influence on this association?*

Debt investors

In contrast to equity investors, debt investors do not bear an immediate risk in regard to the payments that are due them as long as the related firm does not enter bankruptcy. More specifically, as long as unethical firm behavior does not lead to insolvency, debt investors' repayments are not affected by such actions. Indeed, only very few firms (e.g., Enron, Worldcom, and Wirecard) have recently become insolvent due to such behavior. Especially in the European Union and Germany, courts explicitly consider a firm's survival when determining the fines and penalties for unethical firm behavior to avoid jeopardizing employment contracts (Engelhart, 2012). For instance, the German Federal Trade Commission cannot impose a penalty for cartel agreements – one of the most severe unethical firm behaviors – that is higher than 10% of the firm's total revenues from the prior year (§81 Abs. 4 Satz 2 GWB). According to the guidelines of the Commission Department of the European Union, penalties for cartel agreements can only reach 30% of a firm's total revenues from the prior year (see the guidelines for determining penalties in article 23 (2) of EG regulation No. 1/2003, 2006/C210/02, Note 21). Thus, debt investors might value the benefits of a comprehensive CEP less than equity investors because their repayments are typically less affected by unethical firm behavior.

On the other hand, debt investors might fear that the costs of a comprehensive CEP will decrease firms' cash flows to the extent that their creditworthiness is reduced. While this would not immediately affect repayments to debt investors, impaired creditworthiness could lead to a decreased value of debt securities on secondary capital markets, thus ultimately hurting debt investors. In this light, debt investors should be expected to be more critical of management's actions to implement a broad CEP than equity investors, and they should anticipate greater risks. From these arguments, we posit the following hypothesis related to debt investors:

Hypothesis 2: *A broad corporate ethics program (CEP) is positively associated with debt investors' risk assessments.*

Again, based on hypothesis 2, we examine which elements of a firm's CEP have a particularly strong bearing on this relationship.

Research Question 2: *Which factors of a firm's CEP have a particularly strong influence on this association?*

VII.3 Evaluating a firm's Corporate Ethics Program

VII.3.1 CEP index: General description

Corporate ethics programs encompass all processes and actions intended to increase ethical firm behavior and employee compliance with rules (e.g., Weber and Wasieleski, 2013). Both the terms "corporate ethics" and "compliance" stress that employees should follow norms, laws, and regulations. However, Paine (1994) points out that compliance focuses on rules and processes and draws employees' attention to avoiding punishment, while broader ethical programs encourage ethical thinking (Lerner, 1977; Treviño and Weaver, 2001). To capture both facets, namely, compliance and ethical encouragement, we consider clearly defined rules and processes as well as softer factors. In detail, we identify 24 items that firms can potentially implement in their CEPs (in the following: CEP items).

Even though most firms are obligated to have a CEP, they can freely determine its scope (e.g., Weaver and Treviño, 2001). To capture the scope of a firm's CEP in a robust fashion, we analyze the full content of each examined firm's publicly available corporate reporting, such as its (1) annual reports, (2) management commentaries/management discussions and analyses, and (3) corporate social responsibility (CSR) reports where available. Studying the content of corporate reporting is in line with previous research. For instance, Verschoor (1998) evaluates whether firms make verbal commitments to ethical practices in their corporate reporting. Other studies employ content analysis to determine the level of firms' risk disclosures (e.g., Linsley and Shrives, 2006; Rajab and Schachler, 2009). To construct our CEP index, we assess 24 different CEP items, which are described below, in the form of binary indicator variables; a value of one is assigned to a variable if a firm's corporate reporting indicates that the related item is in place and zero otherwise. We summarize these binary indicator variables per firm for each year, which results in an annual time series of the CEP index. This procedure follows the work of Gompers et al. (2003), who collect information on binary indicators for different governance components from publicly available corporate reporting and summarize them into a collective index.

VII.3.2 The CEP index: Items

An effective corporate ethics program is based on precise functions and responsibilities. Our CEP index creation, therefore, starts by considering whether a chief compliance/ethics officer has been appointed (*item #1* "CCO"), as previous research indicates that this is central to a well-managed ethics program (e.g., Lovitky and Ahern, 1999; Treviño et al., 2014). Indeed, in 2014, 58% of the firms in our sample reported that they had appointed a CCO, and this percentage increased continuously, reaching 73% in 2018 (see Table VII.1). Beyond that, a compliance/ethical committee at the board level (*item #2* "Ethical Committee") ensures that a structured approach is adopted to address ethical firm behavior (e.g. Melendy and Huefner, 2011). In 2014, 28% of our sampled firms reported that they had such a committee, and this number increased to 37% in 2018. In addition, we determine whether each firm refers to a clear compliance organization (*item #3* "Compliance Organization") that stretches over all its hierarchical levels. While 48% of the sample firms documented such an organizational structure in 2014, this proportion increased to 67% in 2018. Additionally, we consider whether a firm applies the COSO framework (*item #4* "COSO"), which provides clear rules for effective risk management systems within an entire firm – on average, 36% of our sample firms follow this framework.

Previous research stresses that an essential component of a CEP is a robust ethical culture. For instance, Jose and Thibodeaux (1999) find that 93% of managers state that corporate culture is more important for encouraging ethical employee behavior than other factors. Nielsen and Parker (2012) underline that it is essential that employees' norms and values fit those of their firm (see also Kristof-Brown et al., 2005). Thus, the pure implementation of a formalized CEP is seen as insufficient to ensure ethical firm behavior. Instead, a CEP must allegedly be enacted through a strong ethical culture (Parker and Nielsen, 2009). Otherwise, the implementation of a business ethics program could be a costly waste (Krawiec, 2003). Against this background, our index captures whether a firm highlights the importance of an ethical culture (*item #5* "Ethical Culture"). While in 2014, only 25% of our sample firms referred to an ethical culture, this number had doubled by 2018. Furthermore, previous literature stresses that top management's "tone at the top" significantly shapes a firm's ethical culture (*item #6* "Ethical Tone at the Top"). Moreover, it is emphasized that top management should not only talk about ethics but also strongly support rules and regulations to effectively reduce unethical firm behavior (e.g., Treviño and Nelson, 2021). Therefore, our CEP index incorporates whether a firm highlights the importance of an ethical tone among its top management. Indeed, our descriptive findings document an increased awareness of such a tone. While in 2014, only 13% of the examined firms referred to the importance of this tone, this amount had nearly doubled by 2018. Finally, top management can faithfully underpin its ethical commitment through a membership in the UN Global Compact (*item #7* "UN Global Compact") – the world's largest global initiative for responsible corporate leadership. On average, one-third of our sample firms report such a membership.

Firms can also directly help their employees behave ethically. For instance, firms can provide codes of conduct/ethics (*item #8* "Code of Conduct") to guide employee behavior, especially for when employees face tradeoff situations (e.g., Adams et al., 2001; Erwin, 2011; Valentine et al., 2019). While in 2014, four out of five of the sample firms reported the use of such a code of conduct, in 2018, 94% of our sample firms reported the use of such guidelines. In addition, top management can implement codes of conduct that encourage their business partners to engage in ethical behavior throughout the entire supply chain (*item #9* "Supplier Code of Conduct"). While in 2014, only 29% of the sample firms reported the implementation of such a supplier code of conduct, this proportion had doubled by 2018. Additionally, ethical training can effectively increase employees' awareness and acceptance of codes of conduct (*item #10* "Ethical Training"), which is underlined by previous research (e.g., Weber and Wasieleski, 2013; Valentine and Fleischman, 2004). While in 2014, two out of three firms documented the use of such training, almost all the sample firms provided ethical training in 2018.

Empirical evidence also shows that firms anticipate increasingly more ethical issues related to incentive schemes (Maas and Rosendaal, 2015). Therefore, we ensure that our index captures whether firms have implemented monetary incentives for ethical behavior (*item #11* "Ethical Incentives"). However, only a few firms report such incentives in our sample – on average, 7%. From the opposite perspective, ethical violations should be responded to with appropriate sanctions (*item #12* "Sanctions"), as employees might otherwise not take CEPs seriously. In 2014, 30% of our sample firms reported the use of sanctions, while this amount had nearly doubled by 2018. Moreover, the Association of Certified Fraud Examiners (ACFE) emphasizes the use of job rotation to effectively increase ethical employee behavior (ACFE, 2020), and this factor is also captured by our CEP index (*item #13* "Job Rotation"). Especially in the context of specific divisions such as sales departments, job rotations can help firms avoid extensive familiarity among employees and destroy potential unethical attitudes within existing teams. Against this background, it may be surprising that only 7% (11%) of our sample firms had job rotations in place in 2014 (2018).

To capture the overall effectiveness of a CEP, our index incorporates whether a firm has implemented internal compliance/ethics audits (*item #14* "Internal Compliance Audit"). While in 2014, 52% of all the sample firms reported internal compliance audits, this percentage increased to 79% in 2018. Our index also considers whether external compliance audits by independent audit firms are conducted (*item #15* "External Compliance Audit"). In our sample, 13% (20%) of the firms underwent external compliance audits in 2014 (2018). Our index also takes into account whether the CEP is certified by an independent auditor based on the auditing standard IDW PS 980 (*item #16* "Certification"). The number of firms with such certification doubled between 2014 (5%) and 2018 (10%). Similarly, we acknowledge in the index whether a firm monitors its business partners' ethical behavior (*item #17* "Compliance Check of Partners"). Indeed, such monitoring was conducted by 31% of our sample firms in 2014 and by 68% in 2018.

An effective CEP provides individuals with the opportunity to report potentially unethical behavior (e.g., Near and Miceli, 1985). Such misconduct can either be reported to people holding certain positions within a firm (*item #18* "Internal Whistleblowing Facility") or to bodies outside a firm, for instance, a law enforcement agency (*item #19* "External Whistleblowing Facility"). The proportion of our sample firms with internal whistleblowing facilities increased from 40% (2014) to 71% (2018) over the sample period, and the proportion utilizing external whistleblowing facilities increased from 33% (2014) to 59% (2018). Previous research also underlines the importance of encouraging whistleblowers (e.g., Chen et al., 2017). Thus, our index acknowledges whether the number of whistleblower reports is reported as a supportive signal to speak up (*item #20* "Whistleblowing Report"). While in 2014, only 13% of our sample firms reported this information, in 2018, 21% of firms did so. Because the risk of retaliation is high for whistleblowers, our score also captures whether each firm has appointed an ombudsperson (*item #21* "Ombudsperson"); such a person protects whistleblowers against any disadvantages or discrimination. On average, 21% of our sample firms have appointed such an ombudsperson. In the same vein, our score also captures whether each firm assures confidentiality or anonymity to whistleblowers (*item #22* "Anonymity for Whistleblowers"). While in 2014, only 41% of the firms explicitly guaranteed anonymity, this percentage increased to 78% in 2018.

Finally, a firm must persistently monitor existing and potential new ethical/compliance risks. Thus, our index considers whether each firm conducts ongoing ethical risk assessments (*item #23* "Ethical Risk Assessment"). In 2014, 33% of the firms used such ongoing assessments, while in 2018, 67% of our sample firms continuously monitored their ethical risk. Finally, as a firm's boundaries change dynamically over time, e.g., due to M&A deals, its ethical culture needs to be continuously revised (*item #24* "Check of Compliance Culture"), for instance, through regular employee surveys. While in 2014, only 2% of our sample firms reported such an ethical culture check, this percentage had quadrupled by 2018.

Table VII.1: Description and descriptive statistics of the CEP index.

	CEP Item	Description	% of firms in 2014	% of firms in 2015	% of firms in 2016	% of firms in 2017	% of firms in 2018	Average % of firms in 2014-2018
#1	CCO	Existence of chief ethical/ compliance officer (CCO)	58.00%	60.67%	60.67%	70.00%	72.67%	**64.40%**
#2	Ethical Committe	Existence of ethical/compliance committee at the board level	28.00%	29.33%	27.33%	37.33%	36.67%	**31.73%**
#3	Compliance Organization	Clear compliance organization	48.00%	50.67%	52.00%	62.00%	66.67%	**55.87%**
#4	COSO	Application of the COSO framework	35.33%	36.67%	36.00%	34.67%	37.33%	**36.00%**
#5	Ethical Culture	Ethical/compliance culture mentioned as an essential factor of corporate culture	24.67%	31.33%	38.00%	48.00%	50.67%	**38.53%**
#6	Ethical Tone at the Top	Ethics are mentioned as a relevant component of the tone at the top of the organization	13.33%	15.33%	13.33%	24.67%	24.67%	**18.27%**
#7	UN Global Compact	Member of the United Nations (UN) Global Compact	28.67%	30.00%	30.00%	32.00%	36.67%	**31.47%**
#8	Code of Conduct	Existence of a code of conduct	80.00%	82.00%	84.67%	93.33%	94.00%	**86.80%**
#9	Supplier Code of Conduct	Existence of a supplier code of conduct	28.67%	34.00%	39.33%	51.33%	56.67%	**42.00%**
#10	Ethical Training	Ethical/compliance trainings offered	66.00%	72.00%	74.67%	86.67%	90.00%	**77.87%**
#11	Ethical Incentives	Ethics/compliance is a target in the management compensation system	4.67%	6.00%	6.00%	8.00%	8.00%	**6.53%**
#12	Sanctions	Penalization of compliance/ethical infringements	30.00%	33.33%	42.00%	57.33%	56.67%	**43.87%**
#13	Job Rotation	Job Rotation used as strategic instrument to increase ethical behavior	6.67%	7.33%	7.33%	7.33%	10.67%	**7.87%**
#14	Internal Compliance Audit	Internal compliance audits are conducted	52.00%	56.00%	61.33%	77.33%	79.33%	**65.20%**
#15	External Compliance Audit	External compliance audits are conducted	12.67%	15.33%	21.33%	22.67%	20.00%	**18.40%**

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Table VII.1 – continued from previous page

	CEP Item	Description	% of firms in 2014	% of firms in 2015	% of firms in 2016	% of firms in 2017	% of firms in 2018	Average % of firms in 2014-2018
#16	Certification	Compliance system is certified by independent auditors	4.67%	6.00%	8.67%	9.33%	10.00%	**7.73%**
#17	Compliance Check of Partners	Compliance checks of business partners are conducted	30.67%	42.67%	52.00%	68.67%	68.00%	**52.40%**
#18	Internal Whistleblowing Facility	Existence of internal whistleblower facility	40.00%	41.33%	47.33%	68.00%	70.67%	**53.47%**
#19	External Whistleblowing Facility	Existence of external whistleblower facility	32.67%	36.67%	39.33%	56.00%	58.67%	**44.67%**
#20	Whistleblowing Report	Whistleblowing reports received	12.67%	14.67%	16.00%	20.67%	21.33%	**17.07%**
#21	Ombudsperson	Existence of an ombudsperson at the whistleblowing facility	18.00%	18.67%	22.67%	24.00%	24.00%	**21.47%**
#22	Anonymity for Whistleblowers	Whistleblowing system guarantees anonymity	40.67%	48.00%	54.67%	76.67%	78.00%	**59.60%**
#23	Ethical Risk Assessment	Implementation of an ethical/compliance risk assessment	32.67%	44.67%	47.33%	64.00%	67.33%	**51.20%**
#24	Check of Ethical Culture	Regular employee surveys regarding ethical/compliance culture	2.00%	2.67%	5.33%	6.67%	8.00%	**4.93%**

Remark: This table describes all 24 items of our CEP index and provides descriptive statistics for each item corresponding to each year of the sampling period (2014-2018). The items are coded as binary indicator variables for each of the five years of our sampling period. We use corporate disclosures, such as annual reports, management commentaries, and CSR reports, to determine whether each firm has implemented a given item. When a firm reports about the respective item, the variable corresponding to that item equals 1; otherwise, it equals 0. The descriptive statistics for each item demonstrate how many firms have reported that the respective item is in place during the relevant year. In addition, we report the average for each item over our entire sample period.

VII.3.3 CEP index: Descriptive statistics

We construct an annual CEP index for all the German firms listed in the DAX30, MDAX, SDAX, and TecDAX stock market segment between 2014 and 2018. In total, we analyze 150 firms over five years. We include financial firms – a particularly strictly regulated industry – in our main analyses and consider them separately as a robustness check in Section VII.6.1.

Table VII.2 presents the development of the CEP index. The average (median) CEP index value across all the firms and years is equal to 9.37 (10), i.e., the average (median) firm reports a CEP that contains 9.37 (10) of the 24 CEP items that our index considers. By dividing our sample firms according to the individual stock market segments, we see that the DAX30-listed firms show a much higher average of 15.13 and median index value of 15. The TecDAX-listed firms, in contrast, exhibit the lowest average (median) CEP index, namely, 6.21 (7). Given that DAX30 companies are the largest publicly listed firms in Germany, this may have been expected. However, the DAX-30 firms exhibit the smallest average change over time, namely 2.5 CEP items, while the increase is greater in the other segments. For instance, the firms listed on the MDAX (TecDAX) implemented on average 4.34 (4.38) additional CEP items during our sampling period of 2014 to 2018. The absolute change exhibited by the SDAX firms is the highest at nearly five additional CEP items. This may indicate that the largest German firms have reached a plateau in terms of their ethics and compliance activities, while smaller firms are still catching up with the DAX30 firms.

