

# Measuring the relationship between ESG factors and firm's credit risk in Europe\*

(Preliminary version)

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## Abstract

In this paper, we investigate how ESG factors affect the perceived creditworthiness of firms in the European financial market. We model the CDS spread of a firm by considering the usual drivers that reflect specific firm characteristics such as the firm's financial, auditing, and management factors. Along with these variables, we include the ESG dimensions such as the ESG ratings, overall and for each pillar (E, S, and G). Furthermore, we consider specific drivers for a given pillar (i.e., CO2 emissions) or a firm's specific policies (i.e., commitment to human rights). The considered period in the empirical analysis is from September 2010 to July 2016. Our findings show that Social and Governance dimensions have a positive impact on the firm's perceived creditworthiness while we find the opposite for the Environmental dimension. Prior to the Paris Agreement in December 2015, environmental efforts were most likely seen as a sunk cost for a firm during rather than part of a transition strategy to carbon neutrality.

**Keywords:** Environment Social Governance (ESG), Credit risk, Credit Default Swap, European firms

**JEL Classification:** G14

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# 1 Introduction

Within the last decades, growing awareness of Environmental, Social, and Governance factors (ESG) has influenced public opinion, and it has urged firms to integrate these aspects in their strategies. At the same time, governance and social issues also became more pressing after several negative corporate disclosures and the global financial crisis. All these elements have highlighted the negative effects of extreme climate events, poor environmental engagements, and lacking transparency and accountability on companies' financial credibility and stability (Chavagnon et al., 2017). As a consequence, Socially Responsible Investment (SRI) is acquiring further importance for most firms. It is not seen any longer just as a tool to improve their competitiveness within the framework of globalization and the rush towards reduced production costs. During the last decade, a growing number of firms have started targeting ESG objectives to enhance their corporate sustainability. At the same time, investors were facing a considerable need for precise information about companies' involvement, which led to the creation of sustainability indices and the ESG rating agencies. As result, a new specialized market has soared and traditional rating agencies such as Standards and Poor, Moody's, and Fitch started incorporating these aspects in their analyses, while financial data and information providers such as Thomson Reuters and Bloomberg started proposing their own ESG ratings. Besides, these different components (environmental, social, and governance efforts) present their own features, and modeling non-financial ESG risks might be burdensome. For instance, social characteristics are those that are naturally more difficult to quantify, even though they are more easily understood and integrated into a credit risk framework (education levels, labor market structure, etc.). Furthermore, the importance of each component in investors' decisions varies considerably. Namely, governance issues are perceived as influencing more considerably the creditworthiness of a company and its sustainability (Chavagnon et al., 2019).

While several studies have focused on the relationship between ESG factors and the firm's performance over time, there are few investigations in the literature about ESG factors and

a firm's creditworthiness. Some studies have analyzed the impact of ESG and Corporate Social Responsibility (CSR) factors on a firm's cost of capital. The results of these studies provide mixed evidence. [El Ghouli et al. \(2011\)](#) found that higher CSR scores experience a significantly lower cost of equity capital. [Menz \(2010\)](#) have shown that CSR has not been incorporated into the pricing of corporate bonds and that in some cases the risk premium for socially responsible firms is even higher. [Goss and Roberts \(2011\)](#) found that firms with lower CSR pay between 7 and 18 basis points more with respect to the others. [Sharfman and Fernando \(2008\)](#) have reported that firms with better environmental risk management have a lower cost of equity but a higher cost of debt capital. [Weber et al. \(2010\)](#) found that combining traditional and sustainability criteria improve the prediction of SME defaults. The authors demonstrate the relation between firms' sustainability and their financial ratings. They assert that firms with important environmental and sustainability performances are benefitting from higher credit rating scores. Furthermore, their findings confirm that companies' sustainability influences their financial performances and their creditworthiness. They also stress the utility of integrating sustainability criteria in financial performance predictions, as they allow for improved consistency of credit ratings. [Polbennikov et al. \(2016\)](#) also focuses on the historical relationship between ESG ratings and corporate bond spreads and performances. They find that companies with higher ESG ratings show slightly lower bond spreads, and their bonds have been slightly more performant comparatively to less ESG-engaged firms when controlling for various sources of risk exposures. The transition to sustainable finance is crucial to scale up the massive investments needed to foster a transition to a low-carbon economy that keeps temperature rises below 2 degrees Celsius ([High-Level Expert Group on Sustainable Finance, 2018](#)), in order to prevent permanent environmental damages ([Pachauri et al., 2014](#)). Many central bank governors have recently started considering increasing regulatory oversight to address climate-related risks to financial stability, including carbon stress tests for banks and other relevant financial institutions, to assess the effects of an abrupt transition to a low-carbon economy in response to irreversible climatic

