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The Impact of Corporate Environmental Management on the Cost of Debt Financing: Evidence from Europe, Japan and Australia.

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Abstract:

This study investigates the impact of the corporate environmental management on firms' cost of debt financing. Using environmental scores issued by Thomas Reuters on 138 firms in Europe from 2007 to 2016, I find that environmental performance has a negative relationship with the cost of debt financing. This relationship holds in Europe and for bonds whose maturity is higher than five years. However, the economic significance of this relationship is modest, suggesting that the environmental management has a minor influence on firms' risk. Those results are robust to alternative model specifications and industry membership.

1. Introduction

A recent survey published by the CFA (2017) reveals that 73% of investors take the environmental, social and governance (ESG) factors into account in their investment decisions. Moreover, this survey found that the relevance of each of the three ESG factors has increased between 2015 and 2017. This increased awareness of ESG factors has developed in response to events such as the BP oil spill in 2010 and the Volkswagen Diesel scandal in 2015. These two events clearly demonstrated the influence that environmental performance (EP) can have on firms' stock price and credit ratings. Indeed, the stock price of Volkswagen fell dramatically after admitting the creation of a deception mechanism and issuing a public apology on 18th September 2015. Shortly after this public announcement of wrongdoings, Standard and Poor's downgraded the long-term credit rating of Volkswagen from A to A- and then BBB+ later that year. The strength of the market reaction after the BP oil spill and the Volkswagen scandal implies that the environmental factors are of particular importance. While the effects of the environmental performance (EP) in the equity market have been studied extensively, little is known about its influence in the bond market. This study provides some insight into this relationship.

In this paper, I investigate the relationship between the cost of debt financing and EP in Europe, Australia and Japan. In particular, I examine the conditions under which this relationship holds. I attempt to answer the following questions: Is there a relationship between the cost of debt financing and the EP? How does this relationship change across bond maturities and how does this relationship change across industries and regions? This research is based on the theory that EP can lower reputational, legal and regulatory firms' risks. This lower risk is translated into lower risk premium in the bond market. To answer those questions, I used the environmental scores (ES) provided by Thomas Reuters as proxy for EP. I hypothesize that the firms with higher ES show lower risk and hence risk premium.

Better understanding of the environmental risk could provide investors with further information about their risk exposure and assist them in making investment decision. This could also help managers make decisions about improving their EP as they could better judge whether their environmental investments will bring about financial benefits.

I also include the Social and Governance Score in the analysis. However, it is not the purpose of the paper to give a comprehensive analysis of their relationship with the cost of debt financing. The primary focus of this paper is the EP.

Consistent with the theory, this study documents a statistically significant negative relationship between the cost of debt financing and the environmental management. Firms' commitment and effectiveness towards reducing emissions and firms' ability to create innovative products and innovative way to reduce environmental cost are the two factors leading to a lower cost of debt. However, the results are not economically significant with a maximum reduction of 2.27 basis point. Furthermore, the study finds that the negative relationship between the cost of debt financing and the EP holds especially for bonds issued in Europe and bonds whose maturity is higher than 5 years. Finally, my analysis did not provide evidence about a consistent stronger relationship in high risk industries. However, the difference in cost of debt between the best environmentally performing firms and the worst ones is higher in high-risk industries.

This paper contributes to the literature in many ways. First, it confirms the existence of a negative relationship between EP and the cost of debt in Europe, whereas most of the studies had been focused in the U.S. (e.g. Schneider, 2010; Bauer and Hann, 2010; Chava, 2014). Second, it provides evidence that EP have incremental explanatory power on the cost of debt financing when controlling for the social and governance performances. Earlier literature describes the relationship between the ESG factors and the cost of debt financing but does not provide a detailed description of the effects of each of the ESG factors on the cost of debt

financing (Goss and Roberts, 2009). Lastly, this paper examines the strength of the relationship across bonds maturity, which has never been previously investigated.

This paper is organized as follows. Section 2 describes the framework and the theory used to explain the relationship between the EP and the cost of debt financing. Section 3 provides a description of the finding of the recent literature on this topic. Section 4 provides background for further hypothesis formulation and formulates hypotheses. Section 5 describes the data sample and the methodology used to test the different hypotheses. Section 6 shows the empirical evidence. Section 7 explains the tests performed to ensure the robustness of the results. Section 8 discusses alternative explanation. Section 9 summarizes the results and discusses the potential limitations.

2. Theory

Firms' cost of debt financing is influenced by the default risk on their bonds. This default risk is the probability that the firms do not pay back entirely the principal or the interests on a bond and mainly depends on the uncertainty of their futures activities (Orlitzky and Benjamin, 2001). Therefore, the EP can influence firms' cost of debt financing if it influences their default risk.

Sharfman and Fernando (2008) argue that EP affects the riskiness of firms in different ways. First, firms have an environmental liability, damages to the environment caused by a firm can give rise to substantial clean-up costs, increasing tail risk (Husted, 2005). Second, EP also influences the reputational risk. Customers and investors can turn away from a brand due to firms' involvement in environmentally irresponsible practice (Garber and Hammitt, 1998). Third, regulatory risk is also impacted by EP as firms have to make investment to comply to new regulation (Testa, Iraldo, Frey, 2011). By mitigating clean-up cost, reputational and regulatory risks, the EP decreases the risk premium paid on bonds.

Prior literature already investigated the relationship between those risk and the cost of debt. Barth and McNichols (1994) found that environmental liabilities, which is a clean-up cost risk, have incremental explanatory power to recognized liabilities and assets in determining the equity value of a firm and Graham and Maher (2006) reports that both bond yields and ratings are influenced by firm's potential environmental liability. Other studies also found that debt market takes into consideration the potential impact of the environmental liability on borrowers' solvency (Pitchford, 2001; Boyer and Laffont, 1995; Heyes, 1996; Kroszner and Strahan, 2001). Regarding the reputation risk, Albuquerque, Durnev and Koskinen (2014) found that firms with better CSR performances show lower risk due to a higher customer loyalty. The literature is sparser when it comes to the regulatory risk as it is difficult to measure.

To conclude, I explain the negative relationship between the cost of debt financing and the EP through lower risks. Indeed, firms with strong EP will have lower clean-up cost, reputational and regulatory risks, leading to lower default risks and hence to lower risk premium on their bonds.

3. Recent literature

Previous studies on the relationship between environmental management and the cost of debt financing mainly proxied environmental management using two databases: The Toxic Release Inventory (TRI), which requires firms to release toxic chemicals above a certain threshold, and Kinder, Lydenberg, Domini & Co., Inc (KLD), a financial advisor providing social screening of firms to clients through its reports and socially screened mutual funds.

Using the KLD database to screen firms showing concerns in terms of hazardous chemical, substantial emissions, and climate change, Chava (2014) shows that firms with these environmental concerns are charged a higher interest rate on bank loans and have lower institutional ownership in the United States. He found that a firm with environmental

concerns in all categories of the KLD database pays 25 basis point more per annum than a firm that has no environmental concerns. Goss and Roberts (2009) also uses the KLD database to examine the relationship between CSR performance and a sample of bank loans to U.S. firms. They found a 5 to 11 basis points lower risk premium for best CSR performer but argue that the difference is not economically significant. Bauer and Hann (2010) investigate the relationship between the credit risk and firms' environmental management using the KLD database. They find that in the US market, EP is negatively related to cost of debt and positively related to credit rating. Moreover, they find that this relationship has strengthened over the last decade. They report a maximum reduction of 64 basis points per annum. Schneider (2010) uses the Toxic Release Inventory (TRI) to assess firms' environmental management in the pulp and paper or chemicals industry in the United States. He finds respectively a 10.98 and 11.34 basis points increase per pound of toxic chemicals released for the pulp and paper and chemical industries, with an average of 2.86 pounds of toxic chemicals releases. However, TRI data had been criticized for, among other things, inaccuracy in firm reporting (Toffel and Marshall, 2004). Sharfman and Fernando (2008), on the other hand, investigated the relationship between the firms' EP and weighted average cost of capital in the US market using both TRI and KLD database and found a 5-basis point increase in the firms' cost of debt financing with better environmental risk management. However, they attribute this increase to an increase in leverage.

In addition to these two datasets, Chen and Gao (2012) use carbon emission rates from the Emissions and Generation Resource Integrated Database (EGRID), issued by the Environmental Protection Agency, to test whether corporate climate risk was priced in the capital markets for the U.S. electric company. They conclude that the cost of equity and the cost of debt increases with the level of exposure to climate risk.

The literature is sparse when it comes to the relationship between the environmental management and the cost of debt financing outside the United States. Clarkson et al (2014) uses a voluntary Carbon Emissions survey to test the relationship between firms' exposure to carbon-related risk and cost of debt in Australia. They find a 73 basis point increase in the cost of debt per 1 standard deviation increase in the carbon-related risk.

Other studies also observe that the Chinese financial market reacts weakly on environmental news (Xu, Zeng and Tam, 2011). Using the Asset4 database, Feng et al (2015) found a decrease in the cost of equity for firms with better CSR management in North America, Europe and Africa. However, there was no such relationship in Asia.

To conclude, most of the previous literature has found a negative relationship between the cost of debt financing and the EP in the United States. However, mixed results have been found outside of the U.S., indicating that the strength relationship depends on the region in question.

4. Hypothesis Development

Building on the previous literature, this section formulates hypothesis about the relationship between EP and the cost of debt financing. If these hypotheses are true empirically, there is a relationship between the two factors. Moreover, testing these hypotheses will also prove that EP influences the cost of debt by reducing firms' riskiness.

4.1. Environmental management

As explained in the previous section, firms with strong EP will have lower clean-up cost, reputational and regulatory risks, leading to lower default risks and hence to lower risk premium on their bonds.

"Hypothesis 1: Firms with better EP will incur a lower cost of debt financing".

4.2. Time to maturity

Earlier literature has already shown that the time to maturity has a positive relationship with the cost of debt financing (Chava, 2014; Bauer and Hann, 2010). The concern here is different; I will be examining the relationship between the cost of debt financing and the environmental factors across bonds time to maturity.

Bonds with longer time to maturity present higher interest and business risk (Chen et al., 2007). In particular, the longer the maturity, the higher the probability of environmental scandals. Therefore, reducing those risks should therefore be more beneficial for bonds with higher maturity.

"Hypothesis 2: The negative relationship between EP and the cost of debt financing is stronger for bonds with a longer maturity."

4.3. High-risk Industries

Barth and McNichols (1994) found that firms listed as potentially responsible parties for Superfund liabilities had an implicit environmental liability, which they concluded was incremental to the one already existing in the balance sheet. The literature also found that those firms had lower bonds ratings and higher yields. (Graham, Maher, and Northcut ,2001; Graham and Maher, 2006). There is therefore a misreported environmental liability that influences the bond yield and rating. As practices and environmental risk vary across industries, the misreported environmental liability may also differ across industries.

Another possible source of differences across industries is legislation. Schneider (2010) suggested that some industries were more affected than other by the Toxic Release Inventory. In particular, he found that the cost of debt of firms operating in the chemicals and pulp and paper industries was influenced by the EP. Bauer and Hann (2010) also found that firm in the pulp and paper industry were penalized at a higher rate for environmental concerns.

"Hypothesis 3: Firms in certain industries will show a stronger relationship between environmental management and the cost of debt financing".

5. Methodology

5.1. ESG Performance Data

I extracted the ESG scores from Thomas Reuteurs Eikon ESG Database. Eikon is a software launched in 2010 giving access to several databases from Thomas Reuters, including bonds, equity and ESG data. Thomas Reuteurs is a firm that provides intelligence, technology and human expertise to professionals in the financial market. Their ESG database covers over 6000 public companies all over the world. Thomas Reuters has data on environmental, social and governance performances and issues scores each year for each category based on annual reports, company websites, NGO websites, stock exchange filings, CSR reports and news sources. The exact definitions of the ESG scores and their decompositions are described in table 1 in the Appendix. Each score ranges from 0 to 100 and is relative to peers in the industry.

5.2. Credit Risk Data

I use two different risk measures to assert the importance of EP for investors in the bond market: the spread between the yield to maturity of bonds and the yield to maturity of the corresponding government bonds of the same maturity and the credit rating of the issuer issued by Standard and Poor's and Moody's.

The spread between the offering yield to maturity of bonds and the yield to maturity of the corresponding government bonds of the same maturity is the first independent variable and proxy for the cost of debt financing. As this cost of debt is a value from the market, the spread represents the premium that investors in the bond market charge to compensate for the default risk of the bond. I use the natural logarithm form due to the positive skewness in the

yield to maturity distribution. (Bauer and Hann, 2010; Chava, 2014; Goss and Roberts, 2009). The second independent variable of this paper is the long-term Bond Issuer credit rating, which takes the value 1 for firms rated AAA, 2 for AA+ and so on.

The necessary information was collected on Thomas Reuters Eikon and Bloomberg. Bloomberg is a private company who provides financial software, data, and media services. Their database covers 35 million instruments across all asset classes traded in more than 330 exchanges. Some screens have been performed in order to obtain to accurate data.

First, only firms whose countries of incorporation were Australia, Japan or in the Europe that traded respectively in the ASX200, Nikkei 225 and EuroStoxx600 were included. Firms operating in financial industries (Banking, life insurance, property and casualty insurance, securities and financial other) were excluded. I focus on corporate bonds with fixed coupons payment and classified as senior or junior unsecured. Finally bonds whose maturity was longer than 50 years were excluded.

After matching the ESG data with the different control variables, there remains 1377 bonds from 138 firms between the 1st January 2010 and the 31st December 2016.

5.3. Control Variables

5.3.1. Financial control variable

This section reviews variables included in order to control for differences in firm characteristics that could also impact the cost of debt financing. This is in line with earlier studies which identify determinants of the cost of debt financing. (Bharath et al., 2008; Gray et al., 2009; Goss and Roberts, 2011; Schneider, 2011; Bauer and Hann, 2010, Ashbaugh-Skaife et al., 2006; Clarkson et al., 2014; Bradley, Chen, Dallas, and Snyderwine, 2008; Bhojraj and Sengupta, 2003; Sharfman and Fernando, 2010; Cremers, Nair, and Wei, 2007; Chen and Gao, 2012). Table 2 in the Appendix summarizes the different control variables and their expected correlation with the cost of debt financing. *Firm_Size* is defined as the

natural logarithm of the value of firms' total asset. Larger firms are likely to have access to more and cheaper debt. Moreover, large firms have a larger equity buffer which decreases their vulnerability to negative shocks (Gebhardt, Lee, and Swaminathan, 2001). Some reputation effects also increase with firm size (Diamond, 1991). Therefore, I expect larger firm to have a lower cost of debt financing. *Leverage* is defined as the ratio of total liabilities on total assets. A higher level of liabilities or debt increases the probability of default. I expect firm with higher leverage to have a higher cost of debt financing. A dummy variable *Loss* that equals one when the firm's net income before extraordinary items is negative in the current and prior year to the issue of the bond is included. As losses and profit tend to be persistent (Hayn, 1995), I expect the coefficient of the variable Loss to be positive. *CapInt*, *IntCov* and *ROA* are respectively defined as the net income before extraordinary items divided by total assets, EBITDA divided by interest expense and the ratio of fixed asset on total asset. Earlier studies have shown that those variables were positively related to the credit ratings of the firms, as they are signs of financial strength (Gray et al., 2009). I expect those variables to have a negative relationship with the cost of debt financing. *VOL* is defined as the natural logarithm of the standard deviation of the returns during the year prior the issue of the bond. Campbell and Taksler (2003) showed that firms with more volatile equity had a higher default probability. I expect *VOL* to show a positive relationship with the cost of debt financing. *M_t_B* corresponds to the ratio of the Market value of equity and the Book value of equity. Firms with higher market-to-book ratio show a higher risk as it represents higher expectation for the future (Pennman, 2006). Therefore, I expect higher market-to-book ratio to lead to higher cost of debt financing. I also included the firms' *5-year Beta* and *Return_t1*, defined as the returns on the stock of the firm in the month prior to the bond issue. As beta is the systematic risk of a firm, a higher beta will imply a higher risk. I predict the sign of the beta coefficient to be positive. *Return_t1* is defined as the returns on the stock of the firm the

month prior to the bond issue. Chava and Purnanandam (2010) argued that the past stock return is a significant predictor of the expected return on the stock. As a stock expected return is positively correlated with its risk, I expect the past returns to have a positive relationship with the cost of debt financing. Lastly, Institutional Ownership has an influence on the cost of capital through a reduction of information asymmetries. (Lev and Nissim, 2003). As institutional investors exert influence on the board and even attend some meetings, they can ensure that managers do not make decisions in their interests instead of the interest of the firm. By reducing the agency cost, institutional investors should therefore lower the external cost of funding. When it comes to the cost of debt however, this relationship might not hold due to wealth transfers between equity and debt (Wang and Zhang, 2009). Therefore, I have no expectations about the coefficient of the institutional ownership variable.

In addition to firm characteristics, I control for bonds characteristic to mitigate potential endogeneity problems. *Issue_Size* corresponds to the amount issued by the firm through the bond. Larger issues are more liquid and thus incur a lower yield spread (Ortiz-Molina, 2006). I therefore expect the effect of *Issue_Size* on cost of debt financing to be negative. *Maturity_Years* is defined as the number of years before the bonds reach their maturity. Chen et al. (2007) argues that bonds with shorter maturity show higher liquidity and hence incur a lower cost of debt financing. Furthermore, the interest-rate risk and business risk is higher with longer maturity bonds. However, Schneider (2011) also argues that bonds with different maturities can attract different investors and then behave differently. Therefore, I have no expectations about the influence of years to maturity on the cost of debt financing. Callable_Dummy and Puttable_Dummy are respectively variables that equal one when the bonds are callable or puttable. I expect the coefficient of *Puttable_Dummy* and *Callable_Dummy* to be respectively negative and positive. *Speculative* is a variable that

equals to one when the bond issuer has a non-investment rating. I expect that the coefficient of *Speculative* to be positive because of lower liquidity.

5.3.2. Social and Governance Performance

Corporate governance is "concerned with the resolution of collective action problems among dispersed investors and the reconciliation of conflicts of interest between various corporate claimholders" (Becht, Bolton and Röell, 2005). Corporate governance broadly defined and its relationship with the cost of debt financing has been the topic of earlier studies (Sengupta, 1998; Anderson et al.,2004; Cremers et al, 2007; Klock et al. 2005, Yu 2005; Bradley et al, 2008; Bhojraj and Sengupta, 2003).

Theoretically, there are two channels through which corporate governance can have an impact on the cost of debt financing: Agency risk and information risk.

Agency risk represents the possibility that management acts in its own interests and make decision that do not maximize shareholder value. This agency cost takes the form of wealth expropriation (Jensen and Meckling 1976), short-term bias (Dechow and Sloan, 1991) and unprofitable investment to increase the size of the firm (Murphy, 1985).

Information risk is the possibility that managers do not disclose information that would increase the probability of default of the bond. Investors are unable to properly assess properly the risk that they are exposed to in buying the bond. Good corporate governance mitigates this risk by requiring firms to disclose all required information when it comes due.

Good corporate governance enables management of information and agency risk, thereby reducing the risk premium of bonds.