Table VII.2: Descriptive statistics of the CEP index – Total, market segments and development over time.

All Indices	2014	2015	2016	2017	2018	Avg.(2014 - 2018)	Growth (2014 to 2018)	Absolute Change (2014 - 2018)
Mean	7.31	8.15	8.87	11.07	11.47	9.37	56.93	4.16
Median	7	8	9	11	12	10	71.43	5.00
Std. Dev.	5.38	5.46	5.53	4.72	4.54	5.38	-15.69	-0.84
Minimum	0	0	0	0	0	0	0.00	0.00
Maximum	21	22	22	22	22	22	4.76	1.00

DAX30	2014	2015	2016	2017	2018	Avg.(2014 - 2018)	Growth (2014 to 2018)	Absolute Change (2014 - 2018)
Mean	13.8	14.17	15.1	16.4	16.3	15.13	18.12	2.50
Median	15	15	15	16	16	15	6.67	1.00
Std. Dev.	4.22	4.00	3.38	2.91	2.72	3.61	-35.61	-1.50
Minimum	2	2	9	12	12	2	500.00	10.00
Maximum	21	22	22	22	22	22	4.76	1.00

MDAX	2014	2015	2016	2017	2018	Avg.(2014 - 2018)	Growth (2014 to 2018)	Absolute Change (2014 - 2018)
Mean	7.74	8.98	9.57	11.85	12.09	10.05	56.04	4.34
Median	8	9	10	12	12	11	50.00	4.00
Std. Dev.	4.51	4.72	4.89	3.41	3.70	4.57	-18.02	-0.81
Minimum	0	0	1	0	0	0	0.00	0.00
Maximum	18	17	20	20	21	21	16.67	3.00

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Table VII.2 – continued from previous page

TecDAX	2014	2015	2016	2017	2018	Avg.(2014 - 2018)	Growth (2014 to 2018)	Absolute Change (2014 - 2018)
Mean	4.10	4.97	5.48	8.03	8.48	6.21	106.72	4.38
Median	4	5	6	8	9	7	125.00	5.00
Std. Dev.	3.24	3.69	3.81	3.31	3.34	3.85	3.10	0.10
Minimum	0	0	0	0	0	0	0.00	0.00
Maximum	11	12	14	15	15	15	36.36	4.00

SDAX	2014	2015	2016	2017	2018	Avg.(2014 - 2018)	Growth (2014 to 2018)	Absolute Change (2014 - 2018)
Mean	4.52	5.27	6.11	8.59	9.48	6.80	109.55	4.95
Median	4	5	6	9	10	6	150.00	6.00
Std. Dev.	3.91	4.30	4.49	4.35	4.21	4.63	7.62	0.30
Minimum	0	0	0	0	0	0	0.00	0.00
Maximum	14	16	16	16	18	18	28.57	4.00

Remark: This table presents the descriptive statistics - mean, median, standard deviation, minimum and maximum – of the CEP index for each year during the sampling period (2014-2018). Average denotes the mean CEP index value over the period from 2014 to 2018. Growth and absolute change are the growth rate (in%) of and the absolute change in each CEP index from 2014 to 2018. The first part of the table refers to the full sample, and the lower parts refer to the firms listed in the DAX30, MDAX, TecDAX, and SDAX market segments individually.

VII.3.4 Factors of the CEP index

As a simple summary index, the CEP index treats each item in a firm's corporate ethics and compliance program equally. However, clearly, firms may view specific items as much more beneficial than others. Additionally, certain relations between different items may exist. For instance, some items may be established in groups or, on the contrary, may serve as substitutes of one another. To allow such a structure to arise naturally from our list of CEP items, we conduct a factor analysis of the 24 binary indicator variables of the CEP index. The general objective of this analysis is to identify and extract a small number of unobservable (or latent) characteristic "factors" from the much larger number of observed variables. This factor analysis employs the distance and the relatedness between the observed variables to derive a weighting (or loading) scheme and compile the different factors. In doing so, it uses the maximum common variation among the variables. To generate the factors, we perform an orthogonal varimax rotation of the loading matrix proposed by Kaiser (1958). These factors are orthogonal in the sense that they are linearly uncorrelated and therefore contain different explanatory content. Thus, the factor analysis allows us to interpret the (possibly interrelated) effect of the individual CEP items by grouping them into a small number of factors while ensuring that they continue to contain the original data's full informational content.

From the factor analysis, we retain five factors with eigenvalues larger than 1, i.e., with sufficient explanatory content (cf. Katz and Rohlf, 1975). Table VII.3 reports the corresponding factor loadings. The first factor loads strongly[3] on all the CEP items that refer to the institutionalization of a CEP within a firm: the existence of a chief compliance officer (item #1), a strict compliance organization (item #3), a code of conduct (item #8), a supplier code of conduct (item #9), ethical training (item #10), sanctions in case of ethical infringements (item #12), internal compliance audits (item

[3]It should be noted that there is no established threshold for factor loadings to be considered as sufficiently high. In our analysis, we rely on factor loadings above 0.4, but establish in further robustness tests that our findings also hold when different (stricter) limit levels are chosen, for instance 0.5.

#14), a compliance check of business partners (item #17), internal whistleblowing facilities (item #18), ensured anonymity for whistleblowers (item #22) and an ongoing internal ethical risk assessment (item #23). Thus, we refer to this factor as the "internally institutionalized" factor (*Factor_ Institutionalization*). Essentially, it contains all the items that contribute to a local anchoring of ethical and compliance activities within a firm.

The second factor loads strongly on the externally oriented aspects of a CEP: the application of the COSO framework (item #4), membership in the UN Global Compact (item #7), external whistleblowing facilities (item #19) and external reporting of whistleblowing activities (item #20). We call this factor the "externally orientated" CEP factor (*Factor_External*). The third factor denotes whether external, independent auditors participated in each firm's CEP to conduct an external compliance audit (item #15) or even a certification of the CEP (item #16). Therefore, we call this factor the "external auditor" factor (*Factor_Auditor*). The fourth factor, which is referred to as the "cultural" factor (*Factor_Culture*), loads strongly on the firms' compliance culture (item #5), the ethical tone at the top (item #6), and incentives to improve the ethical culture of the firms (item #11). Finally, the fifth factor loads heavily on other internal organizational matters, such as whether there is an ethical or compliance committee at the board level (item #2) and whether a firm uses job rotation (item #13). It is referred to as the "organizational" factor (*Factor_Organization*). Thus, the fifth factor is closely related to the first factor (*Factor_Institutionalization*), since both focus on the clearly defined instruments and processes implemented by management within an organization.

Table VII.3: Factor analysis of the CEP index.

Variable	Factor_*Institutionalization*	Factor_*External*	Factor_*Auditor*	Factor_*Culture*	Factor_*Organization*
#1 CCO	**0.533**	0.105	0.128	0.109	0.154
#2 Ethical Committee	0.289	-0.036	0.079	-0.041	**0.657**
#3 Compliance Organization	**0.467**	-0.022	0.115	0.396	0.307
#4 COSO	0.110	**0.566**	0.021	-0.018	0.016
#5 Ethical Culture	0.319	-0.120	0.190	**0.585**	-0.109
#6 Ethical Tone at the Top	0.096	0.144	-0.013	**0.828**	0.061
#7 UN Global Compact	0.268	**0.582**	0.267	0.183	0.127
#8 Code of Conduct	**0.718**	0.037	0.075	-0.022	0.040
#9 Supplier Code of Conduct	**0.499**	0.369	0.209	0.180	-0.268
#10 Ethical Training	**0.763**	0.129	0.101	0.001	0.067
#11 Ethical Incentives	-0.020	0.427	0.153	**0.518**	0.040
#12 Sanction	**0.477**	0.246	0.211	0.224	0.250
#13 Job Rotation	0.020	0.197	0.211	0.112	**0.651**
#14 Internal Compliance Audit	**0.510**	-0.009	0.103	0.183	0.288
#15 External Compliance Audit	0.081	0.107	**0.810**	0.138	0.092
#16 Certification	0.104	0.032	**0.877**	-0.031	0.062
#17 Compliance Check of Partners	**0.568**	0.375	0.310	0.157	-0.147
#18 Internal Whistleblowing Facility	**0.616**	0.044	0.104	0.282	0.097
#19 External Whistleblowing Facility	0.490	**0.544**	-0.123	0.146	0.180
#20 Whistleblowing Report	0.162	**0.638**	0.136	0.061	0.021
#21 Ombudsperson	0.161	0.015	0.125	0.060	-0.027
#22 Anonymity of Whistleblowers	**0.673**	0.299	-0.064	0.128	0.156
#23 Ethical Risk Assessment	**0.569**	0.102	0.243	0.164	0.105
#24 Check of Ethical Culture	0.005	0.208	0.123	0.144	0.230

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Table VII.3 – continued from previous page

Remark: This table presents the factor loadings of the five factors with eigenvalues larger than 1 from a factor analysis of the 24 CEP index elements. To generate the factor loadings, we perform an orthogonal varimax rotation of the loading matrix proposed by Kaiser (1958). The factor analysis requires factor loadings to be greater than 0.4. The factor loadings greater than 0.4 are highlighted in bold.

VII.3.5 Discretionary choices in constructing the CEP index

The construction of our CEP index is subject to various discretionary choices that eventually affect its informative value. Additionally, these choices may add noise to the measurement, making it more difficult to find statistically significant results regarding an association between the scope of a firm's CEP and investors' risk assessments. Therefore, they deserve discussion.

(i) Choice of CEP items

To construct a comprehensive measure, we rely on various objective sources to identify relevant CEP items. More precisely, we build on the compliance elements used by the ACFE for their annual Report to the Nations (ACFE, 2020). Moreover, we employ IDW PS 980, an auditing standard on compliance management systems issued by the Institute of Public Auditors in Germany. Finally, we validate our list of CEP items with the German Corporate Governance Code. In this way, we introduce a new and very comprehensive instrument to the literature designed to measure the scope of a firm's CEP. However, we cannot entirely exclude that firms implement other CEP-items not considered in our index.

(ii) Choice of data source

We construct the CEP index solely from publicly available information, i.e., from the examined firms' corporate reports. This has several consequences. First, the reported CEP items of a firm could overstate the true status of its CEP, resulting in a CEP index that is too high. This is particularly crucial because previous research reveals that some firms use CSR reporting as a marketing tool to impress investors (e.g., in the broader context of CSR reporting Cho et al., 2015; Blacconiere and Patten, 1994). We address this concern by using binary coding that assigns a value of 1 if a CEP item is reported to be in place in a firm. Thus, our index is unaffected by the quantity of a firm's reporting. However, we cannot exclude that some CEP items are pure lip service from management, especially in the case of softer CEP items that refer to an ethical culture or the tone at the top of an organization, for instance. If these issues are reported, our CEP index captures them, even though we cannot ensure that the respective item is truly enforced or observed.[4] However, it must be acknowledged that our analyses rely on the same publicly available information that equity and debt investors typically consider when making their risk assessments. The information basis of our approach, in this respect, mirrors that of a typical investor. As previous research indicates that investors ignore unverifiable qualitative corporate reporting due to a lack of credibility (e.g., Cannon et al., 2020), this potential flaw in the index construction should, therefore, – if it impacts them at all – render our results more conservative and hence be acceptable.

Second, a firm could also *under*state its CEP reporting, resulting in a CEP index that is too low in comparison to the effective CEP in place. Such understatements could be caused by concerns regarding litigation risks involving corporate reporting about CEP items. For instance, when a firm is involved in an ethical scandal, investors could decide to sue its management for ineffectively implementing its CEP (e.g. Choi and Jung, 2020). Proprietary costs could also deter management from reporting about CEP items (e.g., Verrecchia, 1983). For instance, information about a firm's (supplier) code of conduct could be used by suppliers or competitors to enhance their positions vis-à-vis the disclosing firm within contract negotiations or competitive situations (in the context of general CSR disclosure; Martínez-Ferrero and García-Sánchez, 2017). However, agency costs should strongly mitigate the incentive to understate a firm's CEP in the context of corporate reporting, as previous research underlines that nonfinancial disclosures can reduce the asymmetric information between managers and stakeholders (e.g. Rossi and Harjoto, 2020). In summary, although we cannot exclude the possibility, we believe that there is little incentive for management to understate the CEPs in place at their firms.

(iii) Choice of data collection and coding

As we hand-collect the information on the CEP items from the firms' documents, the resulting dataset may be error-prone. To increase its intracode reliability, we ensure that one researcher analyzes all the firms for all the examined years. Concerning intercode

[4]Indeed, our factor analysis retains a factor "culture", which covers the mentioned soft CEP-items. This factor is later shown to have no impact on equity and debt investors' risk assessment.

reliability, two research team members then independently code the firms' reported information and compare their results. In case of conflict, a third researcher is asked to assess the issue.

VII.4 Data

The dependent variables in our analyses are different proxies for firm risk. Concerning *equity risks*, we calculate the following four downside risk measures (Hoepner et al., 2021). First, we employ the *value at risk* (*VaR*) to capture each firm's predicted maximum loss over a given horizon within a specific confidence interval (Jorion, 2007). We calculate the VaR as the 5%-quantile of the empirical daily stock return distribution and translate it into a positive number so that a decrease in a VaR will mirror a risk reduction. Second, we use the *expected shortfall or conditional value at risk* (*CVaR*), which corresponds to the mean value of the daily returns below the VaR threshold. Again, the CVaR is translated into a positive number so that lower risk corresponds with a lower CVaR. Finally, we also capture downside risks via *lower partial moments* (*LPMs*) of the second and third order: LPM(0,2) and LPM(0,3). We calculate these based on the return distribution below the 0%-return threshold following Bawa (1975) and Fishburn (1977). To compare our results metrically, we employ the square root of LPM(0,2) and the cube root of LPM(0,3).

Concerning *debt risk*, which is, by definition, focused on bankruptcy risk as a downside risk, we consider single-name *credit default swap* (*CDS*) *spreads*[5] over 1- and 5-year periods as the purest measures of credit risk (Callen et al., 2009). As additional measures of credit risk, we employ the firms' *probabilities of default* (over 12 months and 60 months) and their *distance to default* (*DtD*), which we calculate with volatility-adjusted leverage based on Merton (1974). This factor measures the distance between a firm's default point and the expected value of its assets. A greater DtD value implies a lower probability of default.

[5] It should be noted that the collected CDS spreads are "actuarial" spreads that do not contain any upfront fees, which is different from the notation of conventional CDS spreads.

Following previous research, all our empirical models include firm *leverage* (proxied as debt divided by total assets), *growth* (expressed with sales), *profitability* (measured as operating income divided by total assets), *dividend yield* and *size* (measured by number of employees) as control variables (e.g. Hoepner et al., 2021; Bannier et al., 2021). In line with Callen et al. (2009), we also control for each firm's *market capitalization* (proxied by the logarithm of its market value), the *risk-free interest rate* (given by the one-year German Bund rate), and *equity return volatility* (measured as the annualized standard deviation from daily stock returns) when studying each firm's credit risk. It should be noted that all data are winsorized at the 1st and 99th percentiles to limit the influence of outliers.

We collect firm-level data and daily stock prices from Refinitiv's Datastream. Measures of credit risk, i.e., CDS spreads, probabilities of default, and distance to default, are downloaded from the Risk Management Institute of the National University of Singapore (NUS).[6]

Table VII.4 provides the descriptive statistics of our dependent and control variables. The average value at risk over the sampling period corresponds to a daily stock return decline of 2.9%; the mean expected shortfall is 4.1%, the mean one-year CDS spread is 6.7 basis points, and the mean five-year CDS spread is 12.7 basis points. Concerning the control variables, we observe an average leverage of 0.63 in our sample, sales growth of 6%, profitability of 7%, and a dividend yield of 2.2%. The average firm in our dataset is relatively large, having more than 35,000 employees. The average risk-free rate throughout our sample period is negative at -0.5%,[7] and the average annualized equity return volatility is 1.9%. In general, our dataset exhibits considerable heterogeneity regarding most of the variables considered, which lends credence to our data's representativeness.

[6] As not all the examined variables are available for all the firms over all periods (e.g., not all the firms have CDS traded on the market), our dataset comprises a maximum of 750 firm-year observations from 150 companies. A smaller number may be shown depending on each analysis and the variables employed.

[7] The German 1 Year Government Bond rate became negative during recent years mostly due to the expansionary monetary policy of the European Central Bank.

Table VII.4: Descriptive statistics of the dependent and control variables.