catastrophes (Battiston et al., 2017; Gros et al., 2016).

In this paper, we aim at contributing to the literature by investigating how ESG factors affect the perceived creditworthiness of European firms in the financial markets. We model the CDS spread of a firm by considering the usual drivers that reflect specific firm characteristics such as the firm’s financial, auditing, and management factors. Along with these variables, we include the ESG dimensions such as the ESG ratings, overall and for each pillar (E, S, and G). Furthermore, we consider specific drivers for a given pillar (i.e., Co2 emissions) or a firm’s specific policies (i.e, commitment to human rights). The considered period in the empirical analysis is from September 2010 to July 2016. Our findings show that Social and Governance dimensions have a positive impact on the firm’s perceived creditworthiness. The better the firm’s performance on these pillars, the lower is the CDS spreads. On the other hand, we find that the Environmental pillar is significant and positively related to the CDS spreads. It’s worth mentioning that in December 2015, the Paris Agreement, a legally binding international accord on global emissions to prevent climate change, was signed. Considering our sample ends in July 2016, the influence of the Agreement is likely not yet discernible in the estimations, given that our sample is just 7 months longer. Those environmental efforts were most likely seen as a sunk cost for a firm during the time period under consideration, rather than as part of a transition strategy to carbon neutrality.

The remainder of the chapter is structured as follows. Section 2 presents the empirical strategy and illustrates the model and data. Section 3 illustrates the empirical analysis and our major results. Finally, Section 3 concludes.

## 2 Empirical strategy

In this section, we present the model and the data used in the analysis of the determinants of CDS spreads. Specifically, we consider the usual firm’s characteristics (i.e., market and fundamental data) augmented with the ESG factors.

## 2.1 The Model

In the following section, we describe the model used to measure the impact of ESG factors on a firm’s creditworthiness proxied by CDS at a given tenor. The credit default swap (CDS) is a derivative instrument where the buyer pays to the seller a periodic amount over the tenor of the contract to ensure against the event of default. It is a measure of the firm’s creditworthiness: the higher the spread for the CDS, the higher the perceived credit risk. In this study, we model the CDS spread of a firm by considering three specific groups of determinants and other fixed controls that reflect some specific firm’s characteristics. The groups as defined as follows and will be detailed in the Sample section:

1. *Environmental, Social and Governance factors (ESG)*. This group involves the ESG factors such as the scores attributed by a given rating agency overall and for each pillar (E, S, and G). Furthermore, we consider specific drivers for a given pillar (i.e., Co2 emissions) or firm’s specific policies (i.e, commitment on human rights).
2. *Financial factors (Fin)*. This group involves firm’s financial market data and balancesheet data that are the usual drivers of the firm’s credit risk.
3. *Auditing and Management factors (AdtMng)*. This group involves those factors that describe the firm’s board and management characteristics such as compensation, remuneration and external auditing.
4. *Firmographics and other fixed effects (FirmFE)*. This group involves the usual fixed effects controls related to firmographics such as industry and country of residence. Furthermore, we control also for other fixed effects such time fixed effect.