Social performance comprises a wide range of factors including workforce satisfaction, workforce diversity and equal opportunities, human rights, public health, citizenship and product quality. Oikonomou et al (2014) suggest that equivalent logic applies for environmental and social performance. Firms with lower social performance presents a

higher risk of social scandal that can trigger damages to reputation. Moreover, new social regulations can increase costs for firms that did not act proactively in that area. Finally, social incidents may lead to substantial legal costs. These higher risks will subsequently translate into a higher risk premium and cost of debt financing.

5.4. Empirical method

In order to test the relationship between the cost of debt and the environmental management, I regress the EP measure of firms on their cost of debt financing. The regressions are as follows:

$$Ln(Spread) = \alpha + \beta * Env.Performance + \delta * Control\ variables + \varepsilon$$

The Ln(Spread) is defined earlier in the paper as the difference between the offering yield to maturity of bonds and the yield to maturity of the corresponding government bonds of the same maturity. I use three different EP measures: The ES, the three decompositions of the ES, and the decomposition of the ES in tercile and quartile.

The analysis using the ES allows to investigate incremental change in the EP. If the coefficient is significant, it means that the market values even small environmental differences across firms. This approach has two weakness. First, the ES is broadly defined and does not allow perception of whether the market values one aspect of the environmental management more than the other. Second, the absence of a significant coefficient does not mean absence of relationship as a change of one in the ES might be too small to be meaningful in the market.

To solve the first weakness, I use the decomposition of the ES (namely Emissions, Innovation and Resource use score) as independent variable. As those scores are more precisely defined, this approach gives more insight about what investors value most as EP. However, the 1-point change might still not be large enough for the market to notice. Therefore, I include the decomposition of the ES in tercile and quartiles as independent

variables. This approach shows the results of larger changes in EP and is therefore more likely to identify a potential relationship.

All the regressions include fixed year and industry effects (4-Digit GICS code) to rule out the influence of a particular year of industry on the cost of debt. Moreover, the robust standard errors are clustered at the firm level to take into account the potential correlation between bonds from the same firm (Abadie et al, 2017).

6. Empirical results

6.1. Descriptive Statistics

All the complete tables can be found in the Appendix. I have only included in the text the important part of the tables necessary for the understanding of this paper.

Summary statistics of the variables are presented in Table 2 (Table 1 is shown in the Appendix). *Spread, Size, Issue Size* and *Volatility* have been transformed to their non-logarithm form for interpretation purposes**.** The credit risk variables are economically significant and similar to previous literature. Table 2 documents an average spread of 168 basis points and an average credit rating of A-/A3. *Spread* also shows a relatively large variation with a Standard Deviation of 180 and a range of 1299.89 basis points. With regards to the credit ratings, the distribution is less volatile with a standard deviation of 2. Furthermore, the credit rating of the sample extends from AA/A2 to D and around 7% of the bonds have a speculative rating. The Beta is very close to 1, indicating that our sample is well diversified and the variance inflation factor (VIF) do not indicate multicollinearity (See Table 3 in Appendix).

Finally, one could notice that the ES average is higher than the social and governance score average while keeping a lower volatility than the two other categories. The range of the ES is also lower than the range of the social and governance score.

Table 2: Descriptive Statistics

This table provides a summary statistic of the dependent and independent variables for a sample of 1377 bonds covering the 2007-2017 period. Spread, Size, Issue Size and Volatility have been transformed back to their non-logarithm form for interpretation purpose. *Spread* is the yield to maturity at issue, defined as the difference between the yield to maturity of bond and the yield to maturity of the corresponding government bonds of the same maturity.

Variable	# Obs.	Mean	Std. Dev.	Min	Max
Environmental Performance					
Environmental Score	1377	76.83	11.52	28.57	96.72
Emissions Score	1377	77.45	16.95	20.37	99.56
Resource use Score	1377	80.81	14.62	14.28	99.79
Innovation Score	1377	72.22	22.23	0.38	99.57
Social Performance					
Social Score	1377	70.33	16.29	17.18	96.31
Workforce Score	1377	76.14	19.17	12.5	99.79
Human Rights Score	1377	65.29	33.38	0	99.57
Community Score	1377	60.67	28.93	2.94	99.79
Product Responsibility	1377	71.29	23.77	4.16	99.74
Governance Performance					
Governance Score	1377	58.68	19.76	10.69	96.85
Management Score	1377	56.48	28.08	1.06	99.63
Shareholders	1377	54.03	29.21	0.35	99.14
CSR strategy	1377	75.21	18.15	0.364	99.75
Credit Risk Variables					
Spread (bp)	1377	168	180	1.1	1300
Credit Rating	1377	7.49	2.01	3	12
Firms Control Variables					
Leverage	1377	0.69	0.12	0.04	1.26
Size (In BM$)	1377	76,2	72,1	1.68	438
Capital Intensity	1377	0,29	0.20	0	1.02
Interest Coverage	1377	19.73	54.10	-188.2	1269.93
ROA	1377	0,32	0.036	-0.16	0.33
Loss	1377	0.023	0.15	0	1
Beta	1377	0.99	0.29	0.23	1.80
Institution Ownership (%)	1377	46.84	19.47	0.095	98.74
Market-to-Book	1377	1,52	5.60	-92.42	29,93
Volatility 1-year prior issue	1349	0.58	0.34		
Return 1-month prior issue	1350	0.007	0.07	-0.26	0.33
Speculative	1377	0.0646	0.249	0	1
Bonds Control variable					
Time to Maturity (in years)	1377	8.29	6.86	0.1111	50
Issue Size (BM$)	1377	1,3	2.4	0.0198	449
Callable	1377	0.087	0.28	0	1
Puttable	1377	0.0007	0.03	0	1
Seniority	1377	0.053	0.224	0	1
Country					
Australia	1377	0.024	0.15	0	1
Japan	1377	0.39	0.49	0	1
Europe	1377	0.58	0.49	0	1

6.2. The cost of debt and the environmental management

This section examines the general relationship between the cost of debt financing and the EP using the model outlined in the methodology section.

First, this paper looks at the ESG combined score to see if those scores have any power in predicting the cost of debt financing. The first regression of Table 3 indicates that this is not the case. This could be due to an absence of correlation between the variables or because the three ESG factors put together blur the relationship.

In order to test which possibility prevails, Column 2 presents the regression between the each ESG factors separately and the cost of debt financing. One could observe that only the coefficient of the ES is statistically significant, indicating a negative relationship between the two variables. On average, one-point increase in the ES decreases the cost of debt financing by 0.0199%. Using the mean *Spread* as reference, that corresponds to less than one basis point decrease on the spread paid. As the ES ranges from 28.57 to 96.72, the maximum effect corresponds to a 1,356% reduction or 2.27 basis point reduction. This effect is modest and comparable to the reduction in cost of debt financing found by Goss and Roberts (2009). Surprisingly, the social and governance performances are not significant even though their coefficients have the predicted sign.

Once again, I divided the ESG factors into their subsections in order to understand which parts carry the relationship. Regression (3) shows that the Innovation and Emissions performance drive the ES coefficient significantly. A possible explanation is that Greenhouse gas emissions have been a long-known environmental concern, the database about firms' emissions are easily accessible and give a simple picture of the pollution emitted by the firm**.** The Innovation score importance can be related to the proactive environmental practice. Indeed, by innovating continuously, firms can gain competitive advantage and increase firm performance (Torusga et al, 2013). Furthermore, this decomposition shows further that

governance and social performance do not influence the cost of debt. Even though only the ES seems to be correlated with the cost of debt financing even for a 1-point score change, this might not be the case for larger differences in scores.

Table 3: Relationship between EP and the cost of debt

This table summarizes the relationship between firms' environmental management and the cost of debt financing. I regress the logarithm of the spread between the yield maturity of a bond and the corresponding government rate of the same maturity on the environmental management measure and an array of control variables. All models include year and industry fixed effects. The robust Standard Errors are cluster at the firm level. (1) uses the ESG combined scores. (2) uses the decomposition of the ESG combined scores. (3) uses the decomposition of the each ESG scores. (4) sorts the firms in terciles according to their ESG scores. (5) sorts the firms in quartiles according to ESG scores. P-value are reported in the parenthesis below the coefficient. P-value are reported in the parenthesis below the coefficient. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

	(1) LnSpread	(2) LnSpread	(3) LnSpread	(4) LnSpread	(5) LnSpread
ESGCombinedSc	-0.0000655				
	(0.184)				
Environmental_Sc		-0.000199***			
		(0.002)			
Social_Score		-0.0000261			
		(0.683)			
Governance_Sc		-0.0000365			
		(0.301)			
Emissions_Score			-0.0000812*		
			(0.066)		
Innovation_Scor			-0.000107***		
			(0.004)		
Resourceuse_Sc			0.00000490		
			(0.932)		
Workforce_Scor			-0.0000232		
			(0.581)		
HumanRights_S			0.00000295		
			(0.895)		
Community_Sc			-0.0000370		
			(0.233)		
ProductResp_Sc			0.0000295		
			(0.324)		
Management_Sc			-0.0000131		
			(0.688)		
Shareholders_Sc			-0.0000113		
			(0.724)		
CSRStrategy_Sc			-0.0000224		
			(0.581)		
Env_Ter2				-0.00242	
				(0.119)	
Env_Ter3				-0.00387**	
				(0.031)	
Soc_Ter2				-0.00177	
				(0.340)	
Soc_Ter3				-0.000865	
				(0.721)	
Gov_Ter2				-0.00357**	
				(0.027)	
Gov_Ter3				-0.00281*	
				(0.081)	
Env_Quart2					-0.00128
					(0.557)

Env_Quart3					-0.00548***
					(0.004)
Env_Quart4					-0.00674***
					(0.001)
Soc_Quart2					-0.00104
					(0.558)
Soc_Quart3					-0.00292
					(0.242)
Soc_Quart4					-0.0000220
					(0.994)
Gov_Quart2					-0.00380*
					(0.052)
Gov_Quart3					-0.00227
					(0.255)
Gov_Quart4					-0.00247
					(0.217)
Maturity_Years	0.000844***	0.000820***	0.000814***	0.000835***	0.000826***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Issue_Size	0.000156	0.000103	0.0000883	0.000151	0.0000245
	(0.859)	(0.907)	(0.916)	(0.863)	(0.977)
Callable_Dumm	0.00716*	0.00718*	0.00749*	0.00752*	0.00699*
	(0.076)	(0.071)	(0.055)	(0.060)	(0.081)
	(0.801)	(0.766)	(0.484)	(0.798)	(0.714)
Putable_Dummy	0.0198	0.0201*	0.0199*	0.0197*	0.0220*
	(0.106)	(0.086)	(0.076)	(0.089)	(0.059)
Speculative	0.0142***	0.0121***	0.0124***	0.0128***	0.0107***
	(0.004)	(0.009)	(0.005)	(0.003)	(0.009)
Firm_Size	0.00336***	0.00411***	0.00411***	0.00391***	0.00396***
	(0.006)	(0.003)	(0.002)	(0.003)	(0.003)
Credit_Rating	0.00221***	0.00216***	0.00224***	0.00220***	0.00233***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Lev	-0.00147	-0.00163	-0.00361	-0.00245	-0.00258
	(0.854)	(0.840)	(0.663)	(0.759)	(0.754)
CapInt	0.00356	0.00289	0.00184	0.00257	0.00379
	(0.358)	(0.498)	(0.679)	(0.518)	(0.402)
Loss	0.00782**	0.00783**	0.00737**	0.00725**	0.00739**
	(0.033)	(0.030)	(0.041)	(0.047)	(0.046)
ROA	0.0316	0.0299	0.0268	0.0266	0.0245
	(0.185)	(0.192)	(0.244)	(0.245)	(0.265)
IntCov	0.00000335	0.00000472	0.0000037	0.00000682	0.00000649
	(0.581)	(0.434)	(0.522)	(0.288)	(0.304)
VOL	0.00259	0.00308	0.00326	0.00358	0.00281
	(0.446)	(0.331)	(0.257)	(0.239)	(0.338)
M_t_B	-0.000173*	-0.000170*	-0.000163	-0.000209**	-0.000197**
	(0.054)	(0.070)	(0.136)	(0.027)	(0.037)
Return_t1	0.00154	0.000152	0.000513	0.000567	-0.000331
	(0.814)	(0.981)	(0.931)	(0.929)	(0.960)
Beta	-0.00655*	-0.00465	-0.00457	-0.00582	-0.00457
	(0.098)	(0.219)	(0.244)	(0.130)	(0.210)
Inst_Own_Per	0.0000415	0.0000549*	0.0000515*	0.0000529*	0.0000723**
	(0.187)	(0.065)	(0.090)	(0.088)	(0.018)
Australia	0.0422***	0.0442***	0.0439***	0.0450***	0.0440***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Europe	0.00364	0.00414	0.00422	0.00431	0.00310
	(0.18)	(0.419)	(0.264)	(0.150)	(0.410)
_cons	-0.0773**	-0.0787**	-0.0775**	-0.0849***	-0.0868***
	(0.026)	(0.015)	(0.017)	(0.009)	(0.008)
R^2	0.375	0.387	0.394	0.388	0.401
N	1348	1348	1348	1348	1348

In order to verify the evolution of the relationship as the difference in scores increases, Regression (4) and (5) uses dummy variables that take the value 1 when the bond issuer belongs in the corresponding tercile or quartile respectively. Tercile and Quartile 1, the base in this regression, are the worst environmentally performing firms. The benefit from higher EP seems to be concentrated at the upper level of the distribution. Indeed, bonds whose issuers have an ES in the highest tercile pay on average 0.387% less for their debt financing than the one at the lowest tercile. While social scores do not show relationship with the cost of debt financing, firms with better governance performance pay less on their debt than those at the bottom of the governance score distribution. However, this effect disappears somewhat with quartiles decomposition.

Regarding the general validity of the model, the R-squared of about 40% is lower than in the literature but still satisfying for such a diversified sample (See Chava (2014) and Bauer and Hann (2010) for comparison) and most of control variables show the predicted sign. Time to Maturity appears to have a positive correlation with the risk premium, which could be a sign of lower liquidity and higher interest and business risk for longer maturities bonds. The natural logarithm of the asset value *Firm size* shows a positive relationship with the cost of debt financing, contrary to what was expected. A 1% increase in the size of the assets increases the spread by around 0,004%. A possible explanation for this counter-intuitive result is that bigger firms take on more leverage in this sample. *Loss, Speculative, Credit_Rating and Putable_Dummy* all have a positive influence on the *Spread* as expected. The institutional Ownership has a positive relationship with the cost of debt financing when decomposing the ESG performances in quartiles. However, this relationship is not economically significant as one additional percent in the Institutional Ownership increases by 0.007% the cost of debt financing (the whole range does not even reach 0.1% increase). The same logic goes for the Market-to-Book ratio. Australia shows a higher level of *Spread*, which could also be explained

by the relative small size of the Australian bonds sample or the more illiquid character of the bond market in Australia.

To conclude, Table 3 supports hypothesis 1. ES has incremental power to explain the cost of debt financing when controlling for firms characteristic and social and governance performance. Furthermore, most of the relationship is carried by the Emissions and the Innovation score. Table 3 also indicates that most of the benefit are concentrated in the upper half of the ES distribution. However, the magnitude of the spread reduction is probably not economically significant.

6.3. The cost of debt and the environmental management across different maturities

The previous sections showed that there is a relationship between the cost of debt and the EP on the whole sample. However, this paper also argues that the relationship between the cost of debt financing and the EP is stronger for bonds with longer maturity due to the clean-up costs, reputational loss, regulatory pressures and the potential risk of climate change. In order to investigate this hypothesis, the dataset has been divided into 4 sub-datasets: (1) Bonds with a maturity of less than 3 years, (2) bonds with a maturity between 3 and 5 years, (3) bonds with a maturity between 5 and 10 years and (4) bonds with maturity longer than 10 years.

First, I investigate the general relation between the cost of debt financing and the ESG combined score across bonds maturity in Table 4. This table gives little support for hypothesis 2. Although the relationship between ESG and cost of debt financing becomes more negative as maturities increase, the coefficients for bonds with time to maturity higher than 3 years are not significant and the coefficient for bonds with a maturity lower than 3 years is positive. As in the previous section, possible interaction between the components of the ESG combined score could blur the relationship.

Table 4, 5, 6 and 7: Relationship between EP and the cost of debt across maturities
This table summarizes the relationship between firms' environmental management and the cost of debt financing across maturities. I regress the logarithm of the spread between the yield maturity of a bond and the corresponding government rate of the same maturity on the environmental management measure and an array of control variables. All models include year and industry fixed effects. The robust Standard Errors are cluster at the firm level. This table uses the ESG combined scores. The dataset has been divided into 4 sub-datasets: (1) Bonds with a maturity of lES than 3 years, (2) bonds with a maturity between 3 and 5 years, (3) bonds with a maturity between 5 and 10 years and (4) bonds with maturity longer than 10 years. P-value are reported in the parenthesis below the coefficient. The control variables are not displayed.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

	(1)	(2)	(3)	(4)
	LnSpread	LnSpread	LnSpread	LnSpread
ESGCombined	0.000180***	-0.000109	-0.0000290	-0.000133
	(0.009)	(0.386)	(0.612)	(0.109)
R^2	0.835	0.600	0.489	0.354
N	218	120	551	459
Environmental_Score	-0.0000286	0.0000869	-0.000312***	-0.000185**
	(0.812)	(0.669)	(0.001)	(0.023)
Social_Score	-0.00000975	-0.0000274	0.0000293	-0.0000771
	(0.915)	(0.834)	(0.568)	(0.389)
Governance_Score	-0.0000459	-0.0000128	0.0000435	-0.000162**
	(0.315)	(0.902)	(0.300)	(0.018)
R^2	0.814	0.598	0.519	0.375
N	218	120	551	459
Emissions_Score	0.000112	0.000125	-0.000147***	-0.0000796
	(0.175)	(0.284)	(0.004)	(0.325)
Innovation_Score	-0.0000978	-0.0000616	-0.000145***	-0.0000471
	(0.261)	(0.597)	(0.006)	(0.150)
Resourceuse_Score	-0.000127	0.0000548	0.00000754	-0.0000815
	(0.240)	(0.730)	(0.888)	(0.270)
R^2	0.857	0.629	0.531	0.382
N	218	120	551	459
Env_Ter2	0.00237	0.00449	-0.00431**	-0.00555***
	(0.281)	(0.236)	(0.039)	(0.001)
Env_Ter3	0.00444	-0.0000649	-0.00657**	-0.00404*
	(0.172)	(0.987)	(0.022)	(0.086)
Soc_Ter2	0.00164	0.00491	0.000565	-0.00555**
	(0.732)	(0.224)	(0.754)	(0.012)
Soc_Ter3	0.000393	-0.00134	0.000183	-0.000162
	(0.939)	(0.822)	(0.925)	(0.959)
Gov_Ter2	0.00375	0.00249	-0.000319	-0.00787***
	(0.139)	(0.588)	(0.850)	(0.001)
Gov_Ter3	-0.00408	0.000171	0.00105	-0.00762***
	(0.363)	(0.975)	(0.620)	(0.006)
R^2	0.859	0.626	0.506	0.405
N	218	120	551	459

Table 4 confirms this hypothesis; the decomposition in separate ESG factors reveal the predicted pattern. As expected, there is no significant relationship between the environmental factor and the cost of debt financing for bonds with lower maturity (less than 5 years) while

the relationship becomes negative and significant for higher maturity bonds. The environmental risk seems to be priced only for longer than 5 years bonds maturity. The relationship is weaker for bonds with a maturity higher than 10 years, possibly indicating that the pricing of the environmental factor becomes more difficult for very long-term bonds. However, those results are still not impressive economically speaking. Another important feature of this table is the negative relationship between cost of debt financing and the governance performance for bonds longer than 10 years. A possible explanation is that investors think governance performance only brings benefit in the long-run.