	Firm-year Obs.	Mean	Std. Dev.	Minimum	Maximum
VaR (%)	745	2.90	0.91	1.20	5.46
CVaR (%)	745	4.13	1.38	1.74	8.50
LPM(0,2) (%)	745	1.87	0.61	0.84	3.81
LPM(0,3) (%)	745	2.41	0.90	1.02	5.83
CDS1Y (bp)	675	6.67	9.01	0.05	45.99
CDS5Y (bp)	675	12.65	9.40	1.20	46.24
PD12month (bp)	675	0.00095	0.00136	0.00001	0.00699
PD60month (bp)	675	0.00923	0.00702	0.00054	0.03369
DTD	675	5.84	2.86	-0.22	14.26
Leverage	749	0.63	0.24	0.12	1.46
Sales Growth	747	0.06	0.14	-0.46	0.58
Profitability	749	0.07	0.07	-0.13	0.38
Dividend Yield (%)	745	2.17	1.78	0.00	8.53
Size	743	35748.40	83857.22	0.00	664496.00
Market Capitalisation (log)	740	8.04	1.47	5.09	11.42
Risk-free Rate (%)	750	-0.46	0.27	-0.77	-0.05
Equity Return Volatility (%)	745	1.89	0.60	0.87	3.70

Remark: This table provides the descriptive statistics - number of observations, mean, standard deviation, minimum and maximum - of the dependent and control variables in our analyses. The variables are winsorized at the 1st and 99th percentiles. Descriptions of these variables are provided in Appendix V.A. The number of firm-year observations differs among the variables due to data availability.

VII.5 Empirical methodology

Empirical tests of the relation between corporate activities and corporate outcomes are often fraught with problems of endogeneity (Roberts and Whited, 2013; Li, 2016). Technically, endogeneity arises if an explanatory variable is correlated with the unobserved error term in a regression. This could be either caused by (i) measurement error in the explanatory variable, (ii) omitted explanatory variables in the regression or (iii) reverse causality. Clearly, endogeneity concerns may also affect the relation between a firm's CEP (the explanatory variable) and investors' risk assessments (the dependent variable) in our study, rendering standard inference testing unreliable unless appropriate empirical methods are employed. To address these endogeneity concerns, we apply different estimation approaches, which are explained below. In combination with other tests and supplemental analyses, they should enable a robust assessment of the relation between a firm's CEP and equity and debt risk.

First, potential measurement issues of the CEP index are already intensively discussed in Section VII.3.5, where we conclude that our index is a deliberately conservative measure of the comprehensiveness of a firm's CEP. Moreover, we consider correlational structures within the items of the CEP index via an additional factor analysis, which should allow us to further reduce the impact of potential measurement errors. Second, to reduce the problem of omitted explanatory variables, we use many control variables in all our analyses, based on previous literature. Furthermore, we employ a *fixed-effects estimation procedure* to deal with endogeneity issues from omitted *time-invariant* explanatory variables. This approach should be particularly useful to study our relation of interest, as many factors that could drive a firm's CEP and its risk simultaneously – thus triggering endogeneity – may be industry-specific and, hence, fixed over time.

Third, to reduce endogeneity from omitted *time-varying* variables and reverse causality, we also apply a *GMM estimation approach*. According to Angrist and Pischke (2009), employing both a fixed-effects procedure and a GMM estimation procedure allows us to approximate an upper and a lower bound for the CEP-risk relation, as these two estimation approaches consider different angles of a potential endogeneity issue; indeed, if inappropriately applied, the fixed-effects estimation approach should overestimate the relation between investors' risk assessments and a firm's CEP, while the GMM approach should underestimate it. Therefore, conducting both procedures should yield a comprehensive picture of the true CEP-risk association. As a final robustness test to address reverse causality, we follow El Ghoul et al. (2018) and Breuer et al. (2018) and apply a relatively conventional approach by running *two-stage least squares instrumental variables (IV) regressions* where we use the initial CEP index of each firm and the initial industry-average CEP index as instruments. Both should be correlated with the firm's CEP index in later years but not with its risk; therefore, they are expected to fulfill the relevance and exogeneity conditions necessary for valid instruments. All three estimation procedures (fixed effects, GMM and IV regressions) are explained in more detail in the Appendix V. Based on this battery of different estimation approaches, we are confident that our results allow us to at least narrow down a causal relationship between the examined firms' CEPs and investors' risk assessments. However, we interpret our results in a deliberately conservative fashion in the following section to not inappropriately stretch our contribution.

VII.6 Results

VII.6.1 CEPs and equity investors' risk assessments

Our first hypothesis argues that equity risks are negatively associated with a firm's CEP. Accordingly, Table VII.5 presents fixed-effects (Panel A) and GMM (Panel B) estimates of a dynamic panel regression where the four different proxies used for downside equity risk are employed as dependent variables. The results reveal that a higher CEP index is indeed correlated with a significant reduction in all the equity-risk measures: Both the fixed effects and the GMM estimation approaches show highly significant negative coefficients for the CEP index. Hence, the firms with comprehensive corporate ethics programs offer lower downside equity risks than those without these programs. Regarding economic significance, our results indicate that value at risk, for instance, decreases by approximately 7.2% (fixed-effects estimate) to 30.7% (GMM estimate) for each additional CEP item contained in the index. To put this into perspective, it has to be considered that the median value of the CEP index increases from 7 to 12 over our sampling period (see again Table VII.2): This indicates a tremendous reduction in the firms' value at risk associated with the implementation of these additional five CEP items. Similarly large effects are obtained for the expected shortfall, which decreases by between 7.6% (fixed-effects estimate) and 32.6% (GMM estimate) for each additional item in a firm's CEP. The results for the lower partial moments are equivalent. Among the control factors, the dividend yield shows a consistently positive effect on all the equity risk measures in the fixed effects estimation. While profitability has a weakly negative effect on downside equity risks in the GMM estimation, firm size shows a strongly significant reducing effect on these risk measures.[8]

[8]The reported test statistics of the GMM estimation indicate that the dynamic panel system is well specified and that the lagged variables that the system uses as instruments are valid.

Table VII.5: CEP effects on downside equity risk.

Panel A:	FE	FE	FE	FE
	(1)	(2)	(3)	(4)
	VaR	CVaR	LPM(0,2)	LPM(0,3)
L. dep. var.	-0.316***	-0.319***	-0.307***	-0.315***
	(0.047)	(0.047)	(0.048)	(0.047)
CEP index	-0.072***	-0.076***	-0.042***	-0.045***
	(0.012)	(0.019)	(0.008)	(0.013)
Leverage	0.491**	0.505	0.221	0.185
	(0.238)	(0.365)	(0.160)	(0.253)
Sales Growth	-0.368	-0.637*	-0.233	-0.389
	(0.234)	(0.360)	(0.158)	(0.251)
Profitability	-1.076	-2.506	-1.203*	-2.204*
	(1.075)	(1.655)	(0.726)	(1.151)
Dividend Yield	0.087***	0.145***	0.061***	0.090***
	(0.032)	(0.049)	(0.021)	(0.033)
Size	-1.98e-06	-3.54e-06	-3.81e-06	-4.05e-06
	(6.09e-06)	(9.35e-06)	(4.10e-06)	(6.50e-06)
Constant	4.229***	5.951***	2.830***	3.638***
	(0.333)	(0.499)	(0.227)	(0.338)
Firm-year Obs.	592	592	592	592
Obs.	150	150	150	150
R^2	0.198	0.178	0.174	0.155

Panel B:	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM
	(1)	(2)	(3)	(4)
	VaR	CVaR	LPM(0,2)	LPM(0,3)
L. dep. var.	-1.042***	-1.199***	-1.250**	-1.351**
	(0.337)	(0.368)	(0.516)	(0.587)
CEP index	-0.307***	-0.326***	-0.183***	-0.183***
	(0.066)	(0.086)	(0.046)	(0.064)
Leverage	6.232	7.847	4.847*	6.768
	(3.860)	(5.887)	(2.612)	(4.478)
Sales Growth	2.892	3.271	2.188	2.595
	(4.705)	(4.889)	(2.461)	(3.093)
Profitability	-37.82	-55.18*	-29.82*	-40.03*
	(24.31)	(33.21)	(15.27)	(23.50)
Dividend Yield	-0.254	-0.701	-0.341	-0.579
	(0.392)	(0.571)	(0.306)	(0.469)
Size	-6.77e-05***	-9.85e-05***	-5.06e-05***	-6.79e-05***
	(2.49e-05)	(2.80e-05)	(1.31e-05)	(2.10e-05)
Constant	10.50***	16.02***	7.499***	9.500***
	(2.746)	(3.647)	(2.214)	(2.963)
Firm-year Obs.	592	592	592	592
Obs.	150	150	150	150
Number of Instruments	15	15	15	15
F-stat	17.66	20.96	13.07	8.818
Hansen J p-Value	0.638	0.850	0.839	0.839
AR(2) p-Value	0.433	0.358	0.373	0.284
Lag Specification	(3 4)	(3 4)	(3 4)	(3 4)

Continued on next page

Table VII.5 – continued from previous page

Remark: This table presents two-stage least squares IV regressions on the different proxies for downside equity risk using the initial CEP index (IV_CEPInitial) of each firm and the initial industry average score (IV_IndustryMean_Initial) as instruments. Model (1) presents the first-stage results with the CEP index as the dependent variable. Models (2) to (5) present the second-stage results with VaR, CVaR, LPM(0,2) and LPM(0,3) as dependent variables. Descriptions of these variables are provided in Appendix V.A. The standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

We validate these findings using two-stage least squares IV regressions (Table VII.6). The first-stage estimation in column (1) shows that the initial CEP index of each firm has a significant effect on its later index values; hence, it is a strong instrument. Though the second instrument - the initial average CEP index of each industry – does not show a significant coefficient, the F-Test > 10 nevertheless supports the relevance of our instrument set.[9] In the second-stage regressions, the instrumented CEP index shows a highly significant negative effect on all the downside equity risk measures. These findings support our earlier conclusions: A comprehensive CEP helps firms reduce their downside equity risk.

Table VII.6: Two-stage least squares regressions for downside equity risk measures.

	2SLS IV (1) First Stage CEP-index	2SLS IV (2) Second Stage VaR	2SLS IV (3) Second Stage CVaR	2SLS IV (4) Second Stage LPM(0,2)	2SLS IV (5) Second Stage LPM(0,3)
Predicted CEP-index		-0.040***	-0.061***	-0.027***	-0.036***
		(0.008)	(0.013)	(0.006)	(0.008)
IV_CEP Initial	0.817***				
	(0.027)				
IV_IndustryMean Initial	0.069				
	(0.057)				
Leverage	0.103	-0.103	-0.394*	-0.165*	-0.354**
	(0.426)	(0.139)	(0.215)	(0.093)	(0.140)
Sales Growth	-0.473	-0.006	-0.219	-0.005	-0.152
	(0.769)	(0.250)	(0.374)	(0.166)	(0.238)
Profitability	1.005	-1.007**	-1.611**	-0.763***	-1.096**
	(1.597)	(0.433)	(0.655)	(0.284)	(0.429)
Dividend Yield	0.132**	-0.098***	-0.140***	-0.066***	-0.087***
	(0.064)	(0.020)	(0.031)	(0.013)	(0.019)
Size	1.91e-06*	-7.90e-08	-1.27e-07	8.17e-09	4.83e-08
	(1.06e-06)	(4.04e-07)	(6.76e-07)	(3.12e-07)	(5.02e-07)
Constant	2.470***	3.631***	5.396***	2.425***	3.245***
	(0.469)	(0.142)	(0.222)	(0.097)	(0.147)
Obs.	738	738	738	738	738
F-Test of instruments	11.25				

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[9]Additionally, the Hansen-J test statistics in the second stage indicate that the employed instruments are indeed exogenous, satisfying the test of overidentifying restrictions.

Table VII.6 – continued from previous page

	2SLS IV (1) First Stage CEP-index	2SLS IV (2) Second Stage VaR	2SLS IV (3) Second Stage CVaR	2SLS IV (4) Second Stage LPM(0,2)	2SLS IV (5) Second Stage LPM(0,3)
Prob > F	0				
Cragg-Donald Wald F Stat	592.4				
Hansen J Stat		0.932	0.009	0.022	0.040
Hansen p-value		0.334	0.923	0.881	0.842

Remark: This table presents two-stage least squares IV regressions on the different proxies for downside equity risk using the initial CEP index (IV_CEPInitial) of each firm and the initial industry average score (IV_IndustryMean_Initial) as instruments. Model (1) presents the first-stage results with the CEP index as the dependent variable. Models (2) to (5) present the second-stage results with VaR, CVaR, LPM(0,2) and LPM(0,3) as dependent variables. Descriptions of these variables are provided in Appendix V.A. The standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

To understand which specific items of the CEP index drive the relationship between a firm's CEP and its downside equity risks, we consider the individual factors of the CEP index generated via the factor analysis described in Section VII.3.4. Essentially, we repeat the analyses presented in Table VII.5 but replace the CEP index with the five individual CEP factors as the main explanatory factors. For the purpose of brevity, we report only the coefficients of these five CEP factors in Table VII.7, even though the analyses contain the same sets of control variables as before.[10] The results indicate that the examined relationship is significantly impacted by the "internally institutionalized" factor (*Factor_Instutionalization*). We observe that this factor has highly significant negative coefficients in all the regressions and when using either estimation method. The fixed-effects estimation approach also shows that the internal "organization" factor (*Factor_Organization*) has a significant negative effect on equity risks, but the results are much weaker under the GMM estimation approach. Thus, overall, equity investors seem to value items that are clearly anchored within organizations to ensure ethical firm behavior. Interestingly, the soft "cultural" factor (*Factor_Culture*) hardly plays a role in the assessments of equity investors. Hence, even though academic literature

[10]The corresponding results are available from the authors upon request

often focuses on the relevance of ethical culture, we find no statistical support for this claim. Rather, if firms should try to use these soft items to overstate the scope of their corporate ethics program, we demonstrate that equity investors are obviously unimpressed. This finding gives further support to our measurement of the scope of firms' CEP (see again the discussion in VII.3.5).

Table VII.7: Individual CEP factors and downside equity risk.

Panel A:	FE	FE	FE	FE
	(1)	(2)	(3)	(4)
	VaR	CVaR	LPM(0,2)	LPM(0,3)
L. dep. var.	-0.315***	-0.316***	-0.304***	-0.313***
	(0.048)	(0.048)	(0.049)	(0.047)
Factor_Inst	-0.110***	-0.141***	-0.069***	-0.081**
	(0.033)	(0.051)	(0.023)	(0.036)
Factor_Ext	-0.070	0.057	-0.012	0.040
	(0.127)	(0.196)	(0.086)	(0.136)
Factor_Audit	-0.076	-0.070	-0.069	-0.113
	(0.095)	(0.146)	(0.064)	(0.102)
Factor_Cult	-0.185*	-0.087	-0.070	-0.051
	(0.108)	(0.166)	(0.073)	(0.116)
Factor_Org	-0.325**	-0.510**	-0.202*	-0.246
	(0.160)	(0.245)	(0.108)	(0.171)
Controls	Yes	Yes	Yes	Yes
Firm-year Obs.	592	592	592	592
Obs.	0.203	0.184	0.177	0.158
R^2	150	150	150	150

Panel B:	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM
	(1)	(2)	(3)	(4)
	VaR	CVaR	LPM(0,2)	LPM(0,3)
L. dep. var.	-0.927***	-0.925***	-0.832**	-0.725*
	(0.301)	(0.299)	(0.399)	(0.377)
Factor_Inst	-0.570**	-0.674*	-0.352**	-0.385*
	(0.225)	(0.350)	(0.153)	(0.199)
Factor_Ext	-0.414	0.215	0.216	0.686
	(1.331)	(2.149)	(0.938)	(1.200)
Factor_Audit	0.009	0.146	-0.207	-0.237
	(1.094)	(1.586)	(0.901)	(1.009)
Factor_Cult	0.123	0.177	0.097	-0.0001
	(1.101)	(1.367)	(0.768)	(0.975)
Factor_Org	-2.866	-4.855	-2.475	-3.526*
	(2.278)	(3.266)	(1.960)	(1.850)
Controls	Yes	Yes	Yes	Yes
Firm-year Obs.	592	592	592	592
Obs.	150	150	150	150
Number of Instruments	23	23	23	23
F-stat	10.38	11.07	7.371	5.994
Hansen J p-Value	0.265	0.430	0.368	0.432
AR(2) p-Value	0.941	0.720	0.971	0.570
Lag Specification	(3 4)	(3 4)	(3 4)	(3 4)

Continued on next page

Table VII.7 – continued from previous page

Remark: This table presents dynamic panel estimations of the effects of the five individual compliance factors on the different proxies for downside equity risk. The coefficients are estimated using a fixed-effects approach (Panel A) and a dynamic GMM approach (Panel B). The dependent variables are VaR in model (1), CVaR in model (2), LPM(0,2) in model (3) and LPM(0,3) in model (4). The estimations utilize the list of control variables used in Table VII.5. Descriptions of these variables are provided in Appendix V.A. The standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

VII.6.2 CEPs and debt investors' risk assessments

Table VII.8 presents the results obtained by using our different proxies for credit-based risk as dependent variables, again employing a fixed-effects (Panel A) and a GMM (Panel B) approach within a dynamic panel regression. In line with hypothesis 2, we find a significantly positive relationship between the scope of a firm's CEP and debt investors' risk assessments. For example, an increase in the CEP index of 1 point corresponds with an approximately 0.4 basis-point increase in the one-year CDS in the fixed-effects estimation and a 1.7 basis-point increase in the one-year CDS in the GMM estimation. The 5-point average increase in the CEP index over our five-year sampling period would hence be associated with a 2 to 9 basis-point increase in the one-year CDS. Compared to the average CDS spread of 6.67 basis points (see again Table VII.4), this is a highly significant effect both economically and statistically. Therefore, we conclude that for debt investors, the high costs of implementing and maintaining a broad CEP seem to outweigh the beneficial effect of a lower likelihood of ethical scandals. Moreover, as the cash outflows from such events typically materialize only after several years, for instance, because lawsuits take quite some time, it may not be surprising that we observe larger effects for the more short-term measures of credit risk (the one-year CDS and the 12-month probability of default), while we observe weak or nonexistent effects for the longer-term measures. Regarding the control variables, we find consistent and, presumably, expected results under both estimation approaches: Leverage, dividend yield, and equity return volatility increase credit risk, while market capitalization has a negative effect on credit risk.