Let  $i = 1, \dots, N$  be the firm  $i$  and  $N$  the total number of firms, and  $t = 1, \dots, T$  the time dimension. We can define the model as:

$$\begin{aligned} \log CDS_{it}(tenure) = & \omega + \beta_i \cdot ESG_i + \gamma_i \cdot Fin_i + \theta_i \cdot AdtMng_i + \\ & \phi_i \cdot FirmFE_i + \tau \cdot TimeFE_t + \varepsilon_{it} \end{aligned} \tag{1}$$

where  $\log CDS_{it}(tenure)$  is the logarithm of the CDS at a given tenure,  $\beta_i$ ,  $\gamma_i$ ,  $\theta_i$ , and  $\phi_i$  are vectors of coefficients associated to a given group of variables as previously defined. We aim at investigating if the ESG group provides statistically significant results after controlling for the other usual determinants.

## 2.2 Sample

In this section, we present the database implemented in the empirical analyses. Data have been downloaded on April 2021 at the monthly frequency by Thomson Reuters Eikon and Bloomberg. The CDS spreads time series were available at 5-year tenure in Thomson Reuters Eikon till 2016 and consequently, the sample starts in September 2010 and is limited to July 2016. Figure 1 shows the evolution of the spread over time. We consider only the firms where all the variables of interest are available in the whole period. The resulting database involves 56 European firms (Table 1) that belong to different sectors according to the Global Industry Classification Standards (GICS) and 9 European Countries (Table 2).

The sample includes 59 ESG variables according to the previously defined groups. In particular, we consider alternative specifications of Model 1 according to the type of the ESG information involved.

- *ESG-scores*. The scores are provided by Thomson Reuters Eikon and involve: ESG, Environmental, Social, Governance, ESG combined, Environmental Pillar (Resource use and Emissions), Social Pillar (Workforce and Community, Human rights, Product Responsibility), and Governance (Management, Shareholders and CSR strategy). The scale ranges from 0 (bottom score) to 100 (top score).

We aim at identifying if the best scorers on a given ESG variable exhibit a decrease on the CDS spreads. In this respect, we compute the quartile for each variable to classify a firm according to four groups: top quartile (Q4), medium quartile (Q3), medium-low quartile (Q2) and bottom quartile (Q1). We create a dummy variable that equals one

**Table 1:** List of the 52 European firms considered in the analysis.

Accor	Electricite De France	Naturgy Energy Group Sa
Aegon N.V.	Enbw Energie Baden-Wurttemberg Ag	Neles Oyj
Akzo Nobel N.V.	Enel Spa	Orange Sa
Allianz Se	Engie Sa	Royal Dutch Shell Plc
Assicurazioni Generali Spa	Eni - Ente Nazionale Idrocarburi	Siemens Ag
Atlantia Spa	Fortum Oyj	Telecom Italia Spa
Atlas Copco Ab	Fresenius Se & Co Kgaa	Telefonaktiebolaget Lm Ericsson
Axa Sa	Gecina	Telefonica Sa
Basf Se	Heineken Nv	Telia Company Ab
Bertelsmann Se & Co Kgaa	Hellenic Telecommunications Organisatio	Thyssenkrupp Ag
Bouygues Sa	Iberdrola S.A.	Total Sa
Brisa-Auto Estradas De Portugal, S.A.	Ing Groep N.V.	Unibail-Rodamco-Westfield Se
Compagnie De Saint Gobain Sa	Investor Ab	Unilever N.V.
Daimler Ag	Kering Sa	Valeo Sa
Danone Sa	Klepierre Sa	Volkswagen Ag
Deutsche Lufthansa Ag	Koninklijke Dsm N.V.	Wolters Kluwer Nv
Deutsche Post Ag	Koninklijke Kpn Nv	
Deutsche Telekom Ag	L'Air Liquide Societe Anonyme Pour L'Et	
E.On Se	Leonardo Spa	
Edp - Energias De Portugal S.A.	Linde Aktiengesellschaft	

Figure 1: Time series of the natural logarithm of 5-year CDS.