Moreover, Table 6 confirms that this relationship is carried by the Emissions and Innovation performance as in the previous section even though the relationship fades for bonds with a maturity longer than 10 years. No other score is significant at a 5% level. Interestingly, by decomposing the data into tercile, Table 7 reveals that the hypothesis 2 actually works for the three ESG factors. For bonds with a maturity longer than 10 years, the upper and middle tercile of the ESG factors distribution pay less for their debt financing than the lower tercile. However, the EP is the only factor whose relationship with the cost of debt financing also holds for bonds with a maturity between 5 and 10 years. Once again, investors seem to think that the ESG factors are only important in the long-run.

Finally, the general validity of the models appears to be good with r-squared between around 35% and 80%. A feature shared by the 4 tables is the progressive decrease in r-squared as the bond maturities increases. This makes sense as the uncertainty about the risk and value of the bonds increase as maturity increases; the variables have a lesser power to explain its variation around the mean. Another interesting feature is the positive relationship between the cost of debt financing and the institutional ownership for bonds with maturity longer than 10 years. As explained earlier, by reducing the information asymmetries and agency costs, institutional ownership can reduce the cost of capital but wealth transfer

between equity and debt holder might lead to mixed results. Those results seem to indicate that bond markets believe that institutional investors have a long-term negative effect.

Even though the results look convincing, one could argue that the lack of significance stems from the lower number of observations for bonds belonging in the 0 to 3 years and 3 to 5 years maturity category. However, merging those two categories to have a comparable number of observations (as in the other categories) does not lead to different result, as could have been expected by the opposite sign of the coefficients in regression (1) and (2) in most tables.

To conclude, this section provides support for hypothesis 2. The negative relationship between the EP and the cost of debt financing is stronger for bonds with more than 5 years maturity. Moreover, the relationship is also present at the upper level of the ESG score distribution for the three ESG factors. This may indicate that investors consider ESG factors as a long-term risk reducer.

6.4. Relationship between environmental management across Industries

Earlier literature has shown that some industries might have a higher sensitivity to environmental factors (Cormier and Magnan,1997; Schneider, 2010; Bauer and Hann, 2010). However, firms in my sample have GICS classification while the industries risk classification has been performed using SIC. Therefore, I follow Bhojraj, Lee and Oler (2003) to translate SIC-2digits classification into GICS. Using Bauer and Hann (2010) classification, High_Risk is defined as a variable that takes the value one if the bonds issuer operates in one of the following industries: paper and allied products (SIC:2600; GICS: 151050), chemicals and allied products (SIC: 2800, 5160, 5161, 5169; GICS:151010, 351020), petroleum refining (SIC: 2910, 2911, 2900; GICS: 101020), primary metal (SIC: 3300; GICS : 151040), and mining (SIC: 1000, 1200; GICS: 151040).

As in the previous sections, I first investigate if the ESG factors combined have an influence on the cost of debt financing by decomposing the dataset. It can be observed from the first two regressions in table 8 that both risky and non-risky firms show a negative relationship between the cost of debt financing and the ESG scores combined but the risky industries show a stronger relationship However, regressions (3) and (4) show that those results are not robust when decomposing the ESG factors. Indeed, the EP is not statistically significant. There could be no additional explanatory power due to industry specifics risk in Europe, Japan and Australia. One possible explanation is the difference of legislation between the U.S., Europe, Japan and Australia. Indeed, Schneider (2010) based his industry identification on the fact that the U.S. introduces the Toxic Release Inventory which allows clear identification of the largest polluting facilities. Another explanation is the heterogeneity among risky industries blurred the results (Cormier and Magnan,1997; Schneider, 2010). This absence of relationship could also come from a lack of data. Another data decomposition could help prove the existence of a relationship or not. Therefore, I used terciles in regression (5) and (6) to further investigate the data sample. The regressions reveal that the higher part of the ES distribution pay less for its debt financing in both high-risk and non high-risk industry. However, this effect is stronger in the case of high-risk industry, giving some support to the hypothesis 3.

To conclude, table 8 does not confirm entirely hypothesis 3. There is no significant relationship between the cost of debt financing and the environmental management for one-point score change. However, the best environmentally performing firms pay less than the worst environmentally performing firms within risky industry. This effect exists as well for non-risky industry but is less strong. This pattern seems to indicate that there is more reward for having better environmental management in risky industries, but improvement is not

valued incrementally. Another point that could blur the relationship is the lack of data for risky industries.

Table 8: Relationship between EP and the cost of debt across industries
This table summarizes the relationship between firms' environmental management and the cost of debt financing across industries. I regress the logarithm of the spread between the yield maturity of a bond and the corresponding government rate of the same maturity on the environmental management measure and an array of control variables. All models include year and industry fixed effects. The robust Standard Errors are cluster at the firm level. (1), (3) and (5) use risky industries data while (2), (4) and (6) use the other industries data. P-value are reported in the parenthesis below the coefficient. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	(1) LnSpread	(2) LnSpread	(3) LnSpread	(4) LnSpread	(5) LnSpread	(6) LnSpread
ESGCombined	-0.00022**	-0.000086*				
	(0.021)	(0.091)				
Environmental_Sc			-0.000153	-0.00018**		
			(0.293)	(0.010)		
Social_Score			0.0000163	-0.0000301		
			(0.838)	(0.660)		
Governance_Score			0.0000032	-0.000065*		
			(0.970)	(0.066)		
Env_Ter2					0.00196	-0.00408**
					(0.300)	(0.017)
Env_Ter3					-0.00748**	-0.00408**
					(0.014)	(0.041)
Soc_Ter2					-0.00292	-0.00160
					(0.248)	(0.375)
Soc_Ter3					-0.00373	0.000307
					(0.275)	(0.898)
Gov_Ter2					0.00454	-0.00424***
					(0.207)	(0.010)
Gov_Ter3					-0.000457	-0.00414***
					(0.868)	(0.007)
R^2	0.827	0.380	0.812	0.392	0.839	0.398
N	168	1182	168	1182	168	1182

7. Robustness checks

The complete version of this section can be found in the Appendix. I present herein the results of the robustness checks as well as their purpose. First, the relationship between the cost of debt and the EP only exists in Europe. No sign of this relationship has been found in Japan. Dividing the sample according to country of incorporation or country of issue leads to the same results.

Second, if the ES influences the firms' risk, it should also influence firms' credit rating. This paper does not find evidence of such influence. There are two possible

explanations for this phenomenon: the EP does not influence the cost of debt through risk or the Credit Rating agencies do not take the EP fully into account.

Third, I examined the significance of each ESG factors. Their correlation is relatively large, indicating that not including any one the ESG factor could lead to bias. Moreover, the environmental and governance score has an impact of the bond yields. The social score does not have such impact. However, due to its correlation with the other ESG factors, its inclusion in the analysis is critical.

Fourth, Schneider (2010) stated that, as firms' credit rating goes up, the importance of the EP in the bond pricing goes down. This paper finds the opposite. This effect is related to earlier findings of this paper. EP might not be fully considered by Credit Rating agencies.

Fifth, the results are robust to the inclusion of the ES from the year before and after the bond issue. This means that investors are using timely information in their bonds pricing. Moreover, this rule out the possibility of a reverse direction in the relationship. Indeed, if cheaper debt influenced the environmental management through easier access to capital, there would be a negative relationship between the cost of debt in the current period and the ES in the future period.

Sixth, to rule out endogeneity, I have performed a matched firm approach using the propensity score and Mahalanobis distance. I have also included firm fixed effect in the analysis. The results are robust to those different methodologies.

Seventh, I document decreasing returns to environmental scores with respect to the reduction of cost of debt. Only the first tercile of the environmental scores demonstrated a significant relationship.

Lastly, clustering the standard errors at the industry or the sector level does not alter the results. The results are also robust to the exclusion of year and industry fixed effect.

8. Discussion

The robustness checks have ruled out potential bias of this study. However, some alternatives theory could still explain or spur the results.

First, the ESG scores are issued once a year. Variations in the EP during the year is therefore not embedded in the scores. Moreover, how accurately the scores describe the ESG performance of the firm probably depends on the time difference between the ESG score update and the bond issue. The inaccuracies in reflecting the real ESG performance of the firms can spur the results. Second, this paper did not differentiate between intra-firm effect and sample effect. Indeed, there might be some difference between an improvement of the environmental factors at firm-level and at sample level. Third, investors may not be interested in the country of incorporation or country of bond issue but rather in the country from where the firm has most of its activities or revenues. If this is the case, the classification between Japan and Europe is biased and the results are not valid. Fourth, firms issuing bonds with different maturities may show differences. Those differences could influence the relationship between the cost of debt financing and the ES, spurring the results for hypothesis 2. Finally, there could also be an omitted variable bias even though the robustness checks tend to confirm that this is not the case.

9. Conclusion

This paper presents detailed evidence of a negative relationship between the cost of debt and EP. Basing the research on the hypothesis that EP reduces clean-up costs, reputation and regulatory risks, I regress the ES issued by Thomas Reuters on the cost of debt financing.

First, I found a robust negative relationship between ES and the bond spread. This relationship is robust to estimation method, firm-fixed effect and the inclusion of past and future ES. However, the size of the effect is modest with a maximum reduction of 2.27 basis point. Those results are similar to those found by Goss and Roberts (2009). Second, this

relationship is stronger for longer maturities. In particular, the correlation could be observed only for bonds with a maturity longer than 5 years. This is explained by a larger environmental risk for longer maturity. Third, the relationship is not necessarily stronger in industries with environmental high-risk. However, the difference in Spread between the upper quartile and the lower quartile of the ES distribution is higher in those industries, suggesting that the market only values EP at its best. Fourth, the relationship between the cost of debt and EP only holds in Europe. This could come from difference in investors behaviour, legislation or difference in bond market. Finally, the relationship between the EP and the credit risk has not been confirmed. There is no particular relationship between the credit rating and the ES.

Those results have managerial implications. Investments to improve the EP of a firm can lead to a decrease in cost of debt – albeit they are modest. This is especially true if the firm issues long-term maturity bonds in Europe. Moreover, it only has a positive impact on credit rating for firms with a rating of BB+ or lower. Lastly, only the best quartile sees significant results in risky industries. By acknowledging those findings, managers can build a strategy to reduce firms' cost of debt and ease their access to capital.

There are still a lot of unknowns about the relationship between the cost of debt and the environmental factors. Further studies should explore this relationship in other geographical areas. Emerging countries are particularly interesting in this regard as they show a higher level of risk. Other ESG scores could also be used. This would test if the results are robust to a different database. Finally, little is known about the impact of the EP on the cost of debt for smaller companies. Deeper understanding of the strength of the relationship in those contexts would help generate a generalization of the theory.

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11. Annexe

11.1. Appendix

Table 1
This table summarizes the definition of the different ESG factors issued by Thomas Reuters. The first column indicates the category of the ESG score. The second column indicates the name of the score while the third reports their definition. The last column represents the percentages of the ESG score in the total ESG combined score.

Category	Score	Variable	%
ES	Resource use Score	The 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.	11%
	Emissions Score	The Emission Reduction Score measures a company's commitment and effectiveness towards reducing environmental emission in the production and operational processes.	12%
	Innovation Score	The Innovation Score reflects a company's capacity to reduce the environmental costs and burdens for its customers, thereby creating new market opportunities through new environmental technologies and processes or eco-designed products	11%
Social Score	Workforce Score	The Workforce Score measures a company's effectiveness towards job satisfaction, a healthy and safe workplace, maintaining diversity and equal opportunities, and development opportunities for its workforce.	16%
	Human Rights Score	The Human Rights score measures a company's effectiveness towards respecting the fundamental human rights conventions.	4.5%
	Community Score	The Community Score measures the company's commitment towards being a good citizen, protecting public health and respecting business ethics.	8%
	Product Responsibility Score	The 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.	7%
Governance Score	Management Score	The Management Score measures a company's commitment and effectiveness towards following best practice corporate governance principles	19%
	Shareholders Score	The Shareholders Score measures a company's effectiveness towards equal treatment of shareholders and the use of anti-takeover devices.	7%
	CSR Strategy Score	The 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.	4.5%
ESG combined Score			100%

Table 2

This table documents the different abbreviation of the variables used in the analysis, their descriptions and the expected correlation with the cost of debt financing. The ESG scores definitions are in Table 1.

Abbreviation	Description	Expected Coefficient Sign
ESG Performance Variables		
Env_Ter3/Env_Quart4	Tercile/Quartile regrouping the best environmentally performing firms. The worst being in Env_Ter1/Env_Quart1	-
Soc_Ter3/Soc_Quart4	Tercile/Quartile regrouping the best socially performing firms. The worst being in Env_Ter1/Env_Quart1	-
Gov_Ter3/Gov_Quart4	Tercile/Quartile regrouping the worst environmentally performing firms. The best being in Env_Ter4/Env_Quart4	-
Control Variables		
Maturity_Years	Time to maturity in years	?
Issue_Size	Amount issued by the firm through the bond	-
Callable_Dummy	Equal to 1 when the bond is callable	+
Seniority_Dummy	Equal to 1 when the bond is Senior Unsecured	-
Puttable_Dummy	Equal to 1 when the bond is puttable	-
Speculative	Equal to 1 when the rating of the bond issuer is lower than BBB- or Baa	+
Firm_Size	Natural logarithm of the asset of the firm	-
Lev	Leverage, ratio of total liabilities on total assets	+
CapInt	Capital intensity, ratio of fixed asset on total assets	-
Loss	Equal to 1 when the firm has negative net profit in either of the past two years	+
ROA	Return on Assets, net income before extraordinary items divided by total assets	-
IntCov	Interest Coverage, EBITDA divided by interest expense	-
VOL	Natural logarithm of the standard deviation of the returns during the year prior the issue of the bond.	+
M_t_B	Market value of equity divided by Book value of equity	+
Return_t1	Returns on the stock of the firm the month before the bond issue	+
Beta	Firm's beta calculated on 5-year historical data	+
Inst_Per_Own	Percentage of institutional ownership of the bond issuer	?

Table 3 This table summarizes the Variance Inflation Analysis for each variable.		
Variable	VIF	1/VIF
Europe	5.74	0.174221
Issue_Size	4.45	0.224796
Firm_Size	3.17	0.315318
Credit_Rat~g	3.09	0.323713
Beta	2.89	0.345668
Social_Score	2.41	0.414984
VOL	2.37	0.421418
Seniority_~y	2.20	0.454794
ROA	2.12	0.472642
Speculative	1.93	0.519148
Lev	1.84	0.542627
CapInt	1.60	0.624351
Governance~e	1.54	0.649388
Inst_Own_Per	1.47	0.678134
Maturity_Y~s	1.43	0.701457
Callable_D~y	1.42	0.705191
Environmen~e	1.42	0.705245
M_t_B	1.32	0.756749
Loss	1.24	0.803988
IntCov	1.23	0.816215
Return_t1	1.09	0.921160
Mean VIF	2.19	

11.2. Complete Robustness checks

11.2.1. Regions

If investors in different countries have different awareness of the importance of environmental management, the relationship between the cost of debt financing and the environmental management could differ from country to country. Xu et al. (2011) found that a negative environmental event has a weaker impact on firms' market value in China, as compared with firms based in the United States. Capelle-Blancard and Lugna (2010) found some evidence that stock markets in continental Europe and Japan have higher sensibility to environmental hazard. Compared with the United States, they found that abnormal market losses the day after a chemical disaster are 1.25% and 1.8% higher in continental Europe in Japan respectively. Those differences in awareness could play a role in the incorporation of the environmental management into the pricing of the bonds.

Another factor of variability across regions is legislation. Australia introduced a Carbon Price Mechanism in 2011. The CPM works as an emissions trading scheme and should therefore cap emissions (Subramaniam et al, 2013). Europe and Japan introduced a similar trade system in 2005 and in 2010 and plan to decrease the amount of emissions over time. The National Greenhouse and Energy Reporting Act was also introduced in 2007 in Australia. This act makes the disclosure of GHG emissions, energy consumption and production as well as other environmental information compulsory (Clarkson et al, 2014). Japan also introduced a larger framework called the Climate Change Countermeasure, aimed at reducing greenhouse gaz.

Moreover, different regions also have different debt market. Alcock et al (2012) showed that the Australian market was small and illiquid and firms rely heavily on private debt (Cotter, 1998; Gray et al., 2009; Alcock et al., 2012). Japanese and European bond markets have also relied on private debt and relationship based lending more than the US (Batten and

Szilagyi, 2003; Gaspar, et al, 2002). Nevertheless, the European corporate public bonds market is growing fast (ECB, 2004).

Due to the lack of data for Australian bonds, I focused on the differences between Japan and Europe. In order to investigate the difference in sensitivity between the two regions, I performed the same analysis as in the previous section after dividing the sample according to regions.

First, regressions (1) and (2) in Table 9 suggests that the negative relationship between the cost of debt and the environmental performance is only significant for firms whose country of incorporation is in Europe. The governance score also seems to have a negative influence on the cost of debt in European countries.

Second, decomposing the scores into their sub-score does not give more support to the importance of ESG factors in the Japanese bond market. Indeed, no sub-scores have any significant relationship with the cost of debt financing. Regarding European bonds, innovation score is the most important environmental factor while the Emission score is insignificant. This could be due to decreasing marginal returns on environmental investment as the emissions performance in Europe are already high. The significance of the governance score in the regression one comes from the negative relationship between the CSR strategy score and the management score, which are both negatively correlated with the cost of debt financing.

Third, Table 10 confirms that there is probably no relationship between the cost of debt financing and the environmental performance in Japan. However, some relationship appears for European bonds. One could see that the lowest quartile of the environmental scores distribution pay more than the upper Quartiles. However, the decomposition in Terciles in regression (5) leads to no results. A possible explanation for those two

contradicting findings is that the bottom distribution is the one mostly affected by the environmental performance while the effect will be less strong for better performing firms.

11.2.2. Credit rating

This paper argues that the EP has a negative relationship with cost of debt financing through its influence on risk. If such a relationship exists, there should be a negative relationship between the EP and measures of firm risk.

A reliable measure of long-term risk is the credit rating issued by credit rating agencies. I have collected the firms credit rating issued by Moody's and Standard and Poor's. As explained in the Standard and Poor's website, "Credit ratings are opinions about credit risk. Our ratings express our opinion about the ability and willingness of an issuer, such as a corporation or state or city government, to meet its financial obligations in full and on time" (Standard & Poor's, 2017). I use those ratings as a proxy for firm risk. As EP decreases the clean-up, regulatory and reputational risks, I expected a positive correlation between ranking and credit rating.

The model to test this hypothesis is as follows:

$$Credit\ Rating\ measure = \alpha + \beta * Env.Performance + \ \delta * Control\ variables + \varepsilon$$

The first credit rating measure used is a dummy variable that takes value of one when a firm' rating is in the upper half rating of the sample and EPs measures, Credit_Rating_Half. Table 11 shows the probit regressions between the EP and this credit measure.