Table VII.8: CEP effects on credit risk.

Panel A	FE	FE	FE	FE	FE	Panel B	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM
	(1)	(2)	(3)	(4)	(5)		(1)	(2)	(3)	(4)	(5)
	CDS1Y	CDS5Y	PD12month	PD60month	DTD		CDS1Y	CDS5Y	PD12month	PD60month	DTD
L. dep. var.	-0.196***	-0.124***	-0.209***	-0.122***	-0.071**	L. dep. var.	-0.660	-0.616	-0.775	-0.678	0.152
	(0.048)	(0.041)	(0.049)	(0.042)	(0.036)		(0.909)	(0.580)	(0.969)	(0.572)	(0.298)
CEP index	0.425***	0.205*	6.89e-05***	6.66e-05	-0.019	CEP index	1.656***	0.920**	0.0003**	0.0005	-0.005
	(0.116)	(0.107)	(1.78e-05)	(8.16e-05)	(0.029)		(0.627)	(0.416)	(0.0001)	(0.0003)	(0.096)
Leverage	7.336***	11.80***	0.001***	0.009***	-3.666***	Leverage	25.89*	26.52**	0.004	0.024***	-5.549
	(1.983)	(1.842)	(0.0003)	(0.001)	(0.497)		(13.91)	(11.45)	(0.002)	(0.009)	(3.936)
Sales Growth	-0.749	1.726	-0.0002	0.001	-0.492	Sales Growth	-3.598	-6.495	-0.0003	-0.005	0.612
	(2.020)	(1.857)	(0.0003)	(0.001)	(0.500)		(15.63)	(11.99)	(0.003)	(0.008)	(2.376)
Profitability	-3.479	-0.716	-0.0005	-0.0003	-0.764	Profitability	-1.613	8.629	-0.001	-0.005	-5.676
	(10.30)	(9.525)	(0.002)	(0.007)	(2.558)		(64.45)	(50.81)	(0.010)	(0.036)	(17.44)
Dividend Yield	0.943***	0.533*	0.0002***	0.0004*	-0.156**	Dividend Yield	-2.185	-1.629	-0.0003	-0.001	-0.116
	(0.300)	(0.276)	(4.62e-05)	(0.0002)	(0.075)		(2.363)	(1.918)	(0.0003)	(0.001)	(0.580)
Size	4.84e-05	6.25e-05	6.71e-09	5.16e-08	-1.02e-05	Size	0.0002	0.0002*	3.53e-08	1.14e-07	-7.43e-05
	(5.43e-05)	(5.00e-05)	(8.35e-09)	(3.82e-08)	(1.36e-05)		(0.0002)	(0.0001)	(2.66e-08)	(9.17e-08)	(4.53e-05)
Market Capitalization	-8.556***	-6.157***	-0.001***	-0.004***	1.047***	Market Capitalization	-20.42	-10.94	-0.003	-0.007	-1.009
	(1.104)	(1.017)	(0.0002)	(0.001)	(0.275)		(15.35)	(8.286)	(0.003)	(0.006)	(2.407)
Risk-free Rate	-1.284	-1.789	-0.0002	-0.001	-0.957***	Risk-free Rate	-22.47	-24.46	-0.004	-0.020*	-8.507
	(1.434)	(1.326)	(0.0002)	(0.001)	(0.364)		(21.07)	(15.03)	(0.003)	(0.012)	(5.761)
Return Volatility	5.146***	6.766***	0.001***	0.005***	-2.530***	Return Volatility	8.238	11.10*	0.001	0.008*	-2.297**
	(0.734)	(0.676)	(0.0001)	(0.0005)	(0.183)		(9.091)	(6.229)	(0.002)	(0.005)	(0.880)
Constant	54.81***	37.82***	0.009***	0.026***	5.221**	Constant	113.0	45.14	0.016	0.028	19.09
	(9.404)	(8.691)	(0.002)	(0.007)	(2.339)		(137.4)	(73.86)	(0.023)	(0.057)	(17.26)
Firm-year Obs.	531	531	531	531	531	Firm-year Obs.	531	531	531	531	531
Obs.	136	136	136	136	136	Obs.	136	136	136	136	136

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Table VII.8 – continued from previous page

Panel A	FE	FE	FE	FE	FE	Panel B	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM
	(1)	(2)	(3)	(4)	(5)		(1)	(2)	(3)	(4)	(5)
	CDS1Y	CDS5Y	PD12month	PD60month	DTD		CDS1Y	CDS5Y	PD12month	PD60month	DTD
R^2	0.463	0.477	0.461	0.449	0.588						
						Number of Instruments	21	21	21	21	21
						F-stat	9.093	15.72	8.646	12.34	36.79
						Hansen J p-Value	0.282	0.555	0.269	0.597	0.165
						AR(2) p-Value	0.425	0.337	0.397	0.273	0.862
						Lag Specification	(3 4)	(3 4)	(3 4)	(3 4)	(3 4)

Remark: This table presents the dynamic panel estimations of the effects of the CEP index on the different proxies for credit risks. The coefficients are estimated using a fixed-effects approach (Panel A) and a dynamic GMM approach (Panel B). The dependent variables are the 1-year CDS spread in model (1), the 5-year CDS spread in model (2), the 1-year probability of default in model (3), the 5-year probability of default in model (4) and the distance to default in model (5). Descriptions of these variables are provided in Appendix V.A. The standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Again, we validate these findings using two-stage least squares IV regressions (Table VII.9). Again, the first-stage estimation in column (1) shows that the initial CEP index has a significant effect on the later index values, which supports its value as a strong instrument for the regression of interest, while the high F-value indicates that the full instrument set is relevant. In the second-stage regressions, the instrumented CEP index shows a highly significant positive relationship with all our debt risk measures. Thus, these findings are in line with our previous results: There is a robust and positive association between the scope of a firm's CEP and debt risk.[11]

Table VII.9: Two-stage least squares regressions for credit risk measures.

	2SLS IV (1) First Stage CEP index	2SLS IV (2) Second Stage CDS1Y	2SLS IV (3) Second Stage CDS5Y	2SLS IV (4) Second Stage PD12month	2SLS IV (5) Second Stage PD60month	2SLS IV (6) Second Stage DTD
Predicted CEP index		0.269***	0.419***	3.82e-05***	0.000326***	-0.101***
		(0.079)	(0.075)	(1.19e-05)	(5.68e-05)	(0.022)
IV_CEPInitial	0.757***					
	(0.031)					
IV_IndustryMean_Initial	0.068					
	(0.054)					
Leverage	-0.163	10.76***	13.46***	0.002***	0.010***	-5.859***
	(0.405)	(1.529)	(1.577)	(0.0002)	(0.001)	(0.366)
Sales Growth	-0.097	-11.37***	-9.446***	-0.002***	-0.007***	0.969
	(0.722)	(3.162)	(3.028)	(0.001)	(0.002)	(0.784)
Profitability	0.430	-20.78***	-16.88***	-0.003***	-0.013***	8.804***
	(1.453)	(4.219)	(4.450)	(0.001)	(0.003)	(1.320)
Dividend Yield	0.145**	0.802***	0.648***	0.0001***	0.0005***	-0.312***
	(0.062)	(0.223)	(0.186)	(3.42e-05)	(0.0001)	(0.044)
Size	-2.36e-06*	2.45e-06	3.50e-06	3.82e-10	2.49e-09	-4.30e-07
	(1.36e-06)	(3.33e-06)	(3.34e-06)	(5.04e-10)	(2.55e-09)	(8.68e-07)
Market Capitalization	0.504***	-0.834***	-0.942***	-0.0001***	-0.001***	0.270***
	(0.109)	(0.299)	(0.291)	(4.56e-05)	(0.0002)	(0.081)
Risk-free Rate	-4.608***	-0.073	0.282	-2.09e-05	0.0005	-0.620**
	(0.295)	(1.011)	(1.024)	(0.0002)	(0.001	(0.285)
Return Volatility	0.063	7.538***	9.425***	0.001***	0.007***	-2.742***
	(0.195)	(0.724)	(0.628)	(0.0001)	(0.0005)	(0.164)

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[11] The Hansen-J test statistic indicates weaker exogeneity of instruments as compared to the regression on equity risks, however.

Table VII.9 – continued from previous page

	2SLS IV	2SLS IV	2SLS IV	2SLS IV	2SLS IV	2SLS IV
	(1)	(2)	(3)	(4)	(5)	(6)
	First Stage	Second Stage	Second Stage	Second Stage	Second Stage	Second Stage
	CEP index	CDS1Y	CDS5Y	PD12month	PD60month	DTD
Constant	-3.103***	-9.855***	-9.627***	-0.001***	-0.007***	13.23***
	(1.000)	(3.648)	(3.618)	(0.001)	(0.003)	(0.941)
Obs.	665	665	665	665	665	665
F-Test of instruments	62.94					
Prob > F	0					
Cragg-Donald Wald F Stat	435.9					
Hansen J Stat		7.101	18.56	6.333	18.16	0.004
Hansen p-value		0.007	1.65e-05	0.012	2.03e-05	0.951

Remark: This table presents two-stage least squares IV regressions on the different proxies for credit risks using the initial CEP index (IV_CEPInitial) and the initial industry average score (IV_IndustryMean_Initial) as instruments. Model (1) presents the first-stage results with the CEP index as the dependent variable. Models (2) to (6) present the second-stage results with CDS1Y in model, CDS5Y, PD12month, PD60month and DTD as dependent variables. Descriptions of these variables are provided in Appendix V.A. The standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

By decomposing the CEP index into its different factors, we find significant effects mostly in the fixed-effects estimation method, even though the insignificant coefficients of the GMM estimation do not refute the findings from the fixed-effects analysis (Table VII.10). It seems that debt investors are skeptical about the day-to-day costs of most of the CEP items, including the internally oriented items (*factor_inst* and *factor_org*), the externally oriented items (*factor_ext*), and the items included the cultural factor (*factor_cult*). The significantly positive coefficients of these factors in the regressions involving the one- and five-year CDSs and the 12-month probability of default indicate that debt investors believe that such CEP items increase their risk at least over the short term. In contrast, external auditors' engagement in compliance audits and certifications of firms' CEPs seem to be valued by debt investors and result in a decrease in credit risks, as the factor "Auditor" (*Factor_Audit*) shows a significantly negative coefficient in the fixed-effects estimation model. Hence, debt investors tend to see external firm-specific oversight over a firm's CEP from independent experts positively.

Table VII.10: Individual CEP factors and credit risk.

Panel A	FE	FE	FE	FE	FE
	(1)	(2)	(3)	(4)	(5)
	CDS1Y	CDS5Y	PD12month	PD60month	DTD
L. dep. var.	-0.206***	-0.131***	-0.219***	-0.130***	-0.065*
	(0.048)	(0.041)	(0.049)	(0.043)	(0.036)
Factor_Inst	0.703**	0.254	0.0001**	4.44e-06	0.015
	(0.300)	(0.277)	(4.61e-05)	(0.0002)	(0.076)
Factor_Ext	1.941*	1.758*	0.0003*	0.001	-0.503*
	(1.085)	(1.001)	(0.0002)	(0.001)	(0.272)
Factor_Audit	-1.616**	-1.453**	-0.0002**	-0.001*	0.023
	(0.781)	(0.721)	(0.0001)	(0.001)	(0.196)
Factor_Cult	1.632*	1.292	0.0003*	0.001	-0.199
	(0.903)	(0.831)	(0.0001)	(0.001)	(0.225)
Factor_Org	-0.881	-1.246	-0.0001	-0.001	0.419
	(1.417)	(1.307)	(0.0002)	(0.001)	(0.356)
Controls	Yes	Yes	Yes	Yes	Yes
Firm-year Obs.	531	531	531	531	531
Obs.	136	136	136	136	136
R^2	0.477	0.489	0.474	0.458	0.593

Panel B	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM
	(1)	(2)	(3)	(4)	(5)
	CDS1Y	CDS5Y	PD12month	PD60month	DTD
L. dep. var.	-0.691	-0.681*	-0.739	-0.729*	-0.351
	(0.536)	(0.369)	(0.567)	(0.371)	(0.311)
Factor_Inst	2.268	1.906	0.0004	0.001	0.196
	(1.752)	(1.491)	(0.0003)	(0.001)	(0.476)
Factor_Ext	10.25	5.146	0.002	0.005	-1.605
	(8.428)	(6.295)	(0.001)	(0.005)	(1.879)
Factor_Cert	-13.79	-9.283	-0.002	-0.007	-1.183
	(8.926)	(6.773)	(0.001)	(0.005)	(2.129)
Factor_Cult	4.457	1.167	0.001	-0.001	2.686
	(7.906)	(6.200)	(0.001)	(0.005)	(1.624)
Factor_Org	-7.847	-3.316	-0.001	-9.72e-05	-3.751
	(17.15)	(14.57)	(0.003)	(0.012)	(4.541)
Controls	Yes	Yes	Yes	Yes	Yes
Firm-year Obs.	531	531	531	531	531
Obs.	136	136	136	136	136
Number of Instruments	29	29	29	29	29
F-stat	6.704	9.641	6.552	7.499	24.86
Hansen J p-Value	0.919	0.991	0.899	0.995	0.923
AR(2) p-Value	0.264	0.387	0.239	0.362	0.313
Lag Specification	(3 4)	(3 4)	(3 4)	(3 4)	(3 4)

Continued on next page

Table VII.10 – continued from previous page

Remark: This table presents dynamic panel estimations of the effects of the five individual compliance factors on the different proxies for credit risk. The coefficients are estimated using a fixed-effects approach (Panel A) and a dynamic GMM approach (Panel B). The dependent variables are the 1-year CDS spread in model (1), the 5-year CDS spread in model (2), the 1-year probability of default in model (3), the 5-year probability of default in model (4) and the distance to default in model (5). The estimations utilize the list of control variables used in Table VII.8. Descriptions of these variables are provided in Appendix V.A. The standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

VII.6.3 Summary

Decomposing the CEP index into different factors to answer our two additional research questions regarding which elements of a firm's CEP are particularly relevant for investors' risk assessments reveals that not all CEP items are seen as equally effective. In fact, it is remarkable that equity and debt investors appreciate specific items rather differently: From the perspective of equity investors, a CEP's internally oriented items seem to especially reduce risk. However, these items seem to significantly increase short-term debt risks. The support of external auditors in a firm's CEP, in contrast, is valued by debt investors but appears to be irrelevant to equity investors. Surprisingly, culture-oriented items are relatively unimportant for both equity and debt investors. This is an interesting indication, as previous research has consistently emphasized the importance of such "soft" or cultural elements in the context of corporate ethics and compliance programs (Krawiec, 2003; Parker and Nielsen, 2009; Rosen, 2003).

VII.7 Supplemental analyses

VII.7.1 Financial firms

The financial industry is affected by extensive compliance requirements, making financial institutions a prime setting for studying the relationship between a firm's CEP and its investors' risk assessments. For instance, a Finextra blog post published in late 2019 estimates that 10-15% of the total workforce in financial firms is dedicated purely to ensuring regulatory compliance (Somananth, 2019). Against this background and to test our results' robustness, we reconduct our earlier main analyses for the 27 financial firms in our dataset in isolation. Tables VII.11 and VII.12 report the results regarding the CEP-risk relation from equity and debt investors' perspectives, respectively. Indeed, we again see a negative relationship between the CEP index and equity risk. Moreover, if we compare the coefficients of the CEP index in the regressions of the financial institutions with the respective results from the full sample (Table VII.5), we find that the observed effects are even stronger for the financial firms. A one-point increase in the CEP index, for instance, is associated with decreases in the financial firms' value at risk of 13.2% (fixed-effects estimate) and 33.1% (GMM estimate). This is a larger reduction than we observe in the case of the full sample (full sample fixed effects estimate: 7.2%; full sample GMM estimate: 30.7%). The other proxies for equity risk support this larger effect for the financial institutions. Hence, equity investors in financial firms benefit even more from a comprehensive CEP than stockholders in other industries. While this result might have been expected, given that the largest fines from ethical scandals are most often observed in the financial industry,[12] it supports our earlier findings.