**Table 2:** Sample composition by sector and country.

Sector (GICS)	Percentage	Country	Percentage
Communication Services	14.81	Finland	3.57
Consumer Discretionary	9.26	France	26.79
Consumer Staples	5.56	Germany	25.00
Energy	5.56	Greece	1.79
Financials	11.11	Italy	10.71
Health Care	1.85	Netherlands	16.07
Industrials	18.52	Portugal	3.57
Information Technology	1.85	Spain	5.36
Materials	9.26	Sweden	7.14
Real Estate	5.56	Total	100
Utilities	16.67		
Total	100		

if a given firm belongs to the top quartile Q4 or not:

$$\log CDS_{it}(tenure) = \omega + \beta_i \cdot \mathbb{1}(ESG\ scores_i \in Q4) + \gamma_i \cdot Fin_i + \theta_i \cdot AdtMng_i + \phi_i \cdot FirmFE_i + \tau \cdot TimeFE_t + \varepsilon_{it} \quad (M_1)$$

- *ESG-Policy*. These variables identify if a particular ESG policy is implemented or not in a given firm. The (dummy) variables included are based on:
  - Environmental policies (Policy Emissions, Policy Energy Efficiency, Resource Reduction Policy, Efficiency Policy and Environmental Supply Chain Management).
  - Social policies (Ethics Policy, Policy Community Involvement, Policy Diversity and Opportunity, Policy Skills Training, Policy Career Development, Policy Employee Health Safety, Health Safety Policy, Training and Development Policy).
  - Governance policies (Board Structure Policy, Executive Compensation Policy, Policy Bribery and Corruption, Training Policy, Energy, and CSR Sustainability Committee).

The third specification is defined as follows:

$$\log CDS_{it}(tenure) = \omega + \beta_i \cdot \mathbb{1}(ESG-Policy_i) + \gamma_i \cdot Fin_i + \theta_i \cdot AdtMng_i + \phi_i \cdot FirmFE_i + \tau \cdot TimeFE_t + \varepsilon_{it} \quad (M_2)$$

- *ESG-Factors.* These are factors that measure particular drivers of each pillar. Following the standard approach, we apply the logarithm transformation to reduce the skewness of the data expressed in dollars or in terms of emission. The variables are the following:

- Environmental factors (Water use to revenues, CO2 emission, Total energy use to revenues).
- Social factors (Percentage women employees, Turnover of employees, Full time employees).

The last specification is the following:

$$\log CDS_{it}(tenure) = \omega + \beta_i \cdot ESG-Factors_i + \gamma_i \cdot Fin_i + \theta_i \cdot AdtMng_i + \phi_i \cdot FirmFE_i + \tau \cdot TimeFE_t + \varepsilon_{it} \quad (M_3)$$

Finally, we list the other potential determinants of the CDS spreads according to the groups previously defined.

- *Financial factors.*

Volatility, Size, Cashflow, Enterprise Value to Sales, Financial Leverage, Total Revenue, Operating Income, EBITDA, Intangibles Net, Effective Tax Rate, Capital Expenditures, Sale of Fixed Assets, Long Term Investments.

- *Auditing and Management factors.*

Total Senior Executives, Board Member Compensation, Board Size, Auditor Tenure,

Audit Committee Independence, Highest Remuneration Package, Number of board meetings.

### 3 Results

In this section, we present the results according to the three models discussed above. For the sake of clarity, we do not include the estimates for the control groups (i.e., Financial, Auditing, and Management controls, Industry, Country and Year fixed effects).<sup>1</sup> Model  $M_1$  includes the dummy variables that identify the top scorers for the group *ESG-score*. Results are reported in Table 3 for the full model (column 1) and for the subgroups (columns 2-5). It is worth noting that the top ESG scorers do not show any statistically significant difference from their counterparts. The result is confirmed also in the disjoint specification of  $M_1^{(2)}$ . Interestingly, the top scorers in *ESGcombined* exhibit a significant and negative coefficient, in the full and the disjoint model  $M_1^{(3)}$ , implying a lower level of credit risk with respect to their counterparts. The ESG combined is a score that includes also a penalization for those firms involved in major controversies (e.g., conflict on international norms). Surprisingly, the Environmental score (E) is significant and positively related to the CDS spreads. The results are confirmed also when the ESG score is taken on at the time in specification  $M_1^{(4)}$ . An analogous result is provided by the variable *Emissions* that measures the ability and commitment of a firm in reducing CO2 emission in the production processes. Another variable that shows a significant and negative relationship with the CDS spreads is *ResourceUse* (Environmental) that indicates the top scorer in the percentage of raw materials used from recycled sources. It is worth noting that the Paris Agreement, a legally binding international treaty on global emissions to mitigate climate change, took place in December 2015. Our sample stops in July 2016 and probably the effect of the Agreement are not visible yet in the estimates given that our sample end after 7 months. In the considered period, probably those environmental strategies were perceived as a sunk cost for a firm and not as part of