First, I investigate if there is any relationship between ESG factors and the credit ratings. If the risk-reducing channel is correct, then there should be a positive relationship between the EP and the credit rating. Regression (1) gives some support to that hypothesis and shows that when the EP increases, the likelihood of in the upper half of the credit

measure distribution increases too, suggesting a positive relationship between the ES and the credit rating.

To further investigate the risk-reduction channel hypothesis, I decomposed the ESG scores in order to provide insights about the factors affecting the credit rating. If the risk channel is correct, the Emissions score and the Innovation performances are the one driven the relationship between the credit rating and the EP as those two factors are the ones carrying the relationship between ES and the cost of debt financing (See Table 2)**.** Regression 2 supports this hypothesis. Emissions and Innovation score have indeed a significant positive coefficient.

Finally, regression (3) and (4) implies that this process is quite linear with respect to the ES. Indeed, the best performing quartile and tercile enjoy a higher likelihood to be in the upper half distribution of the Credit Rating. Those results are similar to those found with the cost of debt financing, giving further support to the risk-reduction channel.

To conclude, I find a quasi linear positive relationship between the EP and the probability of being in the upper half distribution of the credit rating. The results found are similar what has been found with the relationship between the cost of debt and the ES. This gives support to the risk-reduction channel: EP reduces risks, which reduces the risk premium in the bond market.

Regarding potential risk-reduction channel through Social and Governance performance, Table 11 gives no further evidence. The Social Score shows a negative relationship with the credit rating quality and the Governance score does not show any statistically significant relationship.

One of the problems with the previous analysis is the credit rating measure. As the variable only takes the value one if the bonds issuer is the upper half distribution of the credit rating, it is hard to examines any potential patterns within the credit rating distribution.

Therefore, I ran three different probit regressions and extracted the marginal effects. Table 12 shows the marginal effects of the first probit regression. I run the a mulnomial probit across all the different credit rating besides the credit rating AA due to lack of observations. Table 12 depicts the probability of an observation within each credit rating for a given change ceteris paribus. For example, holding everything constant, a bond with ES 1 point higher than another has a 0.0146 higher probability than the other bond to have the credit rating BBB+. Table 12 does not provide support for the risk-reduction channel. Indeed, an increase in the ES decrease the probability of the bonds issuer to have the credit rating A+, A or A- but increase its probability of having a rating BB+ or BBB-. This probit shows negative relationship between the credit rating and the ES. However, by breaking the sample in 9 categories, some single firms may drive the results. In order to correct for this potential bias, I ran another regression using the classification of Schneider (2010) in Table 13. I sorted those bonds according to the Credit Rating of their issuer following the 3 categories described by Schneider: Low quality (BB+(Ba1) and lower), Medium quality (BBB- to BBB+ (Baa3 to Baa1)) and High quality (A-(A3) and higher). This table also suggests that increasing the ES decreases the probability of being the in High quality bonds while increasing the probability of being in the middle quality.

To conclude, this section found that the environmental risk-reduction channel does not hold for the hold distribution. One potential explanation for this phenomenon is that there is some decrease in the risk by increasing the EP until some point. After this point, credit agencies do not value further investment as a risk reduction. Decomposition the credit rating sample into quartiles lead to similar results (not tabulated)

11.2.3. Correlation and Relevance

This section explains the reasons for the inclusion of the social and governance factors. First, I analyzed the correlation between the correlation between the ESG factors in order to

assess their relevance to explain the cost of debt of debt financing. Second, I examine if the social and governance scores have power in predicting the cost of debt financing or if they are just noise.

Table 3 has shown that only the EP had an incremental power to explain the cost of debt financing. However, if the three ESG factors are correlated, the statistical significance of each factor could fade away. In order to provide more hindsight about the effects that correlation has on the significance of the ESG performance, a correlation matrix has been created. One can see that the correlation is relatively strong and could have an influence of the size of the coefficient of the variables.

To check further if the correlation blurs potential relationship between a ESG factor and the cost of debt financing, Table 15 runs regressions between the each ESG factor alone and the *Spread.* EP is the only factor significant alone, supporting the relevance of this factor in explaining the cost of debt. One could also notice that the coefficient and the statistical significance of each factors are lower when put together, confirming the correlation.

However, Table 15 does not confirm the significance of the social and governance factors to explain the cost of debt financing. In order to investigate this significance, I used the decomposition into terciles and quartiles of the two factors. The regressions 2 and 3 in table 16 indicate that the social performance has little to no significant influence on the cost of debt. Regarding the governance performance, one could clearly see that better performing firms in terms of governance pay less on average on their debt. The first regression was included to be able to compare the adjusted r-squared. One could clearly see that both the social and the governance factor increase the r-squared significantly.

To conclude, the governance performances has a significant and negative relationship with the cost of debt financing and is correlated with the EP. Therefore, it should be included in the analysis. The social performance has no significant relationship with the cost of debt

financing but is correlated with the EP too. It also increased the adjusted r-squared, indicating that it provides still some explanation of the variations of the cost of debt financing around its mean. Therefore, it is probably not irrelevant and should be included in the analysis.

11.2.3. The relationship by Credit Rating Category

Schneider (2010) found that as the quality of the bonds increases, the idiosyncratic default risk has fewer price effect, which would lead to lower relevance of the environmental risk in the bond pricing as the quality of the bonds increases. To establish the existence of this theory in Europe, Japan and Australia, I replicated its analysis with this sample. I sorted these bonds according to the Credit Rating of their issuer following the 3 categories described by Schneider: Low quality (BB+(Ba1) and lower), Medium quality (BBB- to BBB+ (Baa3 to Baa1)) and High quality (A-(A3) and higher). Table 17 shows the opposite of what Schneider found in the United States. Regressions (1), which uses bonds whose issuers have a rating higher than A- (A3), is the only regression where the ES is statistically significant and negative. This has several potential explanations. First, it could be that environmental risk in only priced correctly when the firms is not risky. This would be the case if the environmental risk is thought to be less prevalent than other risks for example. Its pricing only is effective when the other risks are low. Table 13 actually shows the progressive decrease in the coefficient value of the social score, which becomes negative for firm in the lower credit rating category. Following the explanation given, investors would value more social score than the environmental when the other risks are high but actually see the social performance as a cost when the other risks are low. Another potential explanation is endogeneity. A hidden variable such as environmental disclosure could be correlated with both the credit rating and the cost of debt. Finally, the first category is also the category with most of the observations, which increases its probability to display higher statistical significance compared to the other categories.

To conclude, this paper does not find the same evidence as Schneider. It actually found the opposite, the EP has a negative relationship with the cost of debt financing only for bond in the upper part of the credit rating distribution. This could from difference in investors behavior due to geographical or time difference.

11.2.4. Country of Issue

Section 7.5. showed in a regional analysis of the relationship between the ES and the cost of debt financing that this relationship only exists for bonds whose country of Incorporate is in Europe. However, the bond market reaction to environmental factors could vary not only according to the country of incorporation but also according to the country of Issue. To investigate this issue, I divided the sample between bond issued in Europe (Regression 1,3,5 and 7) and bonds issued in Japan (Regressions 2,4,6 and 8) in Table 18. An analysis similar to the one in section 7.5. has been performed.

The two first equations show that investors have different behaviour in Europe and in Japan. There is a relationship between the environmental and the governance performance and the cost of debt financing in Europe while the social score shows a negative relationship in Japan. Table 9 indicated the same pattern for firms with European country of incorporation but there existed no such pattern for Japanese firm.

Decomposing the ESG factors to further compare country of issues and country of incorporation, one could see that the Innovation score and the CSR strategy scores are still the ones carrying the environmental and the governance score in Europe. An interesting pattern is shown in column 4, the non-significance of the EP in Japan is actually due to the opposite influence of the emissions and the resource use score. Emissions performance is more important in Japan than in Europe. Also, the Workforce Score explains most of the social score significance in Japan.

Finally, Table 19 uses tercile and quartiles decomposition to identify the relationship between the variables of interest. It confirms the importance of the EP in Europe and its limited effect in Japan. The social and governance factors follow the same pattern as described in section 7.5.

To conclude, the negative relationship between the EP and the cost of debt finance exists for bonds whose issuers' country of incorporation is in Europe or if the bond has been issued in Europe. This result is quite natural as only 9 bonds in the sample has a country of Incorporation in Europe but is issued somewhere else.

11.2.5. Control for t-1 and t+1

As it is sometimes difficult to gather timely information about the EP, investors could use the ES of the previous year to estimate the current environmental risk. If this is the case, the ES from the year before the bond issue will have a stronger relationship with the cost of debt financing than the current score. Table 20 includes the EP of the year before the bond issue in the analysis. Regression (1) and (2) both confirms that ES from previous has no statistically significant relationship with the cost of debt. However, the significance of the Emissions Score coefficient goes away compared to Table 3.

Another potential problem is the direction of the relationship. Cheaper debt could allow firms to invest more in their EP through easier access to capital. If that was the case, lower cost of debt financing would be correlated with increased ES in the period following the issues of the bonds. To test this possibility, I included the ES the year following the issues in regression (3) and the two years following the issue in regression (4). As can be seen, only the ES at the same time as the issue is statistically significant, ruling out the possibility of a reverse relationship.

To conclude, the ES is robust to the inclusion of the score the year before the bond issue. This indicates that the risk premium in the bond market is based on current

information. The innovation score is also robust to this inclusion but the emissions score significance goes away. This could be due to low variance in emissions score from year to year. Moreover, I did not find evidence relationship between the cost of debt and the ES in the following years after the issue, ruling out the possibility of a reverse relationship.

11.2.6. Matched firms

One critical potential problem in this analysis is endogeneity. If there is a factor that influence both the environmental factor and the cost of debt financing, the results will be biased. In order to make sure that firms' factors do not bias the finding, this paper uses two different approaches: the matched firms approach and firm-fixed effects.

The matched firm approach has already been used by Goss and Roberts (2009) in the context of CSR and cost of debt. The idea is to analyse the differences in one variable between comparable firms from a treatment and a control group. In my analysis, I use two different definitions of treatment group: if the bond issuer is in the upper half distribution or is the bond issuer is in the upper quartile distribution. The control groups are the bonds not corresponding to the definition in each case. I used different methodologies to show that the results are not dependent on the estimator.

First, I use a propensity score matching estimator. I estimate the propensity score using a logit using all the control variables as well as controlling for years and industries effect. I exclude the dummy variables Loss, Seniority, Callable and Puttable as they represent only a small proportion of the sample but reduce greatly the matching probability. The firm in the control group with the lowest propensity score difference with the firm in the treatment group is chosen to be the matched firm. I also followed Goss and Roberts by considering as potential matches only control firms whose propensity score fall within 0.25 standard deviation of the propensity score of the treatment firms. I allow firms in the control group to be the matched firm for several firms of the treatment groups as it improves the matching

quality (Caliendo and Kopeinig, 2005**).** I did not include multiple neighbour selection as the results were already significant and this method can increase the bias.

The results are given in the two first column of Table 21. One could see that, holding all the other factors constant, the treatment group pay a lower cost of debt and this result is robust with different treatments groups. As King and Nielsen (2016) noticed some problems with the propensity score matching, I included other techniques recommended in that paper.

Second, I use Mahalanobis distance neighbours matching method. This method chooses the firm in the control group that has the lowest Mahalanobis distance from the firm in the treatment group. I corrected for large-sample bias that can occur when matching on more than one continuous variable.

The results are given in the column 3 and 4 of Table 21. The treatment groups also pay a lower cost of debt, suggesting a negative relationship between the EP and the cost of debt.

Finally, I use the Mahalanobis distance kernel matching. Kernel matching is non-parametric estimators that uses information about the whole control group to construct the outcome (See Caliendo and Kopeinig, 2005 for more information). It gives more weights to covariates whose Mahalanobis distance between the treatment and the control groups is lower. As a result, the variance is lower but the bias can be higher.

The results are given in the column 5 and 6 of Table 21. The findings are similar to the one from column 1 to 4.

The other approach I used to deal with endogeneity is the inclusion of firm fixed effect. Table 22 show the results. First, I investigate the relationship between the cost of debt and the ESG factors. One could see that the inclusion of firm fixed effect reduces the significance of the coefficient. Indeed, Column 1 shows no sign of significant relationship between the ESG performance and the cost of debt financing. I further decompose the sample into tercile and quartile according the ESG factors to investigate a potential relationship. While the terciles

do not gives any significant results, one could clearly see that the firms at the bottom of the ES distribution pay a higher cost of debt than the other.

To conclude, both the matched firms approach and the firm fixed-effect found a negative relationship between the cost of debt financing and the ES. The results from the matched firm approach are robust to different definition of EP and different matching method. Therefore, the results are probably not driven by another non-observed variable. There is seemingly a causal and unbiased relationship between the cost of debt and the EP.

11.2.7. Within terciles

This paper has not considered possible change of effects of the ESG factors on the cost of debt according to the level of the ESG factors. In order to investigate this issue, I decomposed the sample in environmental terciles. As there exists probably decreasing returns on investment, I expect the relationship between EP and the spread to be stronger for the lower terciles.

Table 23 depicts the results for the decomposition of the environmental factor. As expected, the sign and the coefficient of the environmental score decreases as the score increases. Interestingly, the opposite pattern appears for the social score, the size of its coefficients increases as the environmental score increase. Social score is therefore considered only for the firms with already high environmental performances.

11.3. Table

Table 1
This table summarizes the distribution of the sample, credit risk and credit rating across sectors. The sample observations are allocated to industry classifications according to their membership in GICS sectors.

GICS Industry	Sample (%)	Average Spread (%)	Credit Rating
Telecommunication Services	12,06	2,7	7,91
Materials	10,34	1,64	8,78
Industrials	24,25	1,96	7,05
Consumer Discretionary	11,02	1,91	7,08
Consumer Staples	10,84	2,87	7,7
Utilities	15,45	1,93	7,63
Energy	3,93	1,92	8,13
Health Care	4,88	0,78	6,28
Information Technology	2,53	1,28	8,14
Real Estate	4,69	1,60	5,8
Observations	2214	2214	2214
Total	100	1,86	7,45

Table 2

This table provides a summary statistic of the dependent and independent variables for a sample of 1377 bonds covering the 2007-2017 period. Spread, Size, Issue Size and Volatility have been transformed back to their non-logarithm form for interpretation purpose. Average Score, Emissions Score, Resource use Score and Innovation Score are defined in table 1. *Spread* is the yield to maturity at issue, defined as the difference between the yield to maturity of bond and the yield to maturity of the corresponding government bonds of the same maturity.

Variable	# Obs.	Mean	Std. Dev.	Min	Max
EP					
ES	1377	76.83	11.52	28.57	96.72
Emissions Score	1377	77.45	16.95	20.37	99.56
Resource use Score	1377	80.81	14.62	14.28	99.79
Innovation Score	1377	72.22	22.23	0.38	99.57
Social Performance					
Social Score	1377	70.33	16.29	17.18	96.31
Workforce Score	1377	76.14	19.17	12.5	99.79
Human Rights Score	1377	65.29	33.38	0	99.57
Community Score	1377	60.67	28.93	2.94	99.79
Product Responsibility	1377	71.29	23.77	4.16	99.74
Governance Performance					
Governance Score	1377	58.68	19.76	10.69	96.85
Management Score	1377	56.48	28.08	1.06	99.63
Shareholders	1377	54.03	29.21	0.35	99.14
CSR strategy	1377	75.21	18.15	0.364	99.75
Credit Risk Variables					
Spread (bp)	1377	168	180	1.1	1300
Credit Rating	1377	7.49	2.01	3	12
Firms Control Variables					
Leverage	1377	0.69	0.12	0.04	1.26
Size (In BM$)	1377	76,2	72,1	1.68	438
Capital Intensity	1377	0,29	0.20	0	1.02
Interest Coverage	1377	19.73	54.10	-188.2	1269.93
ROA	1377	0,32	0.036	-0.16	0.33
Loss	1377	0.023	0.15	0	1
Beta	1377	0.99	0.29	0.23	1.80
Institution Ownership (%)	1377	46.84	19.47	0.095	98.74
Market-to-Book	1377	1,52	5.60	-92.42	29,93
Volatility 1-year prior issue	1349	0.58	0.34		
Return 1-month prior issue	1350	0.007	0.07	-0.26	0.33
Speculative	1377	0.0646	0.249	0	1
Bonds Control variable					
Time to Maturity (in years)	1377	8.29	6.86	0.1111	50
Issue Size (BM$)	1377	1,3	2.4	0.0198	449
Callable	1377	0.087	0.28	0	1
Puttable	1377	0.0007	0.03	0	1
Seniority	1377	0.053	0.224	0	1
Country					
Australia	1377	0.024	0.15	0	1
Japan	1377	0.39	0.49	0	1
Europe	1377	0.58	0.49	0	1

Table 3

This table summarizes the relationship between firms' environmental management and the cost of debt financing. I regress the logarithm of the spread between the yield maturity of a bond and the corresponding government rate of the same maturity on the environmental management measure and an array of control variables. All models include year and industry fixed effects. The robust Standard Errors are cluster at the firm level. (1) uses the ESG combined scores. (2) uses the decomposition of the ESG combined scores. (3) uses the decomposition of the each ESG scores. (4) sorts the firms in terciles according to their ESG scores. (5) sorts the firms in quartiles according to ESG scores. P-value are reported in the parenthesis below the coefficient. P-value are reported in the parenthesis below the coefficient. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

	(1) LnSpread	(2) LnSpread	(3) LnSpread	(4) LnSpread	(5) LnSpread
ESGCombinedScoreInthelast1	-0.0000655				
	(0.184)				
Environmental_Score		-0.000199***			
		(0.002)			
Social_Score		-0.0000261			
		(0.683)			
Governance_Score		-0.0000365			
		(0.301)			
Emissions_Score			-0.0000812*		
			(0.066)		
Innovation_Score			-0.000107**		
			(0.004)		
Resourceuse_Score			0.00000490		
			(0.932)		
Workforce_Score			-0.0000232		
			(0.581)		
HumanRights_Score			0.00000295		
			(0.895)		
Community_Score			-0.0000370		
			(0.233)		
ProductResponsibility_Score			0.0000295		

	(0.324)		
Management_Score	-0.0000131 (0.688)		
Shareholders_Score	-0.0000113 (0.724)		
CSRStrategy_Score	-0.0000224 (0.581)		
Env_Ter2		-0.00242 (0.119)	
Env_Ter3		-0.00387** (0.031)	
Soc_Ter2		-0.00177 (0.340)	
Soc_Ter3		-0.000865 (0.721)	
Gov_Ter2		-0.00357** (0.027)	
Gov_Ter3		-0.00281* (0.081)	
Env_Quart2			-0.00128 (0.557)
Env_Quart3			-0.00548*** (0.004)
Env_Quart4			-0.00674*** (0.001)
Soc_Quart2			-0.00104 (0.558)
Soc_Quart3			-0.00292 (0.242)
Soc_Quart4			-0.0000220 (0.994)
Gov_Quart2			-0.00380* (0.052)
Gov_Quart3			-0.00227 (0.255)