Given the large fines imposed for ethical misconduct in the financial industry, it is not surprising that debt investors are less critical towards broad CEPs in financial firms than they are towards those in the full sample. More precisely, Table VII.12 shows no robust association between the CEPs of the financial firms and their credit risk. Neither the fixed-effects estimation (Panel A) nor the GMM estimation (Panel B) report a significant effect. Thus, debt investors in the financial industry seem to view the ongoing costs incurred by a comprehensive CEP less negatively than debt investors in other industries.

[12]For instance, BNP Paribas paid a fine of $9 billion for financing terrorism ((Planetofcompliance, 2019); additionally, an overview of the highest fines paid in the financial industry is provided here).

Table VII.11: CEP effects on downside equity risk - Financial firms.

Panel A:	FE	FE	FE	FE
	(1)	(2)	(3)	(4)
	VaR	CVaR	LPM(0,2)	LPM(0,3)
L. dep. var.	-0.311***	-0.331***	-0.262**	-0.254**
	(0.091)	(0.099)	(0.102)	(0.103)
CEP index	-0.132***	-0.159***	-0.074***	-0.086***
	(0.027)	(0.041)	(0.018)	(0.024)
Leverage	0.114	-0.460	-0.026	-0.171
	(0.372)	(0.564)	(0.247)	(0.332)
Sales Growth	0.734**	1.144**	0.563**	0.670**
	(0.326)	(0.494)	(0.214)	(0.287)
Profitability	-6.371	-7.545	-4.49	-5.232
	(4.321)	(6.555)	(2.837)	(3.806)
Dividend Yield	-0.012	0.041	0.002	0.035
	(0.070)	(0.106)	(0.047)	(0.062)
Size	-5.04e-05	-9.13e-05	-2.66e-05	-4.21e-05
	(6.75e-05)	(0.0001)	(4.45e-05)	(5.99e-05)
Constant	5.279***	7.752***	3.140***	3.989***
	(1.174)	(1.805)	(0.796)	(1.066)
Firm-year Obs.	104	104	104	104
Obs.	27	27	27	27
R^2	0.377	0.317	0.312	0.266

Panel B:	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM
	(1)	(2)	(3)	(4)
	VaR	CVaR	LPM(0,2)	LPM(0,3)
L. dep. var.	-0.971***	-0.853**	-0.782**	-0.658
	(0.336)	(0.317)	(0.333)	(0.411)
CEP index	-0.331***	-0.361**	-0.195***	-0.228***
	(0.086)	(0.171)	(0.057)	(0.079)
Leverage	-3.439	-7.737	-3.254	-4.741*
	(2.349)	(4.568)	(2.167)	(2.686)
Sales Growth	1.580***	2.578**	1.318**	1.882***
	(0.557)	(1.210)	(0.524)	(0.561)
Profitability	-26.37	-33.89	-17.72	-21.91
	(16.20)	(23.93)	(11.95)	(13.27)
Dividend Yield	-0.399	-0.343	-0.089	-0.002
	(0.514)	(0.738)	(0.249)	(0.301)
Size	-0.0002	-0.0004	-0.0002	-8.56e-05
	(0.0004)	(0.001)	(0.0004)	(0.0005)
Constant	16.89*	25.08*	11.36	12.97
	(8.806)	(13.25)	(8.628)	(8.302)
Firm-year Obs.	104	104	104	104
Obs.	27	27	27	27
Number of Instruments	15	15	15	15
F-stat	11.99	14.29	13.26	7.962
Hansen J p-Value	0.878	0.593	0.496	0.363
AR(2) p-Value	0.286	0.380	0.455	0.714
Lag Specification	(3 4)	(3 4)	(3 4)	(3 4)

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Table VII.11 – continued from previous page

Remark: This table presents dynamic panel estimations of the effects of the CEP index on the different proxies for downside equity risk for the 27 financial firms in our sample. The coefficients are estimated using a fixed-effects approach (Panel A) and a dynamic GMM approach (Panel B). The dependent variables are VaR in model (1), CVaR in model (2), LPM(0,2) in model (3) and LPM(0,3) in model (4). Descriptions of these variables are provided in Appendix V.A. The standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table VII.12: CEP effects on credit risk - Financial firms.

Panel A	FE	FE	FE	FE	FE	Panel B	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM
	(1)	(2)	(3)	(4)	(5)		(1)	(2)	(3)	(4)	(5)
	CDS1Y	CDS5Y	PD12month	PD60month	DTD		CDS1Y	CDS5Y	PD12month	PD60month	DTD
L. dep. var.	-0.410***	-0.259**	-0.457***	-0.302***	-0.128	L. dep. var.	-0.647	0.325	-0.833	0.069	0.218
	(0.129)	(0.103)	(0.135)	(0.100)	(0.101)		(0.730)	(0.402)	(0.720)	(0.352)	(0.256)
CEP index	0.307	0.083	5.15e-05	-0.0002	0.095	CEP index	0.208	0.400	3.97e-05	-5.15e-05	-0.089
	(0.243)	(0.197)	(3.89e-05)	(0.0001)	(0.084)		(1.252)	(0.712)	(0.0002)	(0.001)	(0.137)
Leverage	1.860	4.747*	0.0003	0.004**	-1.114	Leverage	0.360	23.32	-0.0003	0.013	-1.836
	(3.074)	(2.509)	(0.0005)	(0.002)	(1.031)		(24.24)	(15.06)	(0.004)	(0.009)	(3.798)
Sales Growth	3.457	3.002	0.0005	0.003	-1.056	Sales Growth	3.814	1.715	0.001	0.001	-2.039
	(2.567)	(2.110)	(0.0004)	(0.002)	(0.901)		(6.851)	(5.175)	(0.001)	(0.004)	(2.241)
Profitability	-26.60	-23.63	-0.004	-0.011	14.45	Profitability	-55.45	30.02	-0.011	0.012	38.97
	(33.30)	(26.90)	(0.005)	(0.020)	(11.07)		(119.4)	(41.18)	(0.022)	(0.017)	(24.49)
Dividend Yield	0.441	0.027	7.39e-05	0.0002	0.046	Dividend Yield	0.350	-0.475	8.24e-05	0.0003	0.752
	(0.575)	(0.457)	(9.19e-05)	(0.0003)	(0.189)		(2.561)	(1.871)	(0.0004)	(0.001)	(0.491)
Size	0.001	0.001	1.06e-07	2.65e-07	3.52e-05	Size	0.001	0.001	1.41e-07	-2.40e-07	0.0002
	(0.001)	(0.0005)	(9.58e-08)	(3.52e-07)	(0.0002)		(0.004)	(0.002)	(5.72e-07)	(1.33e-06)	(0.001)
Market Capitalization	-10.80***	-6.144**	-0.002***	-0.002	-0.025	Market Capitalization	-11.78	-12.08*	-0.002	-0.004	0.650
	(3.468)	(2.718)	(0.001)	(0.002)	(1.107)		(14.65)	(7.071)	(0.002)	(0.004)	(2.648)
Risk-free Rate	2.896	1.832	0.0005	0.001	-0.722	Risk-free Rate	3.492	8.844	0.0003	0.002	-8.724
	(2.906)	(2.393)	(0.0005)	(0.002)	(1.055)		(14.60)	(18.21)	(0.002)	(0.011)	(5.905)
Return Volatility	-0.223	2.278	-9.39e-05	0.001	-2.048***	Return Volatility	-0.463	0.580	8.95e-05	0.002	-1.902
	(1.869)	(1.494)	(0.0003)	(0.001)	(0.618)		(9.578)	(7.098)	(0.001)	(0.004)	(1.626)
Constant	82.33***	45.38**	0.014***	0.015	7.473	Constant	84.36	80.88	0.010	0.028	-7.688
	(26.11)	(20.42)	(0.004)	(0.015)	(8.489)		(123.2)	(65.24)	(0.018)	(0.031)	(14.75)
Firm-year Obs.	103	103	103	103	103	Firm-year Obs.	103	103	103	103	103
Obs.	27	27	27	27	27	Obs.	27	27	27	27	27

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Table VII.12 – continued from previous page

Panel A	FE	FE	FE	FE	FE	Panel B	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM
	(1)	(2)	(3)	(4)	(5)		(1)	(2)	(3)	(4)	(5)
	CDS1Y	CDS5Y	PD12month	PD60month	DTD		CDS1Y	CDS5Y	PD12month	PD60month	DTD
R^2	0.441	0.464	0.448	0.435	0.453						
						Number of Instruments	21	21	21	21	21
						F-stat	2.500	4.785	2.700	5.689	8.979
						Hansen J p-Value	0.175	0.373	0.202	0.469	0.157
						AR(2) p-Value	0.452	0.382	0.285	0.742	0.773
						Lag Specification	(3 4)	(3 4)	(3 4)	(3 4)	(3 4)

Remark: This table presents dynamic panel estimations of the effects of the CEP index on the different proxies for credit risk for the 27 financial firms in our sample. The coefficients are estimated using a fixed-effects approach (Panel A) and a two-step dynamic GMM approach (Panel B). The dependent variables are the 1-year CDS spread in model (1), the 5-year CDS spread in model (2), the 1-year probability of default in model (3), the 5-year probability of default in model (4) and the distance to default in model (5). Descriptions of these variables are provided in Appendix V.A. The standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Again, we validate these findings using two-stage least squares regressions (see Table VII.13 for equity risk and Table VII.14 for credit risk). For equity risk, the first-stage estimation in column (1) shows that the initial CEP index of a firm has a significant effect on its later index values. However, in the second-stage regressions, the predicted CEP index has no significant effect on our equity risk measures. Nevertheless, all of the coefficients are – as predicted – negative. Regarding debt risk, again, the initial CEP index of a firm has a significant effect on its later index values. Interestingly, in the second-stage regressions, two of our debt risk measures (CDS5Y and PD60months) show a highly significant positive coefficient in relation to the CEP index. While this is in line with our results for the full sample, it contrasts with the results from the fixed-effect and dynamic GMM approaches, which did not find any significant results regarding credit risk for financial firms. Thus, the two-stage least squares regression results could be a vague indicator that financial firms' debt investors are also slightly skeptical of the ongoing costs of a broad CEP.

Table VII.13: Two-stage least squares regressions of the downside equity risk measures for financial firms.

	2SLS IV (1) First Stage CEP index	2SLS IV (2) Second Stage VaR	2SLS IV (3) Second Stage CVaR	2SLS IV (4) Second Stage LPM(0,2)	2SLS IV (5) Second Stage LPM(0,3)
Predicted CEP index		-0.021	-0.030	-0.014	-0.021
		(0.019)	(0.028)	(0.012)	(0.017)
IV_CEPInitial	0.968***				
	(0.085)				
Leverage	0.296	0.862***	1.047**	0.487**	0.624**
	(0.993)	(0.322)	(0.467)	(0.199)	(0.258)
Sales Growth	0.039	-0.074	-0.119	0.020	-0.036
	(1.176)	(0.377)	(0.541)	(0.239)	(0.305)
Profitability	2.250	6.603***	8.980***	3.576***	4.805***
	(5.647)	(1.803)	(2.640)	(1.067)	(1.510)
Dividend Yield	0.151	-0.129***	-0.152**	-0.077***	-0.081**
	(0.124)	(0.042)	(0.059)	(0.025)	(0.033)
Size	-1.34e-05	3.74e-06	5.12e-06	2.14e-06	3.03e-06
	(8.33e-06)	(2.71e-06)	(3.94e-06)	(1.69e-06)	(2.24e-06)

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Table VII.13 – continued from previous page

	2SLS IV (1) First Stage CEP index	2SLS IV (2) Second Stage VaR	2SLS IV (3) Second Stage CVaR	2SLS IV (4) Second Stage LPM(0,2)	2SLS IV (5) Second Stage LPM(0,3)
Constant	1.616	2.112***	2.965***	1.382***	1.685***
	(1.010)	(0.338)	(0.472)	(0.196)	(0.244)
Obs.	130	130	130	130	130
F-Test of instruments	5.619				
Prob > F	0				
Cragg-Donald Wald F Stat	142.8				

Remark: This table presents two-stage least squares IV regressions on the different proxies for equity risk for the financial firms in the sample that use the initial compliance score (IV_CEPInitial) as an instrument. Model (1) presents the first-stage results with the CEP index as the dependent variable. Models (2) to (5) present the second-stage results with VaR, CVaR, LPM(0,2) and LPM(0,3) as dependent variables. Descriptions of these variables are provided in Appendix V.A. The standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table VII.14: Two-stage least squares regressions of the credit risk measures of financial firms.

	2SLS IV (1) First Stage CEP index	2SLS IV (2) Second Stage CDS1Y	2SLS IV (3) Second Stage CDS5Y	2SLS IV (4) Second Stage PD12month	2SLS IV (5) Second Stage PD60month	2SLS IV (6) Second Stage DTD
Predicted CEP index		0.597	0.673**	8.97e-05	0.001**	-0.129*
		(0.369)	(0.330)	(5.61e-05)	(0.0003)	(0.077)
IV_CompInitial	0.827***					
	(0.090)					
Leverage	0.514	2.800	5.078**	0.0004	0.004**	-2.752***
	(0.971)	(2.362)	(2.176)	(0.0004)	(0.002)	(0.722)
Sales Growth	0.905	-5.412	-4.178	-0.001	-0.003	-0.970
	(1.174)	(4.229)	(3.794)	(0.001)	(0.003)	(1.153)
Profitability	4.470	-88.46***	-92.31***	-0.013***	-0.068***	34.46***
	(4.879)	(18.62)	(17.14)	(0.003)	(0.013)	(4.421)
Dividend Yield	0.144	0.654	0.400	0.0001	0.0002	-0.049
	(0.133)	(0.800)	(0.665)	(0.0001)	(0.001)	(0.134)
Size	-2.65e-05***	6.38e-05**	6.12e-05**	9.51e-09**	4.51e-08**	-7.47e-06
	(8.68e-06)	(2.87e-05)	(2.72e-05)	(4.29e-09)	(2.13e-08)	(5.59e-06)
Market Capitalization	0.929***	-2.387**	-2.256**	-0.0004**	-0.002*	0.148
	(0.241)	(1.179)	(1.078)	(0.0002)	(0.001)	(0.271)

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Table VII.14 – continued from previous page

	2SLS IV (1) First Stage CEP index	2SLS IV (2) Second Stage CDS1Y	2SLS IV (3) Second Stage CDS5Y	2SLS IV (4) Second Stage PD12month	2SLS IV (5) Second Stage PD60month	2SLS IV (6) Second Stage DTD
Risk-free Rate	-4.259***	-0.141	-0.055	-1.82e-05	0.0003	0.402
	(0.681)	(3.041)	(2.801)	(0.0005)	(0.002)	(0.749)
Return Volatility	-0.227	9.141***	9.710***	0.001***	0.007***	-3.305***
	(0.664)	(1.754)	(1.602)	(0.0003)	(0.002)	(0.480)
Constant	-6.750***	4.288	4.646	0.001	0.004	11.64***
	(2.076)	(11.10)	(10.04)	(0.002)	(0.008)	(2.505)
Obs.	129	129	129	129	129	129
F-Test of instruments	9.778					
Prob > F	0					
Cragg-Donald Wald F Stat	98.80					

Remark: This table presents two-stage least squares regressions on the different proxies for credit risk for the financial firms in the sample using the initial compliance score (IV_CEPInitial) as an instrument. Model (1) presents the first-stage results with the CEP index as the dependent variable. Models (2) to (6) present the second-stage results with CDS1Y, CDS5Y, PD12month, PD60month and DTD as dependent variables. Descriptions of these variables are provided in Appendix V.A. The standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Finally, we rerun the dynamic panel estimation for the financial firm subsample using the different factors as explanatory variables. Again, the institutionalized factor significantly reduces equity risk, and its coefficient is often larger than in the full sample (Table VII.15). Concerning the credit risk measures, the individual factors provide no clear picture of the CEP-risk relation in financial firms (Table VII.16).

Overall, we conclude that the results of our analysis of the subsample of 27 financial firms support our main findings, especially regarding the association between equity investors' risk assessments and firms' CEPs. However, the small number of observations makes it very difficult to obtain significant results when testing more granular details.

Table VII.15: Individual CEP factors and the downside equity risk of financial firms.