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<sup>1</sup>The full estimates are available upon request to the authors.

the transition plan to carbon neutrality. On the other hand, these indicators involve several environmental metrics that could mask on average the greenhouse gas emissions. The top scorers in *CSRstrategy* (Governance) also show a significant and negative coefficient with respect to the CDS spreads. This variable measures the ability of the firm to disclose its implemented practice on the integration of financial, social, and environmental pillars in the decision-making process. Similarly, the *HumanRights* (Social) top scorers are perceived as less risky. The variable measures the firm's effectiveness in respecting the fundamental human rights conventions. The *ProductResponsibility* (Social) describes the capacity of a firm to provide goods and services by considering customers' health and safety and data privacy. Also, in this case, the top scorer firms are perceived as less risky with respect to their counterparts. Finally, top firm scorers on other social and governance factors such as *Workforce* (job satisfaction, healthy and safe workplace, diversity and equal opportunities), *Community* (good citizenship, protecting public health and business ethics), *Management* (the best practice of corporate governance) and *ShareHolders* (equal treatment of shareholders and the use of anti-takeover devices) are not perceived less risky with respect to the lowest counterparts.

The second model ( $M_2$ ) includes the (dummy) variables that identify the ESG implemented policies as described in the group *ESG-policies*. Estimates are shown in Table 4. Also in this case the environmental dimension does not improve the perceived creditworthiness of a firm but on the contrary, the implementation of environmental policies seems to be perceived by the market as an additional cost. For instance, *PolicyEmissions* detects whether a firm has the policy to improve emission reduction and is positively related to the CDS spreads. An analogous result is found with *PolicyEnergyEfficiency* which identifies those firms that have a policy for energy efficiency improvements. Results are different for the social and governance policies. *PolicyBriberyAndCorruption* involves a code of conduct that aims at avoiding bribery and corruption in the governance and business processes. *PolicyCommunityInvolvement* identifies the policies on social responsibility (e.g., community

donations, volunteering, philanthropic activities, and community investments in education). *PolicyDiversityAndOpportunity* concerns commitment to diversity and equal opportunity (e.g., policies on equal treatment of women, minorities, disabled employees, age, ethnicity, race, nationality, and religion). *PolicySkillsTraining* signals whether a firm implements policies to improve the skills and the training of its employees (e.g., job-specific training). All these policies are significant and negatively related to CDS spreads. The only case involves the policy on a balanced membership of the board (*BoardStructurePolicy*) which is significant and positively related to the CDS spreads. All the other examined ESG policies do not provide any significant results with respect to the counterpart.

The last considered model is  $M_3$  which includes the variables of the *ESG-factors* group. Results are presented in Table 5. The majority of these factors relate to the Environmental dimension and do not provide any significant result. A notable exception concerns the variable *WaterUseToRevenues* which is significant and positively related to the CDS spreads. The factor measures the total water withdrawal in cubic meters divided by net sales. Regarding the social factors, we have an interesting result on employees. Firms with a higher turnover of employees due to voluntary or involuntary reasons are perceived as riskier while firms with a higher percentage of full-time employees are perceived as less risky. Once again, findings on the Social dimension provide evidence of a negative relationship between the perceived credit risk of a firm.