Gov_Quart4					-0.00247
					(0.217)
Maturity_Years	0.000844***	0.000820***	0.000814***	0.000835***	0.000826***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Issue_Size	0.000156	0.000103	0.0000883	0.000151	0.0000245
	(0.859)	(0.907)	(0.916)	(0.863)	(0.977)
Callable_Dummy	0.00716*	0.00718*	0.00749*	0.00752*	0.00699*
	(0.076)	(0.071)	(0.055)	(0.060)	(0.081)
Seniority_Dummy	-0.000864	-0.00109	-0.00273	-0.000797	-0.00142
	(0.801)	(0.766)	(0.484)	(0.798)	(0.714)
Putable_Dummy	0.0198	0.0201*	0.0199*	0.0197*	0.0220*
	(0.106)	(0.086)	(0.076)	(0.089)	(0.059)
Speculative	0.0142***	0.0121***	0.0124***	0.0128***	0.0107***
	(0.004)	(0.009)	(0.005)	(0.003)	(0.009)
Firm_Size	0.00336***	0.00411***	0.00411***	0.00391***	0.00396***
	(0.006)	(0.003)	(0.002)	(0.003)	(0.003)
Credit_Rating	0.00221***	0.00216***	0.00224***	0.00220***	0.00233***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Lev	-0.00147	-0.00163	-0.00361	-0.00245	-0.00258
	(0.854)	(0.840)	(0.663)	(0.759)	(0.754)
CapInt	0.00356	0.00289	0.00184	0.00257	0.00379
	(0.358)	(0.498)	(0.679)	(0.518)	(0.402)
Loss	0.00782**	0.00783**	0.00737**	0.00725**	0.00739**
	(0.033)	(0.030)	(0.041)	(0.047)	(0.046)
ROA	0.0316	0.0299	0.0268	0.0266	0.0245
	(0.185)	(0.192)	(0.244)	(0.245)	(0.265)
IntCov	0.00000335	0.00000472	0.00000374	0.00000682	0.00000649
	(0.581)	(0.434)	(0.522)	(0.288)	(0.304)
VOL	0.00259	0.00308	0.00326	0.00358	0.00281
	(0.446)	(0.331)	(0.257)	(0.239)	(0.338)
M_t_B	-0.000173*	-0.000170*	-0.000163	-0.000209**	-0.000197**
	(0.054)	(0.070)	(0.136)	(0.027)	(0.037)
Return_t1	0.00154	0.000152	0.000513	0.000567	-0.000331
	(0.814)	(0.981)	(0.931)	(0.929)	(0.960)

Beta	-0.00655*	-0.00465	-0.00457	-0.00582	-0.00457
	(0.098)	(0.219)	(0.244)	(0.130)	(0.210)
Inst_Own_Per	0.0000415	0.0000549*	0.0000515*	0.0000529*	0.0000723*
	(0.187)	(0.065)	(0.090)	(0.088)	(0.018)
Australia	0.0422***	0.0442***	0.0439***	0.0450***	0.0440***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Europe	0.00364	0.00414	0.00422	0.00431	0.00310
_cons	-0.0773**	-0.0787**	-0.0775**	-0.0849***	-0.0868***
	(0.026)	(0.015)	(0.017)	(0.009)	(0.008)
R^2	0.375	0.387	0.394	0.388	0.401
N	1348	1348	1348	1348	1348

Table 4

This table summarizes the relationship between firms' environmental management and the cost of debt financing across maturities. I regress the logarithm of the spread between the yield maturity of a bond and the corresponding government rate of the same maturity on the environmental management measure and an array of control variables. All models include year and industry fixed effects. The robust Standard Errors are cluster at the firm level. This table uses the ESG combined scores. The dataset has been divided into 4 sub-datasets: (1) Bonds with a maturity of less than 3 years, (2) bonds with a maturity between 3 and 5 years, (3) bonds with a maturity between 5 and 10 years and (4) bonds with maturity longer than 10 years. P-value are reported in the parenthesis below the coefficient.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

	(1)	(2)	(3)	(4)
	LnSpread	LnSpread	LnSpread	LnSpread
ESGCombinedScoreInthelast1	0.000180***	-0.000109	-0.0000290	-0.000133
	(0.009)	(0.386)	(0.612)	(0.109)
Maturity_Years	0.00684***	-0.00252	0.000182	0.000571***
	(0.000)	(0.520)	(0.685)	(0.007)
Issue_Size	0.000358	-0.00553***	-0.00310***	0.000418
	(0.130)	(0.000)	(0.005)	(0.776)
Callable_Dummy	-0.0187***	-0.00547	0.00288	0.00739
	(0.000)	(0.302)	(0.368)	(0.164)
Seniority_Dummy	-0.0151	0.0226	0.00480	-0.00888**
	(0.155)	(0.127)	(0.220)	(0.031)
Putable_Dummy	0	0	0.0207	0
	(.)	(.)	(0.153)	(.)
Speculative	0.000893	0.00640	0.0134***	0.0106
	(0.733)	(0.452)	(0.001)	(0.284)
Firm_Size	0.000338	0.00620**	0.00453***	0.00376**
	(0.832)	(0.027)	(0.002)	(0.020)
Credit_Rating	0.000842	0.00494***	0.00248***	0.00304***
	(0.151)	(0.004)	(0.001)	(0.008)
Lev	-0.0224*	-0.0306	0.00423	-0.00585
	(0.061)	(0.111)	(0.641)	(0.592)
CapInt	-0.0266***	0.00961	0.0108**	0.00756
	(0.000)	(0.303)	(0.048)	(0.123)
Loss	0.00931*	0.00463	0.00398	0.0102
	(0.068)	(0.575)	(0.315)	(0.247)
ROA	-0.0582*	0.0366	0.0110	0.0705*
	(0.098)	(0.538)	(0.697)	(0.070)
IntCov	0.0000143	0.00000603	0.00000848	0.00000176
	(0.651)	(0.477)	(0.232)	(0.964)

VOL	0.00165	0.00302	0.00391	-0.0000497
	(0.556)	(0.672)	(0.347)	(0.994)
M_t_B	0.00121	-0.0000330	-0.000239*	0.0000653
	(0.218)	(0.836)	(0.061)	(0.685)
Return_t1	0.00387	-0.00183	0.0137	-0.0198
	(0.473)	(0.885)	(0.162)	(0.204)
Beta	0.000760	0.00175	-0.00886**	-0.00396
	(0.916)	(0.785)	(0.038)	(0.410)
Inst_Own_Per	-0.00000823	0.000243**	-0.0000195	0.000120***
	(0.869)	(0.012)	(0.651)	(0.009)
Australia	0	-0.0198**	0.0308**	0.0344***
	(.)	(0.047)	(0.037)	(0.006)
Europe	0.0149***	-0.00720	-0.00468	-0.00212
	(0.001)	(0.298)	(0.382)	(0.813)
_cons	-0.0299	-0.0249	-0.0236	-0.109**
	(0.482)	(0.660)	(0.540)	(0.050)
R^2	0.835	0.600	0.489	0.354
N	218	120	551	459

Table 5

This table summarizes the relationship between firms' environmental management and the cost of debt financing across maturities. I regress the logarithm of the spread between the yield maturity of a bond and the corresponding government rate of the same maturity on the environmental management measure and an array of control variables. All models include year and industry fixed effects. The robust Standard Errors are cluster at the firm level. This table uses the decomposition of the ESG combined scores. The dataset has been divided into 4 sub-datasets: (1) Bonds with a maturity of less than 3 years, (2) bonds with a maturity between 3 and 5 years, (3) bonds with a maturity between 5 and 10 years and (4) bonds with maturity longer than 10 years. P-value are reported in the parenthesis below the coefficient.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

	(1) LnSpread	(2) LnSpread	(3) LnSpread	(4) LnSpread
Environmental_Score	-0.0000286	0.0000869	-0.000312***	-0.000185**
	(0.812)	(0.669)	(0.001)	(0.023)
Social_Score	-0.00000975	-0.0000274	0.0000293	-0.0000771
	(0.915)	(0.834)	(0.568)	(0.389)
Governance_Score	-0.0000459	-0.0000128	0.0000435	-0.000162**
	(0.315)	(0.902)	(0.300)	(0.018)
Maturity_Years	0.00633***	-0.00263	0.000268	0.000575***
	(0.000)	(0.518)	(0.538)	(0.005)
Issue_Size	0.000319	-0.00531***	-0.00301***	0.000343
	(0.217)	(0.000)	(0.005)	(0.806)
Callable_Dummy	-0.0185***	-0.00786	0.00348	0.00767
	(0.003)	(0.146)	(0.277)	(0.129)
Seniority_Dummy	-0.0193	0.0220	0.00700	-0.0117***
	(0.175)	(0.121)	(0.124)	(0.010)
Putable_Dummy	0	0	0.0231*	0
	(.)	(.)	(0.083)	(.)
Speculative	-0.000742	0.00652	0.0102***	0.0107
	(0.890)	(0.464)	(0.009)	(0.231)
Firm_Size	-0.00352	0.00586**	0.00564***	0.00512**
	(0.126)	(0.042)	(0.000)	(0.010)
Credit_Rating	0.000143	0.00478***	0.00282***	0.00300***
	(0.871)	(0.005)	(0.000)	(0.004)
Lev	-0.00868	-0.0257	0.00352	-0.00732
	(0.519)	(0.219)	(0.697)	(0.474)
CapInt	-0.0287***	0.00770	0.0121**	0.00478
	(0.002)	(0.375)	(0.034)	(0.326)
Loss	0.00393	0.00374	0.00483	0.0131
	(0.445)	(0.673)	(0.211)	(0.124)

ROA	-0.0434	0.0491	0.0135	0.0854**
	(0.279)	(0.424)	(0.606)	(0.023)
IntCov	0.0000339	0.00000539	0.0000115*	0.0000406
	(0.381)	(0.515)	(0.090)	(0.266)
VOL	0.00190	0.00288	0.00412	0.00266
	(0.584)	(0.730)	(0.298)	(0.650)
M_t_B	0.0000764	-0.00000595	-0.000219*	0.0000383
	(0.928)	(0.969)	(0.073)	(0.807)
Return_t1	0.00675	-0.00163	0.00923	-0.0218
	(0.306)	(0.899)	(0.297)	(0.169)
Beta	0.00180	0.00205	-0.00599	-0.00271
	(0.831)	(0.776)	(0.112)	(0.529)
Inst_Own_Per	-0.0000499	0.000220**	0.00000122	0.000110**
	(0.411)	(0.023)	(0.974)	(0.016)
Australia	0	-0.0221**	0.0308**	0.0409***
	(.)	(0.033)	(0.016)	(0.001)
Europe	0.0124***	-0.00608	-0.00438	-0.000821
	(0.003)	(0.366)	(0.379)	(0.915)
R^2	0.814	0.598	0.519	0.375
N	218	120	551	459

Table 6

This table summarises the relationship between firms' environmental management and the cost of debt financing across maturities. I regress the logarithm of the spread between the yield maturity of a bond and the corresponding government rate of the same maturity on the environmental management measure and an array of control variables. All models include year and industry fixed effects. The robust Standard Errors are cluster at the firm level. This table uses the decomposition of each ESG combined scores. The dataset has been divided into 4 sub-datasets: (1) Bonds with a maturity of less than 3 years, (2) bonds with a maturity between 3 and 5 years, (3) bonds with a maturity between 5 and 10 years and (4) bonds with maturity longer than 10 years. P-value are reported in the parenthesis below the coefficient.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

	(1) LnSpread	(2) LnSpread	(3) LnSpread	(4) LnSpread
Emissions_Score	0.000112	0.000125	-0.000147***	-0.0000796
	(0.175)	(0.284)	(0.004)	(0.325)
Innovation_Score	-0.0000978	-0.0000616	-0.000145***	-0.0000471
	(0.261)	(0.597)	(0.006)	(0.150)
Resourceuse_Score	-0.000127	0.0000548	0.00000754	-0.0000815
	(0.240)	(0.730)	(0.888)	(0.270)
Workforce_Score	-0.0000476	-0.0000103	0.0000208	-0.00000511
	(0.346)	(0.916)	(0.594)	(0.908)
HumanRights_Score	0.0000501	0.0000752	0.00000384	-0.0000299
	(0.382)	(0.411)	(0.868)	(0.326)
Community_Score	0.0000483	0.0000202	-0.0000402	-0.0000897
	(0.546)	(0.807)	(0.227)	(0.146)
ProductResponsibility_Score	0.000201	0.0000226	0.0000237	0.0000196
	(0.105)	(0.841)	(0.503)	(0.638)
Management_Score	-0.0000728	-0.0000811	0.0000513*	-0.000102
	(0.188)	(0.345)	(0.075)	(0.102)
Shareholders_Score	0.0000880	0.000129*	-0.0000320	-0.0000307
	(0.256)	(0.070)	(0.183)	(0.534)
CSRStrategy_Score	-0.0000118	-0.0000463	0.00000534	-0.0000196
	(0.877)	(0.642)	(0.918)	(0.726)
Maturity_Years	0.00541***	-0.00294	0.000334	0.000567***
	(0.001)	(0.466)	(0.461)	(0.005)
Issue_Size	0.000204	-0.00542***	-0.00283**	0.0000715
	(0.357)	(0.000)	(0.010)	(0.957)
Callable_Dummy	-0.0160***	-0.00993*	0.00364	0.00867*
	(0.000)	(0.082)	(0.282)	(0.084)
Seniority_Dummy	-0.00857	0.00622	0.00469	-0.0123***
	(0.579)	(0.725)	(0.306)	(0.010)

Putable_Dummy	0	0	0.0241*	0
	(.)	(.)	(0.068)	(.)
Speculative	-0.00348	0.0144*	0.0102***	0.00948
	(0.711)	(0.080)	(0.004)	(0.276)
Firm_Size	-0.00159	0.00387	0.00556***	0.00576***
	(0.736)	(0.214)	(0.000)	(0.007)
Credit_Rating	0.000692	0.00387**	0.00296***	0.00325***
	(0.637)	(0.012)	(0.000)	(0.002)
Lev	-0.0341	-0.0165	0.00107	-0.0107
	(0.107)	(0.393)	(0.908)	(0.315)
CapInt	-0.0234**	-0.000431	0.0106*	0.00343
	(0.023)	(0.974)	(0.071)	(0.430)
Loss	-0.00203	0.00217	0.00503	0.0128
	(0.780)	(0.786)	(0.217)	(0.122)
ROA	-0.0750**	0.0555	0.00282	0.0838**
	(0.049)	(0.403)	(0.914)	(0.022)
IntCov	0.0000119	0.00000757	0.0000103	0.0000359
	(0.743)	(0.354)	(0.108)	(0.355)
VOL	0.00409	0.000345	0.00323	0.00367
	(0.157)	(0.968)	(0.379)	(0.526)
M_t_B	0.00210	0.000157	-0.000245*	0.0000103
	(0.221)	(0.210)	(0.081)	(0.953)
Return_t1	0.00800	0.00182	0.00984	-0.0218
	(0.180)	(0.907)	(0.271)	(0.165)
Beta	0.00632	0.00775	-0.00626*	-0.00358
	(0.486)	(0.341)	(0.099)	(0.438)
Inst_Own_Per	0.0000199	0.000133	-0.00000360	0.0000976**
	(0.684)	(0.195)	(0.921)	(0.043)
Australia	0	-0.0292**	0.0307**	0.0406***
	(.)	(0.018)	(0.010)	(0.002)
Europe	0.00638	-0.0106	-0.00357	-0.000557
	(0.158)	(0.220)	(0.459)	(0.937)
_cons	0.0604	-0.00567	-0.0438	-0.109**
	(0.558)	(0.942)	(0.250)	(0.016)
R^2	0.857	0.629	0.531	0.382
N	218	120	551	459

Table 7

This table summarizes the relationship between firms' environmental management and the cost of debt financing across maturities. I regress the logarithm of the spread between the yield maturity of a bond and the corresponding government rate of the same maturity on the environmental management measure and an array of control variables. All models include year and industry fixed effects. The robust Standard Errors are cluster at the firm level. This table sorts the firms in terciles according to their ESG scores. The dataset has been divided into 4 sub-datasets: (1) Bonds with a maturity of less than 3 years, (2) bonds with a maturity between 3 and 5 years, (3) bonds with a maturity between 5 and 10 years and (4) bonds with maturity longer than 10 years. P-value are reported in the parenthesis below the coefficient.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

	(1) LnSpread	(2) LnSpread	(3) LnSpread	(4) LnSpread
Env_Ter2	0.00237	0.00449	-0.00431**	-0.00555***
	(0.281)	(0.236)	(0.039)	(0.001)
Env_Ter3	0.00444	-0.0000649	-0.00657**	-0.00404*
	(0.172)	(0.987)	(0.022)	(0.086)
Soc_Ter2	0.00164	0.00491	0.000565	-0.00555**
	(0.732)	(0.224)	(0.754)	(0.012)
Soc_Ter3	0.000393	-0.00134	0.000183	-0.000162
	(0.939)	(0.822)	(0.925)	(0.959)
Gov_Ter2	0.00375	0.00249	-0.000319	-0.00787***
	(0.139)	(0.588)	(0.850)	(0.001)
Gov_Ter3	-0.00408	0.000171	0.00105	-0.00762***
	(0.363)	(0.975)	(0.620)	(0.006)
Maturity_Years	0.00510***	-0.00165	0.000251	0.000605***
	(0.000)	(0.678)	(0.571)	(0.003)
Issue_Size	0.000221	-0.00538***	-0.00299***	0.000393
	(0.312)	(0.000)	(0.005)	(0.773)
Callable_Dummy	-0.0227***	-0.00592	0.00358	0.00902*
	(0.000)	(0.292)	(0.278)	(0.070)
Seniority_Dummy	-0.0432**	0.0239	0.00679	-0.0101***
	(0.047)	(0.106)	(0.126)	(0.005)
Putable_Dummy	0	0	0.0238*	0
	(.)	(.)	(0.072)	(.)
Speculative	0.00315	0.0108	0.0114***	0.0133
	(0.444)	(0.172)	(0.004)	(0.119)
Firm_Size	-0.00588**	0.00505**	0.00526***	0.00434**
	(0.031)	(0.042)	(0.001)	(0.019)
Credit_Rating	-0.00171	0.00397***	0.00266***	0.00361***

	(0.115)	(0.010)	(0.000)	(0.000)
Lev	-0.00633	-0.0181	0.00346	-0.00917
	(0.690)	(0.341)	(0.705)	(0.293)
CapInt	-0.0431***	0.00517	0.0121**	0.00578
	(0.001)	(0.589)	(0.041)	(0.183)
Loss	0.0143**	0.00164	0.00512	0.0110
	(0.031)	(0.827)	(0.200)	(0.199)
ROA	-0.0182	0.0369	0.00964	0.0827**
	(0.569)	(0.568)	(0.723)	(0.022)
IntCov	0.00000199	0.00000637	0.0000112	0.0000384
	(0.967)	(0.308)	(0.128)	(0.272)
VOL	-0.000980	0.00178	0.00388	0.00312
	(0.785)	(0.816)	(0.314)	(0.576)
M_t_B	0.00121	0.0000465	-0.000232*	-0.0000258
	(0.151)	(0.736)	(0.070)	(0.840)
Return_t1	0.00330	0.00226	0.00950	-0.0248
	(0.502)	(0.875)	(0.281)	(0.119)
Beta	0.0111	0.00746	-0.00667*	-0.00349
	(0.108)	(0.264)	(0.080)	(0.391)
Inst_Own_Per	-0.0000666	0.000213**	-0.00000227	0.0000991**
	(0.386)	(0.026)	(0.953)	(0.039)
Australia	0	-0.0196*	0.0312**	0.0396***
	(.)	(0.061)	(0.019)	(0.000)
Europe	0.00573	-0.00467	-0.00400	-0.00285
	(0.223)	(0.472)	(0.439)	(0.711)
_cons	0.152**	-0.0230	-0.0456	-0.107**
	(0.039)	(0.689)	(0.251)	(0.015)
R^2	0.859	0.626	0.506	0.405
N	218	120	551	459