Panel A:	FE	FE	FE	FE
	(1)	(2)	(3)	(4)
	VaR	CVaR	LPM(0,2)	LPM(0,3)
L. dep. var.	-0.300***	-0.373***	-0.295**	-0.320**
	(0.100)	(0.110)	(0.117)	(0.123)
Factor_Inst	-0.201***	-0.270**	-0.124**	-0.143**
	(0.074)	(0.114)	(0.051)	(0.071)
Factor_Ext	-0.468	-0.348	-0.124	-0.094
	(0.290)	(0.450)	(0.200)	(0.280)
Factor_Audit	0.112	0.557	0.202	0.346
	(0.277)	(0.432)	(0.192)	(0.268)
Factor_Cult	-0.431	-0.504	-0.195	-0.217
	(0.271)	(0.421)	(0.187)	(0.262)
Factor_Org	-0.123	-0.109	-0.152	-0.214
	(0.553)	(0.858)	(0.381)	(0.534)
Controls	Yes	Yes	Yes	Yes
Firm-year Obs.	104	104	104	104
Obs.	27	27	27	27
R^2	0.356	0.291	0.250	0.212

Panel B:	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM
	(1)	(2)	(3)	(4)
	VaR	CVaR	LPM(0,2)	LPM(0,3)
L. dep. var.	-0.521*	-0.942	-0.831	-1.164*
	(0.299)	(0.683)	(0.795)	(0.577)
Factor_Inst	-0.403**	-0.774**	-0.345	-0.464*
	(0.182)	(0.365)	(0.211)	(0.243)
Factor_Ext	0.305	-0.037	0.299	0.178
	(1.130)	(2.894)	(1.623)	(1.526)
Factor_Audit	0.128	0.209	0.176	0.578
	(0.926)	(1.070)	(0.552)	(1.060)
Factor_Cult	-0.399	-0.318	-0.166	-0.011
	(1.057)	(0.880)	(0.485)	(0.598)
Factor_Org	-1.658	-0.546	-0.653	0.093
	(2.571)	(4.745)	(1.802)	(2.207)
Controls	Yes	Yes	Yes	Yes
Firm-year Obs.	104	104	104	104
Obs.	27	27	27	27
Number of Instruments	23	23	23	23
F-stat	6.329	7.741	2.548	6.108
Hansen J p-Value	0.211	0.503	0.295	0.599
AR(2) p-Value	0.746	0.205	0.511	0.119
Lag Specification	(3 4)	(3 4)	(3 4)	(3 4)

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Table VII.15 – continued from previous page

Remark: This table presents dynamic panel estimations of the effects of the five individual compliance factors on the different proxies for downside equity risk for the 27 financial firms in our sample. The coefficients are estimated using a fixed-effects approach (Panel A) and a dynamic GMM approach (Panel B). The dependent variables are VaR in model (1), CVaR in model (2), LPM(0,2) in model (3) and LPM(0,3) in model (4). Descriptions of these variables are provided in Appendix V.A. The estimations utilize the list of control variables used in Table VII.11. The standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table VII.16: Individual CEP factors and the credit risk of financial firms.

Panel A	FE	FE	FE	FE	FE
	(1)	(2)	(3)	(4)	(5)
	CDS1Y	CDS5Y	PD12month	PD60month	DTD
L. dep. var.	-0.362***	-0.251**	-0.407***	-0.281***	-0.156
	(0.128)	(0.109)	(0.130)	(0.104)	(0.101)
Factor_Inst	0.725	0.150	0.0001	-0.0004	0.406*
	(0.592)	(0.511)	(9.12e-05)	(0.0004)	(0.206)
Factor_Ext	3.153	3.257*	0.001	0.001	-1.230*
	(2.115)	(1.796)	(0.0003)	(0.001)	(0.723)
Factor_Audit	-2.672	-1.593	-0.0004	-0.001	-0.149
	(2.019)	(1.709)	(0.0003)	(0.001)	(0.686)
Factor_Cult	-0.704	-0.524	-0.0001	-0.001	-0.384
	(1.955)	(1.668)	(0.0003)	(0.001)	(0.669)
Factor_Org	1.008	0.063	0.0002	0.0002	0.639
	(4.018)	(3.422)	(0.001)	(0.003)	(1.370)
Controls	Yes	Yes	Yes	Yes	Yes
Firm-year Obs.	103	103	103	103	103
Obs.	27	27	27	27	27
R^2	0.493	0.505	0.508	0.469	0.501

Panel B	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM
	(1)	(2)	(3)	(4)	(5)
	CDS1Y	CDS5Y	PD12month	PD60month	DTD
L. dep. var.	-0.408	-0.076	-0.436	-0.295	0.209
	(0.338)	(0.288)	(0.316)	(0.334)	(0.213)
Factor_Inst	-0.210	-1.480	-0.0001	-0.002***	0.367
	(1.324)	(1.800)	(0.0003)	(0.0004)	(0.341)
Factor_Ext	6.985	10.05**	0.002	0.008**	-1.764
	(5.249)	(4.848)	(0.001)	(0.004)	(1.194)
Factor_Audit	0.209	0.734	-6.23e-05	0.002	0.166
	(2.122)	(2.490)	(0.0003)	(0.002)	(1.459)
Factor_Cult	-1.153	1.911	-5.84e-05	0.001	-1.173
	(5.130)	(4.145)	(0.001)	(0.003)	(1.292)
Factor_Org	6.761	0.608	0.001	0.003	-0.747
	(6.695)	(12.16)	(0.001)	(0.009)	(3.061)
Controls	Yes	Yes	Yes	Yes	Yes
Firm-year Obs.	103	103	103	103	103
Obs.	27	27	27	27	27
Number of Instruments	29	29	29	29	29
F-stat	6.702	17.55	9.519	288.3	12.88
Hansen J p-Value	0.704	0.461	0.580	0.564	0.586
AR(2) p-Value	0.757	0.753	0.982	0.610	0.728
Lag Specification	(3 4)	(3 4)	(3 4)	(3 4)	(3 4)

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Table VII.16 – continued from previous page

Remark: This table presents dynamic panel estimations of the effects of the five individual compliance factors on the different proxies for credit risk for the 27 financial firms in our sample. The coefficients are estimated using a fixed-effects approach (Panel A) and a dynamic GMM approach (Panel B). The dependent variables are the 1-year CDS spread in model (1), the 5-year CDS spread in model (2), the 1-year probability of default in model (3), the 5-year probability of default in model (4) and the distance to default in model (5). The estimations utilize the list of control variables used in Table VII.12. Descriptions of these variables are provided in Appendix V.A. The standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

VII.7.2 Net effect of debt and equity investors' risk assessments

A comparison of the results regarding equity and debt investors' risk assessments reveals opposing effects: While we find a strong negative relationship between the scope of a firm's CEP and equity risk, there is a positive association between this index and credit risk. This clearly gives rise to the question of which of these two effects is stronger. However, we cannot straightforwardly use our estimation results to calculate the net effect of these individual risk effects on a firm's cost of capital. This is because our equity risk proxies focus on downside risk using asymmetric risk measures. Therefore, they do not immediately allow us to calculate the full equity cost of a firm, which could then be offset with a corresponding analysis of its cost of debt. Nevertheless, we try to make our estimates of equity risk and credit risk more comparable. To do so, we repeat our fixed-effects estimations but employ mean-centered variables for the regressions on equity risk (Table VII.17) and credit risk (Table VII.18).

A comparison of the coefficients of the equity-risk effects (Table VII.17) and those of the credit-risk effects (Table VII.18) shows that a one-unit increase in the CEP index triggers a stronger effect on the relationship between a firm's CEP and equity risk than on the relationship between a firm's CEP and credit risk. While this is not an exact comparison, it at least indicates that the negative association between a firm's CEP and equity risk seems to outweigh the positive association on the credit side.

Table VII.17: Mean-centered CEP effects on equity risk.

	FE	FE	FE	FE
	(1)	(2)	(3)	(4)
	VaR	CVaR	LPM(0,2)	LPM(0,3)
L. dep. var.	-0.316***	-0.319***	-0.307***	-0.315***
	(0.047)	(0.047)	(0.048)	(0.047)
CEP index	-0.428***	-0.298***	-0.366***	-0.269***
	(0.073)	(0.074)	(0.073)	(0.078)
Leverage	0.131**	0.089	0.088	0.050
	(0.064)	(0.064)	(0.064)	(0.068)
Sales Growth	-0.058	-0.067*	-0.055	-0.062

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Table VII.17 – continued from previous page

	FE (1) VaR	FE (2) CVaR	FE (3) LPM(0,2)	FE (4) LPM(0,3)
	(0.037)	(0.038)	(0.037)	(0.040)
Profitability	-0.089	-0.136	-0.148*	-0.183*
	(0.089)	(0.090)	(0.089)	(0.095)
Dividend Yield	0.171***	0.187***	0.178***	0.177***
	(0.062)	(0.063)	(0.062)	(0.066)
Size	-0.183	-0.216	-0.524	-0.377
	(0.563)	(0.570)	(0.565)	(0.605)
Constant	0.071**	0.062**	0.058**	0.047
	(0.029)	(0.029)	(0.029)	(0.031)
Firm-year Obs.	592	592	592	592
Obs.	150	150	150	150
R^2	0.198	0.178	0.174	0.155

Remark: This table presents fixed effects estimations of the effects of the CEP index on the different proxies for downside equity risk with mean-centered variables. The dependent variables are VaR in model (1), CVaR in model (2), LPM(0,2) in model (3) and LPM(0,3) in model (4). Descriptions of these variables are provided in Appendix V.A. The standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table VII.18: Mean-centered CEP effects on credit risk.

	FE (1) CDS1Y	FE (2) CDS5Y	FE (3) PD12month	FE (4) PD60month	FE (5) DTD
L. dep. var.	-0.196***	-0.124***	-0.209***	-0.122***	-0.071**
	(0.048)	(0.041)	(0.049)	(0.042)	(0.036)
CEP index	0.254***	0.117*	0.273***	0.051	-0.036
	(0.069)	(0.061)	(0.071)	(0.063)	(0.055)
Leverage	0.197***	0.303***	0.187***	0.324***	-0.310***
	(0.053)	(0.047)	(0.054)	(0.048)	(0.042)
Sales Growth	-0.012	0.026	-0.019	0.030	-0.025
	(0.032)	(0.028)	(0.033)	(0.029)	(0.025)
Profitability	-0.029	-0.006	-0.030	-0.004	-0.020
	(0.085)	(0.076)	(0.087)	(0.077)	(0.067)
Dividend Yield	0.186***	0.101*	0.194***	0.101*	-0.097**
	(0.059)	(0.052)	(0.061)	(0.053)	(0.047)
Size	0.450	0.558	0.415	0.617	-0.300
	(0.505)	(0.446)	(0.516)	(0.456)	(0.399)

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Table VII.18 – continued from previous page

	FE (1) CDS1Y	FE (2) CDS5Y	FE (3) PD12month	FE (4) PD60month	FE (5) DTD
Market Capitalization	-1.396***	-0.963***	-1.444***	-0.887***	0.538***
	(0.180)	(0.159)	(0.184)	(0.162)	(0.141)
Risk-free Rate	-0.038	-0.051	-0.036	-0.054	-0.090***
	(0.043)	(0.038)	(0.044)	(0.039)	(0.034)
Return Volatility	0.342***	0.431***	0.328***	0.408***	-0.529***
	(0.049)	(0.043)	(0.050)	(0.044)	(0.038)
Constant	0.049	0.055*	0.047	0.059*	-0.075***
	(0.035)	(0.031)	(0.035)	(0.031)	(0.027)
Firm-year Obs.	531	531	531	531	531
Obs.	136	136	136	136	136
R^2	0.463	0.477	0.461	0.449	0.588

Remark: This table presents fixed effects estimations of the effects of the CEP index on different proxies for credit risk with mean-centered variables. The dependent variables are the 1-year CDS spread in model (1), the 5-year CDS spread in model (2), the 1-year probability of default in model (3), the 5-year probability of default in model (4) and the distance to default in model (5). Descriptions of these variables are provided in Appendix V.A. The standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

VII.7.3 Quartile effects

As our dataset shows a strong heterogeneity in terms of CEP index levels, for instance, across market segments and time (see again Tables VII.1 and VII.2), it might be interesting to see whether the observed association between CEP and risk is dependent on the level of the CEP index. To test for such level effects, we run quartile regressions based on an ordering of the firms according to their CEP indices; we split the data into four annual buckets that range from the top 25% of firms in terms of CEP index (Q4) to the bottom 25% (Q1). The related fixed-effects estimation (Table VII.19, Panel A) clearly shows that, overall, the negative association between a firm's CEP and equity risk is significant for almost all the quartiles. A comparison of the estimated coefficients in the different quartiles shows, however, that this association is strongest for the firms in the highest quartile (Q4), i.e., for the firms that already have a broad CEP in place.

For instance, if a firm in the Q4 quartile implements an additional CEP item, its value at risk decreases by 19.7%. A firm in the Q1 quartile, in contrast, shows a decrease in its value at risk of only 7.0% from adding one additional CEP item. Hence, it seems to be the case that equity investors appreciate increased CEP activity, particularly in firms that have already built up a broad CEP. Against this backdrop, it is quite surprising that our descriptive statistics show that the DAX 30 firms have the highest CEP indices but report the lowest increases over time, as additional CEP items could have an especially fruitful effect for these firms. Unfortunately, the GMM estimation provides relatively unclear results (Table VII.19, Panel B): Splitting the sample into quartiles induces hardly any significant results from this estimation approach. It has to be mentioned, however, that dividing the sample into quartiles impairs the reliability of the dynamic GMM estimation as the number of implicitly employed instruments becomes large relative to the smaller number of observations.

Table VII.20 reports the results from the same quartile regressions using our credit risk measures. Again, only the fixed-effects estimation approach delivers significant effects. It reports significant coefficients only for the firms in the second and third quartiles, indicating that debt investors see a positive association between further CEP-items and short-term credit risk in firms with CEPs having an intermediate scope.

Table VII.19: CEP effects on downside equity risk for quartiles according to the CEP index level.

Panel A	FE	FE	FE	FE	Panel B	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM
	(1)	(2)	(3)	(4)		(1)	(2)	(3)	(4)
	VaR	CVaR	LPM(0,2)	LPM(0,3)		VaR	CVaR	LPM(0,2)	LPM(0,3)
Q4	-0.197***	-0.262***	-0.128***	-0.168***	Q4	-0.119	0.001	-0.065	-0.041
	(0.069)	(0.094)	(0.041)	(0.060)		(0.170)	(0.446)	(0.163)	(0.168)
Q3	-0.167***	-0.196**	-0.106**	-0.132*	Q3	-0.080	0.028	-0.060	0.001
	(0.060)	(0.089)	(0.040)	(0.067)		(0.215)	(0.271)	(0.106)	(0.137)
Q2	-0.095*	-0.190**	-0.101***	-0.161**	Q2	-0.131	-0.303	-0.191*	-0.226
	(0.048)	(0.076)	(0.035)	(0.065)		(0.111)	(0.258)	(0.098)	(0.152)
Q1	-0.070**	-0.072	-0.037*	-0.028	Q1	-0.349***	-0.303	-0.152*	-0.122
	(0.031)	(0.044)	(0.020)	(0.029)		(0.107)	(0.222)	(0.090)	(0.120)
Controls	Yes	Yes	Yes	Yes	Controls	Yes	Yes	Yes	Yes

Remark: This table provides dynamic panel regressions of the effect of the CEP index on downside equity risk for different levels of the CEP index. Q4 denotes the top 25% of firms in terms of CEP index value, while Q1 denotes the bottom 25%. The quartiles are rebalanced each year according to the CEP index in that year. The coefficients are estimated using a fixed-effects approach (Panel A) and a dynamic GMM approach (Panel B). The dependent variables are VaR in model (1), CVaR in model (2), LPM(0,2) in model (3) and LPM(0,3) in model (4). The estimations utilize the list of control variables used in Table VII.5. Descriptions of these variables are provided in Appendix V.A. The standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table VII.20: CEP effects on credit risk for quartiles according to the CEP index level.

Panel A	FE	FE	FE	FE	FE	Panel B	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM
	(1)	(2)	(3)	(4)	(5)		(1)	(2)	(3)	(4)	(5)
	CDS1Y	CDS5Y	PD12month	PD60month	DTD		CDS1Y	CDS5Y	PD12month	PD60month	DTD
Q4	0.076	-0.096	1.80e-05	-7.92e-05	-0.038	Q4	0.255	0.660	3.18e-05	0.001	-0.051
	(0.910)	(0.773)	(0.0001)	(0.001)	(0.144)		(1.744)	(1.306)	(0.0003)	(0.001)	(0.436)
Q3	1.148**	0.553	0.0002**	0.0003	0.067	Q3	0.216	2.175	-1.10e-05	0.002	-0.561
	(0.518)	(0.545)	(7.91e-05)	(0.0004)	(0.146)		(1.531)	(2.447)	(0.0002)	(0.002)	(0.626)
Q2	0.892*	0.268	0.0001*	0.0002	0.131	Q2	0.471	-0.040	0.0002	0.001	0.254
	(0.507)	(0.581)	(7.54e-05)	(0.0004)	(0.187)		(1.274)	(1.038)	(0.0002)	(0.002)	(0.376)
Q1	0.431	0.033	7.12e-05	-7.99e-05	0.072	Q1	1.918	0.752	0.0003	0.001	0.433
	(0.328)	(0.290)	(5.02e-05)	(0.0002)	(0.081)		(1.480)	(1.122)	(0.0002)	(0.001)	(0.401)
Controls	Yes	Yes	Yes	Yes	Yes	Controls	Yes	Yes	Yes	Yes	Yes

Remark: This table provides dynamic panel regressions of the effect of the CEP index on credit risk for different levels of the CEP index. The coefficients are estimated using a fixed-effects approach (Panel A) and a dynamic GMM approach (Panel B). Q4 denotes the top 25% of firms in terms of CEP-index value, while Q1 denotes the bottom 25%. The quartiles are rebalanced each year according to the CEP index in that year. The dependent variables are the 1-year CDS spread in model (1), the 5-year CDS spread in model (2), the 1-year probability of default in model (3), the 5-year probability of default in model (4) and the distance to default in model (5). The estimations utilize the list of control variables used in Table VII.8. Descriptions of these variables are provided in Appendix V.A. The standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

VII.7.4 CEP index breadth versus depth

Our CEP index is constructed from binary variables by examining whether a firm reports having implemented each of the 24 CEP items considered. While we believe that this methodology renders our index conservative in terms of the concern of impression management in corporate reporting, it also captures the scope of a firm's CEP in a very unique way: Our CEP index essentially focuses on the breadth of a corporate ethics program. However, it does not capture how deeply individual CEP items are anchored or employed within a firm. While the issue of breadth vs. depth in the index construction might not be applicable in the context of some of the CEP items – for instance, there is either a CCO or not, and there is either an external certification of a CEP or not – it is still debatable whether an insufficient consideration of depth regarding other CEP items biases our findings in an unrecognized fashion.