## Conclusion

The increasing awareness of ESG criteria on investors' choice explains the need to analyze how ESG factors contribute to the firms' creditworthiness. According to a recent survey of (Amel-Zadeh and Serafeim, 2018), 82% of respondent investors make use of ESG information since they consider it as financially crucial to a firm's performance. Generally, the availability of ESG ratings, which are assigned at a firm level, allows us to exploit cross-sectionally the

relationship between the ESG ratings and credit risk. Given that ESG factors measure a firm's sustainability and attitude towards positive or negative externalities, we investigate in this study how these factors affect the firm's creditworthiness after controlling for the usual determinants. Specifically, we consider the CDS spread for a sample of European firms from September 2010 to July 2016. Results show that a good performance on Social and Governance dimensions is negatively related to the CDS spread level. Conversely, results show that positive achievements on the Environmental pillar are negatively related to the CDS spreads. This clearly requires further investigations. For instance, our considered sample ends in July 2016, 7 months after the Paris Agreement that has represented the first legally binding international agreement to limit global emissions. The Agreement's influence, if any, is not yet discernible in the estimates. Those environmental efforts were most likely viewed as a sunk cost for a company during the time period under analysis, rather than as part of a carbon-neutral transition plan.

**Table 3:** Determinants of the natural logarithm of CDS spread using the specifications discussed in  $M_1$ . Statistical significance is denoted by \*\*\*, \*\*, and \* at the 1%, 5%, and 10% level, respectively. Robust standard errors in parentheses.

$\log CDS(5y)$	$M_1^{(1)}$	$M_1^{(2)}$	$M_1^{(3)}$	$M_1^{(4)}$	$M_1^{(5)}$
ESG(Top)	0.0354 [0.0476]	-0.0174 [0.0403]			
ESGcombined(Top)	-0.0865* [0.0475]		-0.1510*** [0.0478]		
E(Top)	0.3449*** [0.0487]			0.3363*** [0.0437]	
S(Top)	-0.0477 [0.0425]			-0.2177*** [0.0340]	
G(Top)	-0.0449 [0.0495]			-0.0808** [0.0363]	
ResourceUse(Top)	-0.2371*** [0.0365]				-0.2743*** [0.0368]
Emissions(Top)	0.0911* [0.0500]				0.1848*** [0.0459]
Workforce(Top)	-0.0693 [0.0488]				-0.0493 [0.0481]
Community(Top)	0.0014 [0.0354]				0.0121 [0.0321]
Management(Top)	-0.0249 [0.0463]				-0.0447 [0.0348]
Shareholders(Top)	0.0373 [0.0305]				0.0692** [0.0299]
CSRstrategy(Top)	-0.1088*** [0.0408]				-0.0828** [0.0407]
HumanRights(Top)	-0.1896*** [0.0298]				-0.1995*** [0.0318]
ProductResponsibility(Top)	-0.2791*** [0.0401]				-0.2778*** [0.0400]
Financial Ctrl	Yes	Yes	Yes	Yes	Yes
Auditing and Management Ctrl	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
SE	Rob.	Rob.	Rob.	Rob.	Rob.
Observations	2,072	2,072	2,072	2,072	2,072
R-squared	0.6781	0.6380	0.6407	0.6537	0.6660

**Table 4:** Determinants of the natural logarithm of CDS spread using the specifications discussed in  $M_2$ . Statistical significance is denoted by \*\*\*, \*\*, and \* at the 1%, 5%, and 10% level, respectively. Robust standard errors in parentheses.