Table 8

This table summarizes the relationship between firms' environmental management and the cost of debt financing across industries. I regress the logarithm of the spread between the yield maturity of a bond and the corresponding government rate of the same maturity on the environmental management measure and an array of control variables. All models include year and industry fixed effects. The robust Standard Errors are cluster at the firm level. (1), (3) and (5) use risky industries data while (2), (4) and (6) use the other industries data. P-value are reported in the parenthesis below the coefficient. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	(1) LnSpread	(2) LnSpread	(3) LnSpread	(4) LnSpread	(5) LnSpread	(6) LnSpread
ESGCombinedScoreIntheIast1	-0.000226**	-0.0000869*				
	(0.021)	(0.091)				
Environmental_Score			-0.000153	-0.000185**		
			(0.293)	(0.010)		
Social_Score			0.0000163	-0.0000301		
			(0.838)	(0.660)		
Governance_Score			0.00000322	-0.0000650*		
			(0.970)	(0.066)		
Env_Ter2					0.00196	-0.00408**
					(0.300)	(0.017)
Env_Ter3					-0.00748**	-0.00408**
					(0.014)	(0.041)
Soc_Ter2					-0.00292	-0.00160
					(0.248)	(0.375)
Soc_Ter3					-0.00373	0.000307
					(0.275)	(0.898)
Gov_Ter2					0.00454	-0.00424**
					(0.207)	(0.010)
Gov_Ter3					-0.000457	-0.00414**
					(0.868)	(0.007)

Maturity_Years	0.000384**	0.000838***	0.000477*	0.000815**	0.000525***	0.000822**
	(0.011)	(0.000)	(0.012)	(0.000)	(0.002)	(0.000)
Issue_Size	0.00280***	-0.000496	0.00290**	-0.000566	0.00328**	-0.000586
	(0.003)	(0.573)	(0.007)	(0.516)	(0.000)	(0.492)
Callable_Dummy	-0.00106	0.00944**	-0.00480*	0.00946**	-0.00763**	0.00983**
	(0.678)	(0.031)	(0.098)	(0.029)	(0.041)	(0.022)
Seniority_Dummy	0	-0.00176	0	-0.00225	0	-0.00159
	(.)	(0.631)	(.)	(0.579)	(.)	(0.646)
Putable_Dummy	0.0989**	0	0	0	0.0792***	0
	(0.000)	(.)	(.)	(.)	(0.000)	(.)
Speculative	0.0137**	0.0143**	0.0204***	0.0116**	0.0185***	0.0123**
	(0.005)	(0.014)	(0.001)	(0.035)	(0.006)	(0.016)
Firm_Size	0.00151	0.00345**	-0.00145	0.00422**	-0.00121	0.00402**
	(0.488)	(0.006)	(0.523)	(0.003)	(0.520)	(0.003)
Credit_Rating	-0.000110	0.00221**	-0.000568	0.00211**	-0.000410	0.00220**
	(0.870)	(0.002)	(0.523)	(0.003)	(0.764)	(0.002)
Lev	0.0356**	-0.00665	0.0329	-0.00587	0.0187	-0.00719
	(0.012)	(0.464)	(0.125)	(0.526)	(0.276)	(0.416)
CapInt	0.0154*	0.00354	0.0158	0.00229	0.0148	0.00212
	(0.097)	(0.373)	(0.156)	(0.595)	(0.162)	(0.588)
Loss	-0.00623	0.0106**	-0.00144	0.00950*	-0.0000265	0.00946*
	(0.245)	(0.037)	(0.676)	(0.060)	(0.990)	(0.060)
ROA	0.0342	0.0374	0.00417	0.0335	-0.00928	0.0303
	(0.308)	(0.159)	(0.912)	(0.197)	(0.781)	(0.237)
IntCov	-0.000153	0.00000281	-0.0000944	0.00000403	0.00000825	0.00000528
	(0.164)	(0.662)	(0.377)	(0.537)	(0.934)	(0.438)
VOL	-0.00568	0.00362	-0.00636	0.00449	-0.00357	0.00524
	(0.208)	(0.362)	(0.194)	(0.221)	(0.454)	(0.134)
M_t_B	-	-	-0.00268	-	-0.00110	-

	0.00371**	0.000184***		0.000182*		0.000229**
	(0.025)	(0.046)	(0.205)	(0.058)	(0.584)	(0.018)
Return_t1	-0.00314	0.000104	0.00249	-0.000620	0.00699	-0.000730
	(0.662)	(0.989)	(0.772)	(0.933)	(0.485)	(0.920)
Beta	-0.00370	-0.00257	0.00370	-0.000706	0.00761*	-0.00214
	(0.467)	(0.555)	(0.557)	(0.867)	(0.058)	(0.614)
Inst_Own_Per	-0.0000725	0.0000669*	-0.0000958**	0.0000797**	-0.000123**	0.0000764**
	(0.129)	(0.053)	(0.011)	(0.013)	(0.015)	(0.022)
Australia	0	0.0397***	0.0917***	0.0424***	0	0.0421***
	(.)	(0.001)	(0.000)	(0.000)	(.)	(0.000)
Europe	0.0165**	0.000378	0.0154**	0.001000	0.0182***	0.0000751
	(0.001)	(0.941)	(0.043)	(0.826)	(0.005)	(0.987)
_cons	-0.0862*	-0.0588	-0.0209	-0.0596*	-0.0275	-0.0627*
	(0.083)	(0.104)	(0.727)	(0.081)	(0.581)	(0.060)
R^2	0.827	0.380	0.812	0.392	0.839	0.398
N	168	1182	168	1182	168	1182

Table 9

This table summarizes the relationship between firms' environmental management and the cost of debt financing across regions. I regress the logarithm of the spread between the yield maturity of a bond and the corresponding government rate of the same maturity on the environmental management measure and an array of control variables. All models include year and industry fixed effects. The robust Standard Errors are cluster at the firm level. (1) and (3) use European data while (2) and (4) use Japanese industries data. P-value are reported in the parenthesis below the coefficient. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	(1) LnSpread	(2) LnSpread	(3) LnSpread	(4) LnSpread
Environmental_Score	-0.000150*	-0.0000786		
	(0.092)	(0.233)		
Social_Score	0.000000779	-0.0000227		
	(0.992)	(0.658)		
Governance_Score	-0.0000989*	0.0000300		
	(0.089)	(0.198)		
Emissions_Score			-0.000000287	-0.0000616
			(0.996)	(0.135)
Innovation_Score			-0.0000981**	-0.0000225
			(0.023)	(0.354)
Resourceuse_Score			-0.0000531	0.0000107
			(0.322)	(0.775)
WorkforceScoreInthelast11F			0.000000240	-0.0000552
			(0.995)	(0.127)
HumanRightsScoreInthelast1			0.00000224	0.00000928
			(0.954)	(0.540)
CommunityScoreInthelast11F			-0.0000261	0.0000148
			(0.476)	(0.610)
ProductResponsibilityScoreIn			0.0000821*	0.0000186
			(0.067)	(0.401)
ManagementScoreInthelast11			-0.0000722*	0.0000276
			(0.098)	(0.214)
ShareholdersScoreInthelast1			0.0000467	0.00000622
			(0.205)	(0.787)
CSRStrategyScoreInthelast1			-0.000144***	0.0000622
			(0.007)	(0.220)
Maturity_Years	0.000909***	0.000548***	0.000844***	0.000573***
	(0.000)	(0.000)	(0.000)	(0.000)
Issue_Size	0.00173***	-0.00512***	0.00143***	-0.00531***
	(0.003)	(0.000)	(0.007)	(0.000)

Callable_Dummy	-0.000157	0.0352***	0.000602	0.0325***
	(0.950)	(0.000)	(0.813)	(0.000)
Seniority_Dummy	0	-0.00484*	0	-0.00541*
	(.)	(0.059)	(.)	(0.073)
Putable_Dummy	0	0	0	0
	(.)	(.)	(.)	(.)
Speculative	0.00642	-0.00488	0.00539	-0.00626
	(0.213)	(0.464)	(0.323)	(0.362)
Firm_Size	0.00286*	0.00190	0.00351**	0.00172
	(0.062)	(0.355)	(0.020)	(0.393)
Credit_Rating	0.00223**	0.000146	0.00198**	-0.0000769
	(0.027)	(0.635)	(0.016)	(0.833)
Lev	0.00481	0.0104	0.00168	0.00966
	(0.499)	(0.157)	(0.808)	(0.183)
CapInt	0.0133	-0.00480	0.0159**	-0.00248
	(0.103)	(0.127)	(0.040)	(0.259)
Loss	0.0110**	0.00241	0.0121**	0.00271*
	(0.025)	(0.163)	(0.016)	(0.075)
ROA	0.00532	-0.0402	0.00770	-0.0502
	(0.807)	(0.348)	(0.745)	(0.266)
IntCov	0.0000419*	-0.0000133**	0.0000425*	-0.0000122**
	(0.097)	(0.018)	(0.083)	(0.025)
VOL	-0.00159	0.000703	0.000899	-0.000535
	(0.692)	(0.698)	(0.781)	(0.810)
M_t_B	-0.000135*	0.00196**	-0.0000174	0.00185**
	(0.076)	(0.047)	(0.818)	(0.045)
Return_t1	-0.0104	0.00507	-0.00460	0.00351
	(0.218)	(0.443)	(0.551)	(0.516)
Beta	-0.000845	0.00106	0.00186	0.00429*
	(0.861)	(0.681)	(0.652)	(0.091)
Inst_Own_Per	0.0000854***	0.0000141	0.0000875***	0.0000255
	(0.002)	(0.718)	(0.002)	(0.443)
Australia	0	0	0	0
	(.)	(.)	(.)	(.)
Europe	0	0	0	0
	(.)	(.)	(.)	(.)
_cons	-0.104**	0.0763	-0.100**	0.0707

	(0.023)	(0.146)	(0.014)	(0.210)
R^2	0.394	0.755	0.421	0.765
N	773	541	773	541

Table 10

This table summarizes the relationship between firms' environmental management and the cost of debt financing across regions. I regress the logarithm of the spread between the yield maturity of a bond and the corresponding government rate of the same maturity on the environmental management measure and an array of control variables. All models include year and industry fixed effects. The robust Standard Errors are cluster at the firm level. (1) and (3) use European data while (2) and (4) use Japanese industries data. P-value are reported in the parenthesis below the coefficient. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	(1) LnSpread	(2) LnSpread	(3) LnSpread	(4) LnSpread
Env_Ter2	-0.000804	0.000338		
	(0.621)	(0.869)		
Env_Ter3	-0.00110	-0.00180		
	(0.613)	(0.307)		
Soc_Ter2	-0.000894	-0.000330		
	(0.823)	(0.771)		
Soc_Ter3	-0.00115	0.00000247		
	(0.794)	(0.999)		
Gov_Ter2	-0.00501***	-0.000516		
	(0.008)	(0.648)		
Gov_Ter3	-0.00601***	0.00165		
	(0.007)	(0.215)		
Env_Quart2			-0.00423**	0.00122
			(0.048)	(0.587)
Env_Quart3			-0.00772***	-0.0000813
			(0.004)	(0.966)
Env_Quart4			-0.00817***	-0.00192
			(0.004)	(0.302)
Gov_Quart2			-0.00609***	-0.000318
			(0.004)	(0.730)
Gov_Quart3			-0.00204	-0.000122
			(0.413)	(0.907)
Gov_Quart4			-0.00481*	0.00229
			(0.056)	(0.111)
Soc_Quart2			0.00565**	-0.00205
			(0.040)	(0.174)
Soc_Quart3			0.00226	-0.000458
			(0.477)	(0.820)

Soc_Quart4			0.00435	0.000273
			(0.161)	(0.878)
Maturity_Years	0.000910***	0.000561***	0.000874***	0.000580***
	(0.000)	(0.000)	(0.000)	(0.000)
Issue_Size	0.00178***	-0.00519***	0.00159***	-0.00514***
	(0.002)	(0.000)	(0.002)	(0.000)
Callable_Dummy	-0.0000668	0.0339***	-0.000417	0.0343***
	(0.978)	(0.000)	(0.876)	(0.000)
Seniority_Dummy	0	-0.00440*	0	-0.00446*
	(.)	(0.074)	(.)	(0.089)
Putable_Dummy	0	0	0	0
	(.)	(.)	(.)	(.)
Speculative	0.00699	-0.00513	0.00618	-0.00553
	(0.165)	(0.462)	(0.177)	(0.418)
Firm_Size	0.00233	0.00160	0.00385***	0.00183
	(0.107)	(0.379)	(0.008)	(0.344)
Credit_Rating	0.00211**	-0.0000330	0.00257***	-0.0000964
	(0.031)	(0.914)	(0.008)	(0.715)
Lev	0.00394	0.0125**	0.00303	0.0126**
	(0.612)	(0.042)	(0.681)	(0.045)
CapInt	0.0120	-0.00486*	0.0109	-0.00612*
	(0.136)	(0.076)	(0.201)	(0.065)
Loss	0.0112**	0.00163	0.0109**	0.00120
	(0.024)	(0.369)	(0.027)	(0.543)
ROA	0.00497	-0.0366	0.0115	-0.0410
	(0.828)	(0.344)	(0.583)	(0.335)
IntCov	0.0000393	-0.0000120**	0.0000404	-0.0000131**
	(0.109)	(0.025)	(0.108)	(0.020)
VOL	-0.00145	0.000973	-0.00000813	0.00129
	(0.701)	(0.596)	(0.998)	(0.520)
M_t_B	-0.000168**	0.00199*	-0.000135*	0.00182**
	(0.032)	(0.070)	(0.083)	(0.032)
Return_t1	-0.00888	0.00600	-0.0114	0.00587
	(0.278)	(0.381)	(0.181)	(0.363)

Beta	-0.00138	0.00153	-0.00374	0.000704
	(0.764)	(0.528)	(0.448)	(0.782)
Inst_Own_Per	0.0000725**	0.00000988	0.000120***	-0.00000291
	(0.021)	(0.782)	(0.000)	(0.935)
_cons	-0.101**	0.0760	-0.130***	0.0771
	(0.032)	(0.122)	(0.003)	(0.103)
R^2	0.397	0.755	0.416	0.761
N	773	541	773	541

Table 11

This table summarises the relationship between firms' environmental management and the credit rating. I used a probit regression between a dummy variable that takes value of one when a firm' rating is in the upper half rating of the sample and EPs measures, Credit_Rating_Half, and the environmental management measure and an array of control variables. All models include year and industry fixed effects. The robust Standard Errors are cluster at the firm level. (1) uses the decomposition of the ESG combined scores. (2) uses the decomposition of the each ESG scores. (3) sorts the firms in terciles according to their ESG scores and (4) sorts the firms in quartiles according to ESG scores. P-value are reported in the parenthesis below the coefficient. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	(1) Credit_Rating_ Half	(2) Credit_Rating_ Half	(3) Credit_Rating_ Half	(4) Credit_Rating_ Half
Environmental_Score	0.0368***			
	(0.000)			
Social_Score	-0.0104***			
	(0.002)			
Governance_Score	-0.000562			
	(0.799)			
Emissions_Score		0.0242***		
		(0.000)		
Resourceuse_Score		-0.000902		
		(0.789)		
Innovation_Score		0.0131***		
		(0.000)		
WorkforceScore		-0.0171***		
		(0.000)		
HumanRightsScore		0.00332**		
		(0.049)		
CommunityScore		0.000183		
		(0.932)		
ProductResponsibility Score		0.000119		
		(0.956)		
ManagementScore		-0.00368**		
		(0.042)		
ShareholdersScore		-0.000156		
		(0.927)		
CSRStrategyScore		0.0132***		
		(0.000)		
Env_Ter2			0.427***	

			(0.000)	
Env_Ter3			1.005***	
			(0.000)	
Soc_Ter2			0.234*	
			(0.052)	
Soc_Ter3			-0.392***	
			(0.005)	
Gov_Ter2			-0.0234	
			(0.825)	
Gov_Ter3			-0.0652	
			(0.558)	
Env_Quart2				-0.0277
				(0.835)
Env_Quart3				0.438***
				(0.001)
Env_Quart4				0.993***
				(0.000)
Soc_Quart2				0.184
				(0.216)
Soc_Quart3				0.00374
				(0.980)
Soc_Quart4				-0.432***
				(0.009)
Gov_Quart2				-0.0360
				(0.769)
Gov_Quart3				0.0281
				(0.825)
Gov_Quart4				-0.189
				(0.150)
Maturity_Years	-0.0349***	-0.0305***	-0.0374***	-0.0388***
	(0.000)	(0.000)	(0.000)	(0.000)
Issue_Size	-0.159***	-0.156***	-0.159***	-0.163***
	(0.000)	(0.000)	(0.000)	(0.000)
Callable_Dummy	0.495***	0.522***	0.465***	0.449***
	(0.002)	(0.002)	(0.005)	(0.007)
Seniority_Dummy	-2.010***	-2.024***	-1.976***	-1.715***
	(0.000)	(0.000)	(0.000)	(0.000)

Putable_Dummy	0 (.)	0 (.)	0 (.)	0 (.)
Firm_Size	-0.661***	-0.746***	-0.625***	-0.596***
	(0.000)	(0.000)	(0.000)	(0.000)
Lev	5.561***	5.937***	5.505***	5.321***
	(0.000)	(0.000)	(0.000)	(0.000)
CapInt	-0.545**	-0.0162	-0.640***	-0.588**
	(0.012)	(0.946)	(0.004)	(0.010)
ROA	-2.896	-1.690	-2.485	-2.448
	(0.136)	(0.397)	(0.221)	(0.221)
IntCov	-0.0159***	-0.0151***	-0.0174***	-0.0157***
	(0.000)	(0.000)	(0.000)	(0.000)
VOL	1.341***	1.434***	1.238***	1.349***
	(0.000)	(0.000)	(0.000)	(0.000)
M_t_B	-0.0947***	-0.0802**	-0.101***	-0.0850**
	(0.004)	(0.029)	(0.002)	(0.012)
Return_t1	-0.439	-0.371	-0.460	-0.754
	(0.457)	(0.546)	(0.440)	(0.209)
Beta	-0.546***	-0.318*	-0.613***	-0.667***
	(0.001)	(0.085)	(0.001)	(0.000)
Inst_Own_Per	0.00635***	0.00820***	0.00646***	0.00722***
	(0.007)	(0.001)	(0.006)	(0.003)
_cons	20.48***	21.65***	21.02***	21.10***
	(0.000)	(0.000)	(0.000)	(0.000)
pseudo R^2	0.363	0.403	0.375	0.379
N	1347	1347	1347	1347