To demonstrate that it is indeed the breadth and not the depth of a firm's CEP that mainly influences investors' risk assessments, we reconstruct our CEP index by only considering those items that cannot be feasibly scaled in terms of depth (item#1: CCO; item#2: Ethical Committee; item#7: UN Global Compact; item#16: Certification; item#18: Internal Whistleblowing Facility; item#19: External Whistleblowing Facility; and item#21: Ombudsperson). As all these items are typically implemented firm-wide, we refer to this new index as the "breadth-oriented CEP-subindex". We then rerun our dynamic panel estimations for our proxies of equity and credit risk.

The results reveal that for all the equity (Table VII.21) and credit (Table VII.22) risk measures, the effect of this CEP subindex on investors' risk assessments is even stronger than that of the full CEP index. Regarding equity risk, for instance, the impact of the breadth-oriented CEP subindex on value at risk equals -17.3% under the fixed-effects approach, while this impact is equal to -7.2% under the fixed-effects approach for the full CEP index. Regarding credit risk, for example, the coefficient of the 1-year CDS spread equals 0.889 in relation to the breadth-oriented CEP subindex using the fixed-effects approach, while this coefficient is only 0.425 under the fixed-effects approach for the full CEP index. From these results, we conclude that for investors' risk assessments, it seems that the breadth, not the depth, of a firm's CEP is particularly relevant. More specifically, investors appear to place more trust in hard CEP items feasibly implemented firm-wide than in items that must be stringently implemented through all organizational levels. Moreover, these findings again indicate that our results are not driven by an overstated CEP index based on soft CEP items that could be pure lip service, such as an ethical tone at the top of an organization. Investors seem to be rather cautious about items that allow for management discretion in their enforcement.

Table VII.21: Effect of breadth-oriented CEP subindex on downside equity risk.

Panel A:	FE	FE	FE	FE
	(1)	(2)	(3)	(4)
	VaR	CVaR	LPM(0,2)	LPM(0,3)
L. dep. var.	-0.309***	-0.315***	-0.299***	-0.310***
	(0.048)	(0.047)	(0.048)	(0.047)
CEP subindex	-0.173***	-0.196***	-0.115***	-0.139***
	(0.035)	(0.054)	(0.023)	(0.037)
Leverage	0.454*	0.458	0.194	0.148
	(0.241)	(0.367)	(0.161)	(0.253)
Sales Growth	-0.343	-0.613*	-0.220	-0.376
	(0.236)	(0.361)	(0.158)	(0.250)
Profitability	-1.426	-2.851*	-1.377*	-2.370**
	(1.084)	(1.655)	(0.724)	(1.145)
Dividend Yield	0.079**	0.138***	0.059***	0.089***
	(0.032)	(0.049)	(0.021)	(0.033)
Size	-1.18e-06	-2.45e-06	-3.05e-06	-2.96e-06
	(6.18e-06)	(9.41e-06)	(4.12e-06)	(6.50e-06)
Constant	3.979***	5.718***	2.707***	3.537***
	(0.328)	(0.489)	(0.221)	(0.328)
Firm-year Obs.	592	592	592	592
Obs.	150	150	150	150
R^2	0.180	0.172	0.171	0.159

Panel B:	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM
	(1)	(2)	(3)	(4)
	VaR	CVaR	LPM(0,2)	LPM(0,3)
L. dep. var.	-1.006**	-1.210***	-1.158*	-1.296**
	(0.386)	(0.382)	(0.589)	(0.637)
CEP subindex	-1.093***	-1.185***	-0.664***	-0.640**
	(0.300)	(0.334)	(0.201)	(0.260)
Leverage	6.086	7.577	4.632	7.486
	(4.366)	(5.755)	(2.883)	(4.540)
Sales Growth	4.664	4.472	3.061	3.236
	(5.593)	(5.819)	(3.133)	(3.621)
Profitability	-38.77	-54.26*	-29.68*	-41.24*
	(26.85)	(32.25)	(16.32)	(22.17)
Dividend Yield	-0.151	-0.631	-0.243	-0.531
	(0.413)	(0.544)	(0.315)	(0.455)
Size	-7.79e-05**	-0.0001***	-5.49e-05***	-7.30e-05***
	(3.27e-05)	(3.00e-05)	(1.67e-05)	(2.15e-05)
Constant	10.36***	16.19***	7.253**	8.969**
	(3.744)	(4.393)	(2.984)	(3.745)
Firm-year Obs.	592	592	592	592
Obs.	150	150	150	150
Number of Instruments	15	15	15	15
F-stat	11.16	18.22	10.28	8.106
Hansen J p-Value	0.483	0.824	0.749	0.825
AR(2) p-Value	0.410	0.238	0.304	0.197
Lag Specification	(3 4)	(3 4)	(3 4)	(3 4)

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Table VII.21 – continued from previous page

Remark: This table presents dynamic panel estimations of the effects of the breadth-oriented CEP subindex on the different proxies for downside equity risk. The breadth-oriented CEP subindex represents items that are typically anchored firm-wide and are generally not scalable in terms of depth (item#1: CCO; item#2: Ethical Committee; item#7: UN Global Compact; item#16: Certification; item#18: Internal Whistleblowing Facility; item#19: External Whistleblowing Facility; and item#21: Ombudsperson). The coefficients are estimated using a fixed-effects approach (Panel A) and a dynamic GMM approach (Panel B). The dependent variables are VaR in model (1), CVaR in model (2), LPM(0,2) in model (3) and LPM(0,3) in model (4). Descriptions of these variables are provided in Appendix V.A. The standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table VII.22: Effect of breadth-oriented CEP subindex on credit risk.

Panel A	FE	FE	FE	FE	FE	Panel B	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM
	(1)	(2)	(3)	(4)	(5)		(1)	(2)	(3)	(4)	(5)
	CDS1Y	CDS5Y	PD12month	PD60month	DTD		CDS1Y	CDS5Y	PD12month	PD60month	DTD
L. dep. var.	-0.202***	-0.131***	-0.213***	-0.126***	-0.075**	L. dep. var.	-0.697	-0.596	-0.805	-0.662	0.118
	(0.048)	(0.041)	(0.049)	(0.042)	(0.035)		(0.783)	(0.511)	(0.879)	(0.540)	(0.355)
CEP subindex	0.889***	0.220	0.0002***	-1.49e-05	-0.013	CEP subindex	5.624***	3.340***	0.001***	0.002**	-0.093
	(0.337)	(0.309)	(5.18e-05)	(0.0002)	(0.084)		(1.557)	(1.231)	(0.0003)	(0.001)	(0.353)
Leverage	7.521***	11.81***	0.001***	0.009***	-3.660***	Leverage	36.01	36.73**	0.005	0.034**	-6.298
	(2.001)	(1.851)	(0.0003)	(0.001)	(0.498)		(23.48)	(17.55)	(0.004)	(0.013)	(6.001)
Sales Growth	-0.930	1.681	-0.0002	0.001	-0.496	Sales Growth	-16.78	-13.72	-0.002	-0.010	1.378
	(2.038)	(1.866)	(0.0003)	(0.001)	(0.501)		(15.93)	(13.39)	(0.003)	(0.010)	(3.518)
Profitability	-2.729	-0.477	-0.0004	-0.0003	-0.775	Profitability	32.45	6.803	0.005	-0.017	-9.554
	(10.38)	(9.563)	(0.002)	(0.007)	(2.559)		(77.59)	(63.13)	(0.013)	(0.044)	(16.61)
Dividend Yield	1.038***	0.616**	0.0002***	0.0004**	-0.164**	Dividend Yield	-0.508	-1.431	-6.29e-05	-0.001	-0.107
	(0.301)	(0.276)	(4.63e-05)	(0.0002)	(0.075)		(1.905)	(2.016)	(0.0003)	(0.002)	(0.615)
Size	4.69e-05	6.19e-05	6.45e-09	5.16e-08	-1.00e-05	Size	0.0002	0.0002	3.33e-08	9.63e-08	-7.61e-05
	(5.47e-05)	(5.02e-05)	(8.42e-09)	(3.82e-08)	(1.36e-05)		(0.0002)	(0.0001)	(3.28e-08)	(1.09e-07)	(6.29e-05)
Market Capitalization	-8.257***	-5.985***	-0.001***	-0.004***	1.032***	Market Capitalization	-20.04	-11.73	-0.003	-0.008	-1.001
	(1.108)	(1.016)	(0.0002)	(0.001)	(0.274)		(13.69)	(7.618)	(0.002)	(0.006)	(3.581)
Risk-free Rate	-1.495	-2.257*	-0.0002	-0.002*	-0.894**	Risk-free Rate	-31.75	-23.74	-0.005	-0.018	-7.260
	(1.481)	(1.363)	(0.0002)	(0.001)	(0.371)		(19.71)	(15.67)	(0.003)	(0.013)	(7.212)
Return Volatility	5.064***	6.713***	0.001***	0.005***	-2.523***	Return Volatility	7.973	9.392	0.001	0.006	-2.607***
	(0.739)	(0.678)	(0.0001)	(0.001)	(0.183)		(8.163)	(5.856)	(0.001)	(0.005)	(0.901)
Constant	54.05***	37.63***	0.008***	0.026***	5.244**	Constant	96.23	49.79	0.014	0.034	21.48
	(9.482)	(8.728)	(0.001)	(0.007)	(2.340)		(126.4)	(72.72)	(0.022)	(0.057)	(24.58)
Firm-year Obs.	531	531	531	531	531	Firm-year Obs.	531	531	531	531	531
Obs.	136	136	136	136	136	Obs.	136	136	136	136	136

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Table VII.22 – continued from previous page

Panel A	FE	FE	FE	FE	FE	Panel B	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM
	(1)	(2)	(3)	(4)	(5)		(1)	(2)	(3)	(4)	(5)
	CDS1Y	CDS5Y	PD12month	PD60month	DTD		CDS1Y	CDS5Y	PD12month	PD60month	DTD
R^2	0.454	0.473	0.452	0.448	0.587						
						Number of Instruments	21	21	21	21	21
						F-stat	9.731	13.30	9.066	10.11	36.61
						Hansen J p-Value	0.666	0.919	0.646	0.958	0.150
						AR(2) p-Value	0.815	0.725	0.758	0.734	0.920
						Lag Specification	(3 4)	(3 4)	(3 4)	(3 4)	(3 4)

Remark: This table presents dynamic panel estimations of the effects of the breadth-oriented CEP subindex on the different proxies for credit risk. The breadth-oriented CEP subindex represents items that are typically anchored at the highest organizational level and are generally not scalable in terms of depth (item#1: CCO; item#2: Ethical Committee; item#7: UN Global Compact; item#16: Certification; item#18: Internal Whistleblowing Facility; item#19: External Whistleblowing Facility; and item#21: Ombudsperson). The coefficients are estimated using a fixed-effects approach (Panel A) and a dynamic GMM approach (Panel B). The dependent variables are the 1-year CDS spread in model (1), the 5-year CDS spread in model (2), the 1-year probability of default in model (3), the 5-year probability of default in model (4) and the distance to default in model (5). Descriptions of these variables are provided in Appendix V.A. The standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

VII.7.5 Upside chances of equity investors

One might argue that an effective CEP not only helps to avoid major downside risks but also reduces risky opportunities that may deliver large gains. Additionally, previous research has shown that a very formal CEP can reduce employee creativity and motivation, thus decreasing employee performance (e.g., for a meta-analysis, see Avey et al., 2011). Considering the association between a CEP and these "upside chances" should therefore allow us to paint a more comprehensive picture of the full cost of a CEP. To assess the additional costs of lost upside chances, we repeat our earlier analyses of equity risk effects but focus on upside chances rather than downside risk. As all our downside risk proxies are asymmetric measures of risk, we can straightforwardly apply our methodology to assess extremely positive rather than extremely negative equity returns. Table VII.23 presents the corresponding results.

We find that under both estimation approaches, namely, the fixed-effects (Panel A) and GMM (Panel B) estimation approaches, a higher CEP index is associated with decreased upside chances, and the related coefficients are generally comparable to those of our earlier downside risk estimations (see again Table VII.5). For instance, focusing on value at risk, upside chances decrease by 8.8% when an additional CEP item is implemented, while downside risk decreases by 7.2%. Overall, it seems that high CEP levels reduce downside risk and upside chances to a relatively equal extent.

Table VII.23: CEP effects on equity risk upside chances.

Panel A	FE	FE	FE	FE
	(1)	(2)	(3)	(4)
	VaR+	CVaR+	UPM(0,2)	UPM(0,3)
L. dep. var.	-0.122***	-0.136***	-0.156***	-0.184***
	(0.045)	(0.047)	(0.049)	(0.050)
CEP index	-0.088***	-0.099***	-0.049***	-0.052***
	(0.012)	(0.018)	(0.008)	(0.011)
Leverage	0.512**	0.611*	0.257*	0.324
	(0.232)	(0.350)	(0.150)	(0.217)
SalesGrowth	-0.061	-0.393	-0.113	-0.297
	(0.229)	(0.345)	(0.148)	(0.214)
Profitability	-1.245	-0.468	-0.359	-0.244
	(1.052)	(1.586)	(0.678)	(0.984)
Dividend Yield	0.012	0.011	0.016	0.018
	(0.031)	(0.046)	(0.020)	(0.029)
Size	-1.01e-05*	-7.89e-06	-3.53e-06	-3.30e-06
	(5.95e-06)	(8.98e-06)	(3.84e-06)	(5.57e-06)
Constant	4.430***	5.743***	2.664***	3.283***
	(0.324)	(0.480)	(0.218)	(0.304)
Firm-year Obs.	592	592	592	592
Obs.	150	150	150	150
R^2	0.138	0.092	0.106	0.081

Panel B	Diff. GMM	Diff. GMM	Diff. GMM	Diff. GMM
	(1)	(2)	(3)	(4)
	VaR+	CVaR+	UPM(0,2)	UPM(0,3)
L. dep. var.	-0.689	-0.900**	-1.054***	-1.082***
	(0.427)	(0.402)	(0.364)	(0.363)
CEP index	-0.317***	-0.453***	-0.223***	-0.250***
	(0.080)	(0.079)	(0.043)	(0.050)
Leverage	4.103	1.633	1.111	1.005
	(3.635)	(4.320)	(1.892)	(2.004)
SalesGrowth	4.347	3.748	1.106	1.088
	(3.091)	(4.578)	(1.550)	(1.697)
Profitability	-33.60*	-27.33	-11.71	-11.00
	(18.04)	(25.59)	(10.65)	(12.27)
Dividend Yield	-0.063	-0.094	-0.053	-0.074
	(0.300)	(0.397)	(0.185)	(0.231)
Size	-6.77e-05**	-7.68e-05***	-3.78e-05***	-4.07e-05***
	(2.66e-05)	(2.29e-05)	(1.05e-05)	(1.18e-05)
Constant	10.23***	15.98***	7.588***	9.110***
	(3.576)	(4.113)	(2.002)	(2.003)
Firm-year Obs.	592	592	592	592
Obs.	150	150	150	150
Number of Instruments	15	15	15	15
F-stat	7.542	11.59	10.18	8.136
Hansen J p-Value	0.843	0.483	0.360	0.402
AR(2) p-Value	0.273	0.058	0.033	0.007

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Table VII.23 – continued from previous page

Remark: This table presents dynamic panel estimations of the effects of the CEP index on the different proxies for upside equity risks. The coefficients are estimated using a fixed-effects approach (Panel A) and a dynamic GMM approach (Panel B). The dependent variables are VaR+ in model (1), CVaR+ in model (2), UPM(0,2) in model (3) and UPM(0,3) in model (4). These risk measures use the methodology described in Section 3 but refer to the positive part of the equity return distribution. Descriptions of these variables are provided in Appendix V.A. The standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

VII.8 Conclusion, implications, and limitations

Our analyses contribute to business ethics research, as we study the association between a firm's CEP and investors' risk assessments and provide multiple insights. To evaluate firms' CEPs, we introduce a new measure to the literature, the CEP index. Based on 24 distinguishable items determinable from publicly available sources, we evaluate 150 listed firms from 2014 to 2018. In this way, we provide a comprehensive overview of these firms' CEPs today and their development over recent years. The descriptive analyses show that the examined firms listed on the DAX30 have CEPs that consist of an average of 15 individual CEP items – these CEPs are hence moderately comprehensive and found to be rather stagnant over our sampling period. The firms from subordinate market segments (the MDAX, SDAX, or TecDAX) start from lower levels but display much greater increases in their CEP indices. Overall, our descriptive results allow managers to benchmark their respective firms' CEPs and provide inspiration regarding the question of which additional CEP items could benefit their firms. However, our results also reveal that the management teams of these firms seem to shy away from implementing fully comprehensive CEPs, probably due to the associated costs. Against this background, our paper provides guidance for managers by studying (i) whether investments in a comprehensive CEP are valued by investors when they make their risk assessments and (ii) which CEP items are especially appreciated or viewed critically in this context.