$\log CDS(5y)$	$M_2$
PolicyEmissions	0.5932* [0.3319]
EthicsPolicy	-0.1258 [0.1137]
PolicyEnergyEfficiency	0.6564*** [0.0801]
BoardStructurePolicy	0.1586** [0.0734]
ExecutiveCompensationPolicy	-0.0571 [0.1564]
PolicyExecutiveCompensationPerformance	0.0951 [0.1452]
PolicyBriberyAndCorruption	-0.2082** [0.0831]
PolicyCommunityInvolvement	-0.9988*** [0.1489]
PolicyDiversityAndOpportunity	-0.2207*** [0.0803]
PolicySkillsTraining	-0.4806*** [0.0970]
PolicyCareerDevelopment	-0.0819 [0.1689]
PolicyEmployeeHealthSafety	0.1399 [0.1001]
CSRSustainabilityCommittee	0.0981 [0.1134]
EnvironmentalSupplyChainManagement	0.0926 [0.0792]
Financial Controls	Yes
Auditing and Management Controls	Yes
Industry FE	Yes
Country FE	Yes
Year FE	Yes
SE	Rob.
Observations	2,072
R-squared	0.6581



**Table 5:** Determinants of the natural logarithm of CDS spread using the specifications discussed in [M3](#). Statistical significance is denoted by \*\*\*, \*\*, and \* at the 1%, 5%, and 10% level, respectively. Robust standard errors in parentheses.

$\log CDS(5y)$	$M_2$
CO2 Emission	-0.0044 [0.0325]
WaterUseToRevenues	0.1409*** [0.0173]
TotalEnergyUseToRevenues	-0.0006 [0.0307]
Perc.WomenEmployees	-0.0015 [0.0029]
TurnoverOfEmployees	0.0058*** [0.0015]
FullTimeEmployees	-0.2111*** [0.0510]
Financial Controls	Yes
Auditing and Management Controls	Yes
Industry FE	Yes
Country FE	Yes
Year FE	Yes
SE	Rob.
Observations	1,530
R-squared	0.6839

## References

- Amel-Zadeh, A., Serafeim, G., 2018. Why and how investors use esg information: Evidence from a global survey. *Financial Analysts Journal* 74, 87–103.
- Battiston, S., Mandel, A., Monasterolo, I., Schütze, F., Visentin, G., 2017. A climate stress-test of the financial system. *Nature Climate Change* 7, 283–288.
- Chavagnon, E., Beeching, A., Nuzzo, C., 2017. Shifting perceptions: Esg, credit risk and ratings.
- Chavagnon, E., Beeching, A., Nuzzo, C., 2019. Shifting perceptions: From disconnects to action areas.
- El Ghouli, S., Guedhami, O., Kwok, C. C., Mishra, D. R., 2011. Does corporate social responsibility affect the cost of capital? *Journal of Banking & Finance* 35, 2388–2406.
- Goss, A., Roberts, G. S., 2011. The impact of corporate social responsibility on the cost of bank loans. *Journal of Banking & Finance* 35, 1794–1810.
- Gros, D., Lane, P. R., Langfield, S., Matikainen, S., Pagano, M., Schoenmaker, D., Suarez, J., 2016. Too late, too sudden: Transition to a low-carbon economy and systemic risk. No. 6, Reports of the Advisory Scientific Committee.
- High-Level Expert Group on Sustainable Finance, 2018. Financing a sustainable European economy. E3G.
- Menz, K.-M., 2010. Corporate social responsibility: Is it rewarded by the corporate bond market? a critical note. *Journal of Business Ethics* 96, 117–134.
- Pachauri, R. K., Allen, M. R., Barros, V. R., Broome, J., Cramer, W., Christ, R., Church, J. A., Clarke, L., Dahe, Q., Dasgupta, P., et al., 2014. Climate change 2014: synthesis report. Contribution of Working Groups I, II and III to the fifth assessment report of the Intergovernmental Panel on Climate Change. Intergovernmental Panel on Climate Change.
- Polbennikov, S., Desclée, A., Dynkin, L., Maitra, A., 2016. Esg ratings and performance of corporate bonds. *The Journal of Fixed Income* 26, 21–41.
- Sharfman, M. P., Fernando, C. S., 2008. Environmental risk management and the cost of capital. *Strategic management journal* 29, 569–592.
- Weber, O., Scholz, R. W., Michalik, G., 2010. Incorporating sustainability criteria into credit risk management. *Business strategy and the environment* 19, 39–50.