Table 12

This tables summarizes the marginal effects for the credit rating analysis. The marginal effects indicate the probability of a firm having a particular credit rating given a change in an explanatory variable while holding the explanatory variables fixed at their mean. P-value are reported in the parenthesis below the coefficient. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	AA-/Aa3	A+/A1	A/A2	A-/A3	BBB+/Baa1	BBB/Baa2	BBB-/Baa3	BB+/Ba1	BB/Ba2
Environmental_Score	7.57e-09	-0.03**	-0.0007	-0.0167***	0.0146***	0.00285	0.00347**	-0.00014	-2.06e-06
	(0.713)	(0.023)	(0.115)	(0.000)	(0.000)	(0.174)	(0.011)	(0.467)	(0.743)
Social_Score	-3.27e-08	0.00253**	0.00150**	-0.00262	0.00619***	-0.00618***	-0.00198*	-0.000013	1.40e-07
	(0.716)	(0.021)	(0.018)	(0.104)	(0.000)	(0.000)	(0.07)	(0.461	(0.853)
Governance_Score	-9.88e-10	.0000471	.0021437***	.0010647	.0020934**	-.0052691***	-.00003	.0000284	-1.25e-06
	(0.818)	(0.94)	(0.008)	(0.323)	(0.013)	(0.000)	(0.969)	(0.433)	(0.744)
Maturity_Years	4.01e-08	.0038455**	.0018909**	.0050342	-.0029665	-.0014151	-.0058986**	-7.84e-06	1.45e-06
	(0.718)	(0.038)	(0.028)	(0.132)	(0.22)	(0.714)	(0.028)	(0.627)	(0.754)
Issue_Size	4.67e-07	0.0248395***	.0148113***	.0203138*	-.0203392***	.0095734	-.0399794***	-.0000229	-5.77e-06
	(0.717)	(0.001)	(0.008)	(0.094)	(0.01)	(0.42)	(0.000)	(0.557)	(0.758)
Firm_Size	1.06e-06	.0201066	.0405163**	.2944976***	.0053129	-.2085187***	-.1332923***	.0002168	-6.84e-06
	(0.715)	(0.305)	(0.013)	(0.000)	(0.771)	(0.000)	(0.000)	(0.467)	(0.778)
Lev	-6.72e-06	-.4781104***	-.0806344	-2.264959***	.6139115***	1.621758***	.47642***	.0024934	-.0001069
	(0.713)	(0.001)	(0.127)	(0.000)	(0.000)	(0.000)	(0.004)	(0.433)	(0.722)
CapInt	2.59e-06	.4916758***	.1372799**	-1.615374***	-.1929678*	.9791056***	.2447809***	-.0004057	.0000148
	(0.72)	(0.000)	(0.016)	(0.000)	(0.059)	(0.000)	(0.008)	(0.528)	(0.813)
ROA	.0000154	.1821596	0.1525113**	-0.4131129***	0.1758312***	0.2614823***	-1.605656***	.0062176	-.0006597
	(0.72)	(0.762)	(0.013)	(0.000)	(0.005)	(0.004)	(0.002)	(0.436)	(0.752)
IntCov	5.16e-09	.0019743**	.000562*	-.0021143	.000667	.0038737**	-.0041382***	-.0000687	-2.64e-06
	(0.736)	(0.023)	(0.076)	(0.19)	(0.555)	(0.022)	(0.001)	(0.416)	(0.726)
VOL	9.93e-08	-.0969441*	.0279449	-.0514383	-.1202356*	.076943	.1447783**	.0007114	.0001047
	(0.777)	(0.073)	(0.112)	(0.562)	(0.07)	(0.396)	(0.017)	(0.46)	(0.755)
M_t_B	1.19e-08	.0125827	-.0016202	.1013839***	-.0106209	-.06917***	-.0338059***	-4.57e-06	8.96e-06
	(0.898)	(0.149)	(0.661)	(0.000)	(0.143)	(0.000)	(0.000)	(0.923)	(0.748)
Return_t1	-7.81e-07	-.1690557	.0051692	.0616145	-.2241429	.3876677	-.0665648	-.001265	-.0000195
	(0.732)	(0.288)	(0.905)	(0.814)	(0.263)	(0.16)	(0.69)	(0.468)	(0.827)
Beta	-1.71e-06	.2028768***	.0472046**	-.1514849*	-.3414614***	-.0118104	.2083644***	.0014544	.0000566
	(0.716)	(0.000)	(0.041)	(0.079)	(0.000)	(0.887)	(0.000)	(0.427)	(0.739)

Table 13

This tables summarizes the marginal effects for the credit rating analysis. The marginal effects indicate the probability of a firm having a particular credit rating category given a change in an explanatory variable while holding the explanatory variables fixed at their mean. The credit ratings are sorted in three categories: Low quality (BB+(Ba1) and lower), Medium quality (BBB- to BBB+ (Baa3 to Baa1)) and High quality (A-(A3) and higher). P-value are reported in the parenthesis below the coefficient.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	High quality	Medium quality	Low quality
Environmental_Score	-.0165699	.0162194	0003504
	(-0.000)	(0.000)	(0.669)
Social_Score	.0005496	.0011673	-.0017169
	(0.68)	(0.352)	(0.012)
Governance_Score	-.0001606	-.0015728	.0017334
	(-0.857)	(0.061)	(0.000)
Maturity_Years	.0139755	-.0087217	-.0052538
	(0.000)	(0.002)	(0.002)
Issue_Size	.0663398	-.0410744	-.0252654
	(0.000)	(0.000)	(0.000)
Firm_Size	.2695103	-.1865347	-.0829755
	(0.000)	(0.000)	(0.000)
Lev	-2.23073	1.722842	.5078874
	(0.000)	(0.000)	(0.000)
CapInt	-.0141851	-.002968	.0171531
	(0.868)	(0.0972)	(0.704)
ROA	-.4156365	1.323641	-.9080034
	(0.622)	(0.089)	(0.005)
IntCov	.0052167	-.0001353	-.0050814
	(0.000)	(0.915)	(0.000)
VOL	-.2790061	.0839901	.1950158
	(0.000)	(0.257)	(0.000)
M_t_B	.0577385	-.0458192	-.0119192
	(0.001)	(0.000)	(0.016)
Return_t1	.047349	.1191947	-.1665435
	(0.839)	(0.592)	(0.107)
Beta	.214358	-.3836362	.169278
	(0.002)	(0.000)	(0.000)

Table 14
This table summarizes the correlation between the three ESG factors.

	Environmental_Score	Social_Score	Governance_Score
Environmental_Score	1.000		
Social_Score	0.2578	1.000	
Governance_Score	0.1493	0.1971	1.000

Table 15

This table summarizes the relationship between firms' social and governance performance and the cost of debt financing. I regress the logarithm of the spread between the yield maturity of a bond and the corresponding government rate of the same maturity on the social and governance measure and an array of control variables. All models include year and industry fixed effects. The robust Standard Errors are cluster at the firm level. (1) does not include any ESG factors, (2) includes the ES, (3) includes the social score, (4) includes the governance score and (5) includes the three ESG factors. P-value are reported in the parenthesis below the coefficient. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	(1) LnSpread	(2) LnSpread	(3) LnSpread	(4) LnSpread	(5) LnSpread
Environmental_Score		-0.000205***			-0.000199***
		(0.001)			(0.002)
Social_Score			-0.0000672		-0.0000261
			(0.266)		(0.683)
Governance_Score				-0.0000400	-0.0000365
				(0.288)	(0.301)
Maturity_Years	0.000859***	0.000827***	0.000863***	0.000852***	0.000820***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Issue_Size	0.00000641	0.000111	0.000193	0.000208	0.000103
	(0.994)	(0.899)	(0.830)	(0.814)	(0.907)
Callable_Dummy	0.00639	0.00718*	0.00690*	0.00690*	0.00718*
	(0.111)	(0.072)	(0.086)	(0.086)	(0.071)
Seniority_Dummy	-0.000719	-0.000235	-0.00153	-0.000973	-0.00109
	(0.828)	(0.949)	(0.662)	(0.783)	(0.766)
Putable_Dummy	0	0.0210*	0.0222*	0.0206*	0.0201*
	(.)	(0.081)	(0.080)	(0.090)	(0.086)
Speculative	0.0147***	0.0119***	0.0134***	0.0144***	0.0121***
	(0.002)	(0.009)	(0.005)	(0.004)	(0.009)
Firm_Size	0.00316***	0.00397***	0.00378***	0.00357***	0.00411***
	(0.008)	(0.003)	(0.005)	(0.005)	(0.003)
Credit_Rating	0.00200***	0.00228***	0.00215***	0.00211***	0.00216***
	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)
Lev	-0.000365	-0.00204	-0.000674	-0.000857	-0.00163
	(0.965)	(0.804)	(0.933)	(0.914)	(0.840)
CapInt	0.00148	0.00322	0.00240	0.00276	0.00289
	(0.696)	(0.444)	(0.554)	(0.484)	(0.498)
Loss	0.00842**	0.00820**	0.00788**	0.00773**	0.00783**
	(0.014)	(0.028)	(0.029)	(0.031)	(0.030)
ROA	0.0360**	0.0295	0.0298	0.0302	0.0299
	(0.047)	(0.192)	(0.206)	(0.211)	(0.192)

IntCov	9.36e-08	0.00000447	0.00000395	0.00000267	0.00000472
	(0.985)	(0.468)	(0.491)	(0.667)	(0.434)
VOL	0.000399	0.00254	0.00254	0.00254	0.00308
	(0.891)	(0.446)	(0.456)	(0.434)	(0.331)
M_t_B	-0.0000888	-0.000164*	-0.000172*	-0.000178*	-0.000170*
	(0.210)	(0.077)	(0.058)	(0.051)	(0.070)
Return_t1	-0.000795	0.000104	0.00205	0.00256	0.000152
	(0.873)	(0.987)	(0.758)	(0.699)	(0.981)
Beta	-0.00442	-0.00452	-0.00575	-0.00658*	-0.00465
	(0.253)	(0.240)	(0.141)	(0.089)	(0.219)
Inst_Own_Per	0.0000667**	0.0000583*	0.0000423	0.0000425	0.0000549*
	(0.021)	(0.062)	(0.174)	(0.173)	(0.065)
Australia	0	0.0430***	0.0440***	0.0439***	0.0442***
	(.)	(0.000)	(0.000)	(0.000)	(0.000)
Europe	0.00278	0.00368	0.00546	0.00425	0.00414
	(0.583)	(0.459)	(0.260)	(0.412)	(0.373)
_cons	-0.0855**	-0.0817**	-0.0900**	-0.0860**	-0.0787**
	(0.012)	(0.018)	(0.013)	(0.011)	(0.015)
R^2	0.336	0.386	0.374	0.374	0.387
N	1314	1348	1348	1348	1348

Table 16

This table summarizes the relationship between firms' social and governance performance and the cost of debt financing. I regress the logarithm of the spread between the yield maturity of a bond and the corresponding government rate of the same maturity on the social and governance measure and an array of control variables. All models include year and industry fixed effects. The robust Standard Errors are cluster at the firm level. (1) uses the tercile decomposition of the social performance, (2) uses the quartile decomposition of the social performance, (3) uses the tercile decomposition of the governance performance, (4) uses the quartile decomposition of the governance performance. P-value are reported in the parenthesis below the coefficient. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	(1) LnSpread	(2) LnSpread	(3) LnSpread	(4) LnSpread
Soc_Ter2	-0.00249			
	(0.165)			
Soc_Ter3	-0.00211			
	(0.352)			
Soc_Quart2		-0.00222		
		(0.190)		
Soc_Quart3		-0.00391*		
		(0.099)		
Soc_Quart4		-0.00149		
		(0.574)		
Gov_Ter2			-0.00380**	
			(0.023)	
Gov_Ter3			-0.00289*	
			(0.085)	
Gov_Quart2				-0.00360*
				(0.098)
Gov_Quart3				-0.00267
				(0.211)
Gov_Quart4				-0.00275
				(0.233)
Maturity_Years	0.000864***	0.000870***	0.000855***	0.000861***
	(0.000)	(0.000)	(0.000)	(0.000)
Issue_Size	0.000212	0.000119	0.000223	0.000224
	(0.812)	(0.894)	(0.799)	(0.800)
Callable_Dummy	0.00595	0.00651*	0.00724*	0.00695*
	(0.110)	(0.098)	(0.073)	(0.083)
Seniority_Dummy	-0.00126	-0.00118	-0.00135	-0.00110
	(0.695)	(0.733)	(0.688)	(0.759)
Putable_Dummy	0.0222*	0.0189	0.0224*	0.0228*

	(0.086)	(0.144)	(0.062)	(0.071)
Speculative	0.0132***	0.0130***	0.0143***	0.0143***
	(0.005)	(0.003)	(0.004)	(0.004)
Firm_Size	0.00351***	0.00369***	0.00356***	0.00339***
	(0.005)	(0.005)	(0.004)	(0.006)
Credit_Rating	0.00214***	0.00228***	0.00214***	0.00213***
	(0.001)	(0.001)	(0.001)	(0.001)
Lev	0.00144	-0.000563	-0.00181	-0.00215
	(0.855)	(0.946)	(0.812)	(0.777)
CapInt	0.00196	0.00179	0.00284	0.00345
	(0.625)	(0.679)	(0.444)	(0.366)
Loss	0.00805**	0.00761**	0.00709**	0.00757**
	(0.025)	(0.038)	(0.048)	(0.033)
ROA	0.0340	0.0270	0.0280	0.0280
	(0.119)	(0.243)	(0.236)	(0.238)
IntCov	0.00000535	0.00000451	0.00000411	0.00000341
	(0.349)	(0.447)	(0.517)	(0.591)
VOL	0.00287	0.00269	0.00292	0.00209
	(0.387)	(0.421)	(0.355)	(0.511)
M_t_B	-0.0000263	-0.000181*	-0.000203**	-0.000192**
	(0.182)	(0.051)	(0.026)	(0.033)
Return_t1	0.00168	0.00235	0.00276	0.00226
	(0.796)	(0.721)	(0.679)	(0.737)
Beta	-0.00602	-0.00622	-0.00657*	-0.00610
	(0.108)	(0.114)	(0.091)	(0.117)
Inst_Own_Per	0.0000452*	0.0000496	0.0000445	0.0000473
	(0.096)	(0.106)	(0.167)	(0.134)
Australia	0.0439***	0.0444***	0.0439***	0.0431***
	(0.000)	(0.000)	(0.000)	(0.000)
Europe	0.00535	0.00455	0.00427	0.00420
	(0.283)	(0.355)	(0.400)	(0.411)
_cons	-0.0845**	-0.0875**	-0.0842**	-0.0839**
	(0.017)	(0.017)	(0.012)	(0.012)
R^2	0.370	0.377	0.379	0.377
N	1380	1348	1348	1348

Table 17

This table summarises the relationship between firms' ESG performance and the cost of debt financing across Credit rating. I regress the logarithm of the spread between the yield maturity of a bond and the corresponding government rate of the same maturity on ESG measures and an array of control variables. All models include year and industry fixed effects. The robust Standard Errors are cluster at the firm level. (1) uses Low quality (BB+(Ba1) and lower) bonds, (2) uses Medium quality (BBB- to BBB+ (Baa3 to Baa1)) bonds, (3) uses and High quality (A-(A3) and higher) bonds. P-value are reported in the parenthesis below the coefficient. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	(1) LnSpread	(2) LnSpread	(3) LnSpread
Environmental_Score	-0.000209***	-0.0000978	0.000187
	(0.000)	(0.294)	(0.293)
Social_Score	0.000140**	0.000128**	-0.000278**
	(0.017)	(0.035)	(0.046)
Governance_Score	-0.0000128	-0.000122**	0.000151
	(0.767)	(0.037)	(0.226)
Maturity_Years	0.000700***	0.000670***	0.00119***
	(0.000)	(0.003)	(0.008)
Issue_Size	-0.00102	0.000116	-0.00290*
	(0.219)	(0.911)	(0.065)
Callable_Dummy	0.00370	0.00242	0.0170***
	(0.425)	(0.500)	(0.001)
Seniority_Dummy	-0.00150	0	-0.0257
	(0.546)	(.)	(0.127)
Putable_Dummy	0	0	-0.00916
	(.)	(.)	(0.650)
Speculative	0	0	0.00159
	(.)	(.)	(0.877)
Firm_Size	0.000319	0.00384**	0.00648
	(0.852)	(0.010)	(0.242)
Credit_Rating	-0.000773	0.00228	0.00201
	(0.213)	(0.431)	(0.790)
Lev	0.0210**	0.00495	-0.0331
	(0.036)	(0.579)	(0.179)
CapInt	-0.00515	0.0133*	0.0295*
	(0.158)	(0.094)	(0.089)
Loss	0.00403	-0.00220	0.0181**
	(0.135)	(0.522)	(0.011)
ROA	0.0641*	0.0528**	-0.0312
	(0.094)	(0.031)	(0.494)

IntCov	0.00000537	0.0000542*	0.000168
	(0.268)	(0.079)	(0.491)
VOL	-0.00143	0.00221	0.00927**
	(0.652)	(0.609)	(0.019)
M_t_B	-0.00213*	-0.0000164	0.00143
	(0.065)	(0.264)	(0.307)
Return_t1	-0.000246	-0.00442	0.00882
	(0.960)	(0.750)	(0.488)
Beta	0.00235	-0.00783*	0.0213
	(0.428)	(0.057)	(0.101)
Inst_Own_Per	0.0000491**	0.0000759**	0.0000252
	(0.044)	(0.040)	(0.662)
Australia	0.0380***	0.0301***	0.0646***
	(0.000)	(0.000)	(0.000)
Europe	-0.00208	0.00894**	-0.0134**
	(0.655)	(0.044)	(0.013)
_cons	0.0128	-0.0942**	-0.0303
	(0.719)	(0.048)	(0.767)
R^2	0.478	0.345	0.747
N	734	406	227

Table 18

This table summarizes the relationship between firms' environmental management and the cost of debt financing across country of issue. I regress the logarithm of the spread between the yield maturity of a bond and the corresponding government rate of the same maturity on the environmental management measure and an array of control variables. All models include year and industry fixed effects. The robust Standard Errors are cluster at the firm level. (1) and (3) use bonds issue in Europe while (2) and (4) use bonds issued in Japan. P-value are reported in the parenthesis below the coefficient. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	(1) LnSpread	(2) LnSpread	(3) LnSpread	(4) LnSpread
Environmental_Score	-0.000173*	0.000000227		
	(0.070)	(0.995)		
Social_Score	-0.00000109	-0.0000880**		
	(0.990)	(0.029)		
Governance_Score	-0.000103*	0.0000138		
	(0.064)	(0.323)		
Emissions_Score			-0.0000590	-0.0000368*
			(0.334)	(0.056)
Innovation_Score			-0.0000885**	-0.00000233
			(0.039)	(0.880)
Resourceuse_Score			-0.0000314	0.0000433*
			(0.598)	(0.087)
WorkforceScoreInthelast11F			-0.0000213	-0.0000520**
			(0.625)	(0.045)
HumanRightsScoreInthelast1			0.0000221	-0.00000816
			(0.550)	(0.479)
CommunityScoreInthelast11F			-0.0000440	-0.0000275
			(0.212)	(0.172)
ProductResponsibilityScoreIn			0.0000786*	-0.00000438
			(0.088)	(0.757)
ManagementScoreInthelast11			-0.0000565	0.0000162
			(0.218)	(0.346)
ShareholdersScoreInthelast1			0.00000745	-0.0000102
			(0.850)	(0.612)
CSRStrategyScoreInthelast1			-0.000140**	0.0000366
			(0.013)	(0.273)
Maturity_Years	0.000910***	0.000675***	0.000875***	0.000696***
	(0.000)	(0.000)	(0.000)	(0.000)
Issue_Size	0.00183***	0.000969*	0.00167**	0.000894**
	(0.009)	(0.057)	(0.011)	(0.023)