In the first part of our research agenda, we run fixed-effects and GMM dynamic panel regressions and two-stage least squares IV regressions to assess the relation between the scope of a firm's CEP and investors' risk assessments. We find that *equity investors* appreciate a relatively comprehensive CEP since a firm's downside risk is negatively associated with the scope of its CEP: the higher a firm's CEP index is, the lower its downside equity risk is. Hence, for equity investors, the ongoing costs of a broad CEP are outweighed by a lower likelihood of ethical scandals since the associated costly fines and reputational damages affect these equity holders, as they are the residual claimants on firms' free cash flows, particularly strongly. *Debt investors*, in contrast, hold a senior and typically fixed claim on firms' cash flows. They are directly affected by ethical misconduct only if it leads to firm insolvency. However, insolvencies due to ethical scandals are scarce, and the resulting cash outflows typically materialize only after several years, for instance, because lawsuits last quite some time. Additionally, however, the ongoing day-to-day costs of implementing and maintaining a comprehensive CEP may impair a firm's creditworthiness, reducing the market value of its debt securities and hence affecting debt investors indirectly. Consequently, it is not surprising that debt investors with short investment horizons are shown to be more sensitive to ongoing CEP costs than to extreme events involving ethical scandals.

Concerning these opposing findings regarding equity and debt investors, we estimate a *net effect* by mean-centering our variables and rerunning our regressions. This analysis indicates that the risk-decreasing effect from the perspective of equity investors outweighs the risk-increasing effect from the point of view of debt investors. However, as our equity risk measures do not lend themselves directly to approximating a firm's equity capital costs, we encourage future research to provide deeper insights into the association between a firm's CEP and its cost of capital. To provide a comprehensive view of the costs and benefits of a CEP, we additionally consider whether a high CEP index not only reduces risky opportunities but also prevents large gains. Indeed, we find that a comprehensive CEP reduces downside equity risks and upside chances to a relatively equal extent. Based on these results, it appears reasonable for a management team to discontinue further investments in a firm's CEP when a certain index level is reached. However, further quartile regressions reveal that the implementation of additional CEP items has a particularly strong impact in the form of decreased downside equity risk for firms with very high CEP indices. Thus, CEP investments are especially fruitful for firms that already have broad CEPs in place. Against this background, future research is clearly needed to analyze whether specific firm characteristics such as age, reputation, intangible assets or market characteristics may moderate this association.

These findings on the relation between CEP and investors' risk assessments motivate the second part of our research agenda: Which *factors*, i.e., combinations of CEP items, are especially important to investors and should be prioritized by management? Applying a factor analysis, we decompose our CEP index into its factors and then rerun our regression models using these factors as explanatory variables. Our results reveal that equity investors especially appreciate institutionalized CEP items with precise organizational anchoring, such as chief compliance officers, ethical committees, clear compliance organizations, codes of conduct for employees and suppliers, ethical trainings, clear sanctions of unethical employee behavior, job rotations, internal compliance audits, compliance checks of business partners, internal whistleblowing facilities with guaranteed anonymity for whistleblowers and ongoing ethical risk assessments. In contrast, debt investors perceive only the involvement of independent auditors for external compliance audits or the certification of firms' CEPs as risk-reducing. In their discussions with debt investors, management teams might therefore want to highlight the involvement of independent auditors in their firms' CEPs. Surprisingly, cultural CEP items seem to be nearly meaningless for investors' risk assessments. While prior research has often claimed that culture is highly important for the effectiveness of a CEP, investors appear to see such soft CEP items as pure lip service when making their risk assessments. Therefore, management should ensure that relatively soft items are strictly enforced and anchored within their organization and report accordingly to their investors. Future research could verify and explain this apparent skepticism against soft CEP items in more detail, for instance, through conducting survey-based analyses among investors.

Despite thorough attempts at ensuring robustness and comprehensiveness, we must nevertheless disclose several *limitations* to our analyses. First, although we try hard to reduce potential endogeneity problems in our estimation approaches, further tests are called-for to support the robustness of our results and determine a clear causality rather than just an association between firms' CEPs and investors' risk assessments. In particular, a difference-in-difference design would be appropriate, which we were unable to apply due to the specific characteristics of our data set. To do so, researchers should be very aware of circumstances where legal requirements for particular CEP items are established – such a setting could allow for a natural experiment to be conducted over time. Second, the quality of our CEP index relies predominantly on firms neither overreporting nor underreporting about their CEPs, even though our results are driven by hard CEP items, which are difficult for management to obscure. Third, the benefits of a firm's CEP are not only determined by its impact on investors' risk assessments. A CEP's usefulness is also ascertained by other stakeholder groups such as employees and by the firm's overall responsibility towards society. Future research could adopt a more comprehensive view encompassing a broad group of firm stakeholders and their overall assessments of firms' CEPs.

Appendix I (to Chapter II)

Appendix I.A: Description of variables.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Appendix I.F: Supplemental Analyses.

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

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

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

Panel A: U.S.

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

Panel B: EU

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

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

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

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

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

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

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

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

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

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

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Appendix I.I – continued from previous page

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

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

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

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Appendix I.J – continued from previous page

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

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

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

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

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

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Appendix I.K – continued from previous page

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

Appendix II (to Chapter III)

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

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

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Appendix II.A – continued from previous page

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

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

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

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

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Appendix II.B – continued from previous page

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

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

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

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Appendix II.C – continued from previous page

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

Appendix III (to Chapter IV)

Appendix III.A: Measuring misvaluation.

Residual income model

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

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

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

The ROE forecast is estimated as follows:

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

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

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

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

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

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

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

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

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

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

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

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

RRV misvaluation measure

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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Appendix III.C – continued from previous page

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

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Appendix III.C – continued from previous page

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

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

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

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

Appendix IV (to Chapter VI)

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

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

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Appendix IV.A – continued from previous page

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

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

Appendix V (to Chapter VII)

Appendix V.A: Description of variables.

Panel A: Equity Risks	
Value at Risk (VaR)	The Value at Risk of a firm is calculated as the 0.05-quantile of its empirical daily stock return distribution. We translate this into a positive number so that a lower VaR mirrors a risk reduction.
Conditional Value at Risk (CVaR)	The CVaR corresponds to the mean value of daily returns below the VaR threshold. It is translated into a positive number so that lower risk corresponds with a lower CVaR.
Lower Partial Moment (0,2) (LPM(0,2))	We calculate the LPM(0,2) of a firm based on its return distribution below the 0% return threshold following Bawa (1975) and Fishburn (1977). To compare our results metrically, we employ the square root of LPM(0,2). LPM(0,2) is hence calculated as follows: $$\text{LPM(0,2)} = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(R_{n,i})^2}$$ $R_{n,i}$ denotes the negative daily return of firm i and N represents the number of observed negative daily returns of firm i in the respective year.

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Appendix V.A – continued from previous page

Lower Partial Moment (0,3) (LPM(0,3))	We calculate the LPM(0,3) of a firm based on its return distribution below the 0% return threshold following Bawa (1975) and Fishburn (1977). To compare our results metrically, we employ the cube root of LPM(0,3). LPM(0,3) is hence calculated as follows: $$\text{LPM(0,3)} = \sqrt[3]{\frac{1}{N}\sum_{i=1}^{N}(\lvert R_{n,i}\rvert)^3}$$ $R_{n,i}$ denotes the negative daily return of firm i and N represents the number of observed negative daily returns of firm i in the respective year.
Panel B: Credit-based Risk Measures	
Credit Default Swap Spread CDS1Y	The CDS1Y is the one-year credit default swap spread.
Credit Default Swap Spread CDS5Y	The CDS5Y is the five-year credit default swap spread.
Probability of Default (PD) 12 month	The PD12month denotes the one-year probability of default.
Probability of Default (PD) 60 month	The PD160month denotes the five-year probability of default.
Distance to Default (DTD)	DTD measures the distance between the default point of a firm and the expected value of its assets. A greater distance to default hence implies a lower probability of default. The DTD is calculated with volatility-adjusted leverage based on Merton (1974).

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Appendix V.A – continued from previous page

Panel C: Control variables	
Dividend Yield	Dividend yield is a firm's percentage payout relative to its stock price.
Leverage	Firm leverage is proxied as debt divided by total assets.
Market Capitalization	Market Capitalization is proxied by the logarithm of each firm's market value.
Profitability	Profitability is measured as operating income divided by total assets.
Return Volatility	Equity Return Volatility is measured as a firm's annualized standard deviation from daily stock returns.
Risk-free Rate	The risk-free Interest Rate is given by the one-year German Bund rate.
Sales Growth	Sales growth is the growth rate of a firm's total sales.
Size	Size is measured as the number of employees in a firm.

Remark: This table presents the descriptions of the variables employed in this study. Panel A delineates our equity risk measures, Panel B describes our credit risk measures and Panel C defines the control variables.

Appendix V.B: Further methodological explanations

As we cannot entirely exclude that endogeneity affects our estimation, biasing the results of our simple OLS regressions, we employ two independent, relatively sophisticated estimation approaches that consider different angles of the endogeneity issue in our main analyses. By doing so, we derive an upper and a lower bound for the CEP-risk relation. This allows us to draw robust conclusions regarding the existence and sign of the effect of interest despite the potential imperfections of each approach when used in isolation.

The first estimation approach is based on a simple fixed-effects panel estimation where the inherent differencing (or "within"-estimation) procedure eliminates all time-invariant variables. Hence, if the only relevant omitted variables in an estimation are fixed over time (e.g., industry-related variables), their endogeneity effect is nullified via a fixed-effects estimation. However, in many cases, there may also be omitted time-varying variables, and reverse causality may further contribute to their detrimental endogeneity effect. For instance, it is possible that a firm's risk history leads to certain compliance choices and therefore affects its risk level. In this case, a dynamic panel model that includes the lagged dependent variable as a further explanatory variable might be helpful, as the lagged dependent variable would essentially capture the effect of the omitted time-varying variables:

$$y_{i,t} = \beta_1 y_{i,t-1} + \beta_2 \phi_{i,t} + \beta_3 x_{i,t} + \upsilon_i + \epsilon_{i,t} \tag{A.11}$$

Here, $y_{i,t-1}$ represents the lagged dependent variable, i.e. firm risk in our case. The CEP index is denoted as $\phi_{i,t}$ so that the coefficient β_2 demonstrates the contemporary impact of compliance activity on firm risk. $x_{i,t}$ is a vector of control variables, υ_i is the time-constant firm effect, and $\epsilon_{i,t}$ denotes the idiosyncratic error term in the regression.

If the dynamic panel equation (A.11) is estimated via a fixed-effects approach, the differencing procedure eliminates the time-invariant part υ_i:

$$\Delta y_{i,t} = \beta_1 \Delta y_{i,t-1} + \beta_2 \Delta \phi_{i,t} + \beta_3 \Delta x_{i,t} + \Delta \epsilon_{i,t} \tag{A.12}$$

However, consistency may be difficult to achieve through this fixed-effects estimation, as the differenced error term $\Delta\epsilon_{i,t}$ and the lagged dependent variable $\Delta y_{i,t-1}$ are naturally correlated via $\epsilon_{i,t-1}$; thus, endogeneity is introduced by construction. Fortunately, the GMM estimation procedure developed by Arellano and Bond (1991) and

Arellano and Bover (1995) allows us to solve this problem, and we therefore choose it as our second estimation approach. The GMM estimation employs a two-step procedure that instruments the endogenous explanatory variable $\Delta y_{i,t-1}$ with its lagged level $y_{i,t-2}$. As long as this instrument is uncorrelated with $\epsilon_{i,t-1}$, this estimation approach will deliver consistent results. It must be stressed, however, that this assumption cannot be merely taken for granted. Rather, the stronger the correlation between the instrument $y_{i,t-2}$ and the endogenous variable $\Delta y_{i,t-1}$, i.e., the "stronger" the instrument is, the more likely it becomes that the identifying condition of the GMM estimation approach is violated. To see this for our problem at hand, consider a case where firm risk is serially correlated. Such a firm's historic risk level may easily become correlated with the error term in this estimation. Particularly for credit risk, the typical temporal stability of credit ratings (Altman and Rijken, 2004; Löffler, 2005) shows that this concern cannot be easily dismissed.

To summarize, while the fixed-effects estimation procedure allows us to address the endogeneity issues arising from time-invariant omitted variables, the GMM approach reduces endogeneity from reverse causality. Nevertheless, each method comes with restrictive identifying conditions that may not entirely hold for the problem at hand. To make use of the beneficial effects of both methods despite their individual difficulties, we follow Angrist and Pischke (2009) and employ both the fixed effects estimation method and the GMM approach to analyze our dynamic panel dataset in an attempt to capture their "bracketing property": If inappropriately applied, the fixed-effects estimation approach should overestimate a positive relation of interest, while the GMM approach should underestimate it. By applying both methods simultaneously, we can therefore at least "narrow down" a causal effect. Our approach in this respect follows Cremers et al. (2017), who also employ these two estimation methods to establish the effect of staggered boards on firm value.

To consider additional heterogeneity issues, we use robust standard errors for both estimations. In the fixed-effects estimations, the standard errors are robust to heteroscedasticity and autocorrelation. For the GMM estimations, we apply robust standard errors as developed by Windmeijer (2005). Moreover, our estimation procedure follows those of Roodman (2009), Wintoki et al. (2012) and Eugster (2020). More precisely, we apply the Stata command xtabond2 for our GMM estimations using the following options: twostep, robust, small, orthogonal and collapse. The collapse option, as suggested in Wintoki et al. (2012), mitigates instrument proliferation. The lag length of the instruments is (3 4). Furthermore, we report all the relevant test statistics necessary to judge the quality of the dynamic panel GMM estimation, such as the Hansen J-statistic (test of overidentification restrictions) and the AR(2) test statistic (regarding second-order serial correlation of residuals).

As an additional and more conventional means of further alleviating potential endogeneity concerns, we apply a two-stage least squares instrumental variables (IV) estimation approach (Roberts and Whited, 2013). This approach divides an estimation into two steps. The first serves to isolate the part of a (potentially) endogenous variable that is uncorrelated with the error term, i.e., is exogenous by definition. It does so by regressing the endogenous variable on so-called "instrumental variables". To be valid, these instrumental variables must be relevant, i.e., correlated with the endogenous variable, but exogenous, i.e., uncorrelated with the error term in the regression of interest. The predicted values from this first-stage regression are then used as a replacement for the potentially endogenous variable in a second-stage regression, thus alleviating the endogeneity problem in the regression of interest. To test whether the instruments in our first stage are valid, we perform several diagnostic checks. We consider the Cragg and Donald Wald F-statistic to test for weak instruments. Values above 19.93 indicate relevant instruments at a significance level of 5% for a two-stage least squares regression with two instruments and one endogenous regressor, as detailed in the work of Stock and Yogo (2005). Moreover, we test for overidentification by using the Hansen J-statistic. P-values above 0.1 confirm that the instruments are exogenous.

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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.

Yannik Bofinger, October 21, 2021

Submitted Papers:

1. Bannier, C. E., Bofinger, Y. and Rock B. (2022). Doing safe by doing good: Non-financial reporting and the risk effects of corporate social responsibility. *European Accounting Review*, forthcoming. DOI: https://doi.org/10.1080/09638180.2022.2042349.

2. Bannier, C. E., Bofinger, Y. and Rock, B. (2022). Corporate Social Responsibility and Credit Risk. *Finance Research Letters*, Volume 44, 102052. DOI: https://doi.org/10.1016/j.frl.2021.102052.

3. Bofinger, Y., Heyden, K. J., and Rock, B. (2022). Corporate social responsibility and market efficiency: Evidence from ESG and misvaluation measures. *Journal of Banking & Finance*, Volume 134, 106322.
DOI: https://doi.org/10.1016/j.jbankfin.2021.106322.

4. Bannier, C. E., Bofinger, Y., Heyden K. J., and Rock, B. (2022). The sustainability trap: Active fund managers between ESG investing and fund overpricing. *Finance Research Letters*, Volume 45, 102160.
DOI: https://doi.org/10.1016/j.frl.2021.102160

5. Bannier, C. E., Bofinger, Y. and Rock B. (2021). *Zooming in on CSR: Which categories are relevant for companies' equity risk?*. Corporate Finance.

6. Bannier, C. E., Bauer, A., Bofinger, Y. and Ewelt-Knauer, C. (2021). *Corporate ethics programs: Reducing risks or wasting money? - Insights from the perspective of investors*. Working Paper