Callable_Dummy	0.00143	0	0.00234	0
	(0.572)	(.)	(0.363)	(.)
Seniority_Dummy	0	-0.00162	0	-0.00211
	(.)	(0.351)	(.)	(0.335)
Putable_Dummy	0	0	0	0
	(.)	(.)	(.)	(.)
Speculative	0.00874	0.00843	0.00849	0.00808
	(0.146)	(0.111)	(0.139)	(0.140)
Firm_Size	0.00359**	-0.00123	0.00440***	-0.00133
	(0.019)	(0.259)	(0.006)	(0.252)
Credit_Rating	0.00220*	-0.00000679	0.00204**	-0.0000984
	(0.050)	(0.978)	(0.035)	(0.746)
Lev	0.00876	0.0182***	0.00928	0.0174***
	(0.288)	(0.000)	(0.286)	(0.000)
CapInt	0.0164*	-0.00520**	0.0212**	-0.00437**
	(0.071)	(0.018)	(0.014)	(0.022)
Loss	0.00994**	0.00377***	0.0107**	0.00377**
	(0.042)	(0.005)	(0.030)	(0.012)
ROA	0.0286	0.00615	0.0346	-0.00331
	(0.187)	(0.819)	(0.139)	(0.905)
IntCov	0.0000179	-0.00000252	0.0000199	-0.00000211
	(0.604)	(0.447)	(0.571)	(0.541)
VOL	-0.000591	0.000802	0.000577	0.000125
	(0.881)	(0.512)	(0.861)	(0.940)
M_t_B	-0.000118	-0.000553	-0.00000461	-0.000615
	(0.141)	(0.472)	(0.954)	(0.370)
Return_t1	-0.00877	0.00155	-0.00469	0.000654
	(0.323)	(0.568)	(0.586)	(0.771)
Beta	-0.00111	-0.00169	0.00108	-0.000836
	(0.832)	(0.341)	(0.826)	(0.630)
Inst_Own_Per	0.0000807***	-0.0000235	0.0000757***	-0.0000271
	(0.005)	(0.371)	(0.009)	(0.324)
Australia	-0.0196*	0	-0.0186*	0
	(0.051)	(.)	(0.070)	(.)
Europe	-0.0426***	0.0124***	-0.0430***	0.0126**
	(0.000)	(0.009)	(0.000)	(0.011)
_cons	-0.0820*	0.0147	-0.0884*	0.0130

	(0.092)	(0.642)	(0.054)	(0.707)
R^2	0.468	0.654	0.483	0.665
N	802	532	802	532

Table 19

This table summarizes the relationship between firms' environmental management and the cost of debt financing across country of issue. I regress the logarithm of the spread between the yield maturity of a bond and the corresponding government rate of the same maturity on the environmental management measure and an array of control variables. All models include year and industry fixed effects. The robust Standard Errors are cluster at the firm level. (1) and (3) use bonds issue in Europe while (2) and (4) use bonds issued in Japan. P-value are reported in the parenthesis below the coefficient. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	(1) LnSpread	(2) LnSpread	(3) LnSpread	(4) LnSpread
Env_Ter2	-0.000707	0.000179		
	(0.664)	(0.909)		
Env_Ter3	-0.000919	0.000558		
	(0.669)	(0.731)		
Soc_Ter2	-0.00411	-0.00130		
	(0.290)	(0.113)		
Soc_Ter3	-0.00237	-0.00170		
	(0.594)	(0.220)		
Gov_Ter2	-0.00578***	0.000151		
	(0.006)	(0.847)		
Gov_Ter3	-0.00675***	0.000215		
	(0.002)	(0.802)		
Env_Quart2			-0.00293	0.000802
			(0.227)	(0.533)
Env_Quart3			-0.00834***	0.000921
			(0.006)	(0.526)
Env_Quart4			-0.00948***	0.00142
			(0.001)	(0.330)
Gov_Quart2			0.00112	-0.00318***
			(0.722)	(0.004)
Gov_Quart3			-0.00210	-0.00372**
			(0.558)	(0.035)
Gov_Quart4			0.00140	-0.00263
			(0.713)	(0.132)
Soc_Quart2			-0.00427**	0.000202
			(0.023)	(0.682)
Soc_Quart3			0.000196	0.0000696
			(0.926)	(0.915)
Soc_Quart4			-0.00293	0.000802
			(0.227)	(0.533)

Maturity_Years	0.000909***	0.000676***	0.000877***	0.000681***
	(0.000)	(0.000)	(0.000)	(0.000)
Issue_Size	0.00188***	0.00101**	0.00169**	0.00110***
	(0.007)	(0.040)	(0.012)	(0.009)
Callable_Dummy	0.00162	0	0.00137	0
	(0.513)	(.)	(0.622)	(.)
Seniority_Dummy	0	-0.00100	0	-0.000824
	(.)	(0.557)	(.)	(0.613)
Putable_Dummy	0	0	0	0
	(.)	(.)	(.)	(.)
Speculative	0.00859	0.00883	0.00719	0.00983*
	(0.149)	(0.128)	(0.200)	(0.070)
Firm_Size	0.00298**	-0.00159	0.00435***	-0.00130
	(0.026)	(0.102)	(0.004)	(0.207)
Credit_Rating	0.00211*	-0.0000392	0.00260**	-0.000202
	(0.052)	(0.870)	(0.016)	(0.419)
Lev	0.00782	0.0211***	0.00785	0.0200***
	(0.380)	(0.000)	(0.340)	(0.000)
CapInt	0.0154*	-0.00483**	0.0149	-0.00773***
	(0.092)	(0.014)	(0.121)	(0.003)
Loss	0.0106**	0.00408**	0.00966*	0.00349**
	(0.038)	(0.011)	(0.056)	(0.016)
ROA	0.0295	0.0134	0.0321	0.00536
	(0.176)	(0.587)	(0.141)	(0.853)
IntCov	0.0000147	-0.00000245	0.0000150	-0.00000164
	(0.656)	(0.493)	(0.650)	(0.644)
VOL	-0.000305	0.000890	0.000554	0.00127
	(0.933)	(0.498)	(0.885)	(0.258)
M_t_B	-0.000176**	-0.000522	-0.000127*	-0.000692
	(0.023)	(0.510)	(0.100)	(0.316)
Return_t1	-0.00616	0.00189	-0.00928	0.00186
	(0.476)	(0.488)	(0.296)	(0.500)
Beta	-0.00182	-0.00216	-0.00291	-0.00208
	(0.722)	(0.259)	(0.594)	(0.192)
Inst_Own_Per	0.0000569*	-0.0000294	0.000112***	-0.0000255
	(0.088)	(0.276)	(0.001)	(0.321)

Australia	-0.0217**	0	-0.0161	0
	(0.019)	(.)	(0.119)	(.)
Europe	-0.0437***	0.0123**	-0.0404***	0.0127**
	(0.000)	(0.018)	(0.000)	(0.012)
_cons	-0.0764	0.0164	-0.107**	0.0135
	(0.112)	(0.536)	(0.029)	(0.598)
R^2	0.472	0.643	0.488	0.660
N	802	532	802	532

Table 20

This table summarizes the relationship between firms' environmental management and the cost of debt financing while controlling for the performance in the year prior the bond issue. I regress the logarithm of the spread between the yield maturity of a bond and the corresponding government rate of the same maturity on the environmental management measure and an array of control variables. All models include year and industry fixed effects. The robust Standard Errors are cluster at the firm level. (1) uses the decomposition of the ESG combined scores. (2) uses the decomposition of the each ESG scores. P-value are reported in the parenthesis below the coefficient. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

	(1) LnSpread	(2) LnSpread	(3) LnSpread	(4) LnSpread
Environmental_Score	-0.000243***		-0.000252**	-0.000313**
	(0.003)		(0.023)	(0.022)
Envirmental_Score_t+1			0.0000280	-0.0000139
			(0.709)	(0.864)
Envirmental_Score_t+2				0.000178
				(0.120)
Social_Score	-0.0000268		-0.0000211	-0.0000227
	(0.674)		(0.758)	(0.731)
Governance_Score	-0.0000349		-0.0000190	0.0000184
	(0.321)		(0.675)	(0.672)
Environmental_Score_t_1	0.0000527			
	(0.474)			
Emissions_Score		-0.0000706		
		(0.375)		
Resourceuse_Score		-0.0000841		
		(0.339)		
Innovation_Score		-0.0000920***		
		(0.003)		
Emissionst1_Score		-0.0000211		
		(0.797)		
Ressourcet1_Score		0.000111		
		(0.152)		
Innovationt1_Score		-0.0000164		
		(0.550)		
WorkforceScoreInthelast11F		-0.0000258		
		(0.543)		
HumanRightsScoreInthelast1		0.00000304		
		(0.893)		

CommunityScoreInthelast11F		-0.0000383 (0.217)		
ProductResponsibilityScoreIn		0.0000261 (0.378)		
ManagementScoreInthelast11		-0.0000121 (0.709)		
ShareholdersScoreInthelast1		-0.0000106 (0.737)		
CSRStrategyScoreInthelast1		-0.0000258 (0.523)		
Maturity_Years	0.000818***	0.000806***	0.000869***	0.000773***
	(0.000)	(0.000)	(0.000)	(0.000)
Issue_Size	0.0000908	0.0000470	0.000149	0.000420
	(0.917)	(0.956)	(0.873)	(0.615)
Callable_Dummy	0.00719*	0.00748*	0.00781	-0.00240
	(0.071)	(0.053)	(0.190)	(0.508)
Seniority_Dummy	-0.00115	-0.00345	-0.000952	0.000298
	(0.752)	(0.396)	(0.846)	(0.951)
Putable_Dummy	0.0201*	0.0203*	0.0165	0.0162
	(0.086)	(0.066)	(0.111)	(0.119)
Speculative	0.0123***	0.0125***	0.0104**	0.00688
	(0.009)	(0.005)	(0.030)	(0.108)
Firm_Size	0.00407***	0.00410***	0.00402***	0.00278**
	(0.003)	(0.002)	(0.004)	(0.030)
Credit_Rating	0.00217***	0.00223***	0.00265***	0.00238***
	(0.001)	(0.001)	(0.000)	(0.002)
Lev	-0.00137	-0.00301	-0.00173	-0.00384
	(0.866)	(0.718)	(0.842)	(0.649)
CapInt	0.00293	0.00165	0.00528	0.00608
	(0.490)	(0.713)	(0.283)	(0.213)
Loss	0.00775**	0.00763**	0.0101**	0.0109**
	(0.031)	(0.036)	(0.034)	(0.016)
ROA	0.0307	0.0266	0.0283	0.00814
	(0.186)	(0.264)	(0.235)	(0.746)

IntCov	0.00000463	0.00000369	0.00000442	0.00000287
	(0.440)	(0.524)	(0.418)	(0.547)
VOL	0.00307	0.00309	0.00357	0.00487
	(0.331)	(0.286)	(0.439)	(0.263)
M_t_B	-0.000175*	-0.000175	-0.000213*	-0.000179
	(0.063)	(0.113)	(0.059)	(0.127)
Return_t1	0.000231	0.000172	-0.00491	-0.000564
	(0.971)	(0.976)	(0.621)	(0.966)
Beta	-0.00467	-0.00456	-0.00536	-0.00666*
	(0.218)	(0.246)	(0.191)	(0.069)
Inst_Own_Per	0.0000545*	0.0000467	0.0000515	0.0000395
	(0.066)	(0.120)	(0.137)	(0.324)
Australia	0.0442***	0.0436***	0.0474***	0.0482***
	(0.000)	(0.000)	(0.000)	(0.000)
Europe	0.00408	0.00393	0.00384	0.00775*
	(0.382)	(0.358)	(0.439)	(0.055)
_cons	-0.0786**	-0.0770**	-0.0826**	-0.0597*
	(0.015)	(0.018)	(0.020)	(0.093)
R^2	0.388	0.396	0.438	0.433
N	1348	1348	1235	1010

Table 21

This table documents the results of the matched firm approach. The covariates for those approaches are all the control variables besides Callable Dummy, Puttable dummy, Seniority dummy and Loss Dummy. Column (1) and (2) use propensity score matching. (1) consider the upper half distribution of the ES as the treatment group while (2) considers upper quartile of the environmental distribution as the treatment group. Column (3) and (4) use the Nearest-Neighbor matching method according to the Mahalanobis distance. The treatment groups for (3) and (4) are similar to (1) and (2). Column (5) and (6) use the Multivariate-distance kernel matching according to the Mahalanobis distance. The treatment groups for (5) and (6) are similar to (1) and (2). P-values are displayed under the coefficients.

Method	Propensity-score Matching	Propensity-score Matching	Nearest-Neighbor matching	Nearest-Neighbor matching	Multivariate-distance kernel matching	Multivariate-distance kernel matching
Metric	Propensity score	Propensity score	Mahalanobis	Mahalanobis	Mahalanobis	Mahalanobis
Dependent Variable	LnSpread (1)	LnSpread (2)	LnSpread (3)	LnSpread (4)	LnSpread (5)	LnSpread (6)
Average treatment effects						
Env_Half	-0.01221		-0.003318			
	(-9.57)		(-3.73)			
Env_Quart4		-0.00294		-0.003317		
		(-2.53)		(-3.63)		
Average treatment of treated						
Env_Half					-0.00335	
Env_Quart4						-0.003129

Table 22

This table summarises the relationship between firms' environmental management and the cost of debt financing while including firm fixed-effect. I regress the logarithm of the spread between the yield maturity of a bond and the corresponding government rate of the same maturity on the environmental management measure and an array of control variables. All models include year and industry fixed effects. The robust Standard Errors are cluster at the firm level. (1) uses the decomposition of the ESG combined scores. (3) sorts the firms in terciles according to their ESG scores (2) sorts the firms in quartiles according to ESG scores. P-value are reported in the parenthesis below the coefficient. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

	(1) LnSpread	(2) LnSpread	(3) LnSpread
Environmental_Score	-0.000128		
	(0.114)		
Social_Score	-0.00000561		
	(0.933)		
Governance_Score	-0.0000177		
	(0.717)		
Env_Ter2		-0.000624	
		(0.737)	
Env_Ter3		-0.000985	
		(0.608)	
Soc_Ter2		-0.00107	
		(0.562)	
Soc_Ter3		-0.000201	
		(0.937)	
Gov_Ter2		-0.00296	
		(0.116)	
Gov_Ter3		-0.00257	
		(0.267)	
Env_Quart2			-0.00180
			(0.442)
Env_Quart3			-0.00439*
			(0.069)
Env_Quart4			-0.00481**
			(0.023)
Gov_Quart2			-0.00336
			(0.119)
Gov_Quart3			-0.00246
			(0.308)
Gov_Quart4			-0.00121
			(0.638)

Soc_Quart2			0.00167 (0.256)
Soc_Quart3			0.000456 (0.801)
Soc_Quart4			0.00180 (0.490)
Maturity_Years	0.000893***	0.000910***	0.000895***
	(0.000)	(0.000)	(0.000)
Issue_Size	-0.000668	-0.000666	-0.000656
	(0.456)	(0.450)	(0.444)
Callable_Dummy	0.00830*	0.00820*	0.00828*
	(0.051)	(0.052)	(0.056)
Seniority_Dummy	-0.00121	-0.00139	-0.000766
	(0.654)	(0.576)	(0.792)
Putable_Dummy	0.0558***	0.0599***	0.0589***
	(0.000)	(0.000)	(0.000)
Speculative	0.00313	0.00318	0.00468
	(0.402)	(0.432)	(0.196)
Firm_Size	0.00293*	0.00270*	0.00277*
	(0.055)	(0.060)	(0.053)
Credit_Rating	0.00109	0.000890	0.00115
	(0.175)	(0.217)	(0.140)
Lev	0.00433	0.00522	0.00534
	(0.686)	(0.600)	(0.617)
CapInt	-0.00205	-0.00186	0.000546
	(0.734)	(0.750)	(0.933)
Loss	0.00677***	0.00671**	0.00690***
	(0.007)	(0.015)	(0.010)
ROA	0.0158	0.0165	0.0155
	(0.412)	(0.389)	(0.438)
IntCov	0.0000524***	0.0000568***	0.0000552***
	(0.006)	(0.005)	(0.004)
VOL	0.00153	0.00178	0.00115
	(0.578)	(0.504)	(0.640)
M_t_B	-0.0000429	-0.0000859	-0.0000450
	(0.639)	(0.365)	(0.639)

Return_t1	-0.00412	-0.00378	-0.00532
	(0.480)	(0.527)	(0.398)
Beta	0.000861	-0.000657	0.000171
	(0.768)	(0.835)	(0.954)
Inst_Own_Per	0.0000690	0.0000777	0.0000851*
	(0.158)	(0.108)	(0.080)
Australia	0.0196***	0.0193***	0.0179***
	(0.001)	(0.000)	(0.000)
Europe	0.00178	0.00226	0.000592
	(0.693)	(0.622)	(0.892)
_cons	-0.0495	-0.0502	-0.0563*
	(0.165)	(0.140)	(0.096)
R^2	0.490	0.491	0.497
N	1348	1348	1348

Table 23

This table summarizes the relationship between firms' environmental management and the cost of debt financing across environmental score terciles. I regress the logarithm of the spread between the yield maturity of a bond and the corresponding government rate of the same maturity on the environmental management measure and an array of control variables. All models include year and industry fixed effects. The robust Standard Errors are cluster at the firm level. This table uses the ESG combined scores. The dataset has been divided into 3 terciles: (1) Bonds in the first tercile of the ES distribution (2) Bonds in the second tercile of the ES distribution and (3) Bonds in the first third of the ES distribution, the third being composed of the firms with the highest ES. P-value are reported in the parenthesis below the coefficient.

	(1) LnSpread	(2) LnSpread	(3) LnSpread
Environmental_Score	-0.000366***	-0.000550	-0.000121
	(0.004)	(0.136)	(0.592)
Social_Score	-0.00000604	-0.0000764	-0.000149*
	(0.960)	(0.376)	(0.059)
Governance_Score	0.0000454	-0.0000400	-0.0000740
	(0.433)	(0.507)	(0.132)
Maturity_Years	0.00115***	0.000434***	0.000585***
	(0.000)	(0.007)	(0.001)
Issue_Size	-0.000856	-0.00187	0.000700
	(0.529)	(0.141)	(0.321)
Callable_Dummy	0.00738	0.00648	0.00636*
	(0.136)	(0.433)	(0.063)
Seniority_Dummy	0.000271	-0.00478	0.000828
	(0.968)	(0.368)	(0.849)
Putable_Dummy	0.0419***	0	0
	(0.005)	(.)	(.)
Speculative	0.00385	0.0211***	0.0113
	(0.585)	(0.000)	(0.106)
Firm_Size	0.00211	0.00427***	0.00338**
	(0.259)	(0.001)	(0.040)
Credit_Rating	0.00168	-0.000659	0.00253***
	(0.235)	(0.422)	(0.003)
Lev	0.0536***	0.00653	-0.0201*
	(0.000)	(0.661)	(0.058)
CapInt	0.00383	-0.00354	0.0124**
	(0.550)	(0.490)	(0.036)

Loss	0.00255	0.00632*	0.0156**
	(0.684)	(0.068)	(0.028)
ROA	0.0194	0.0555*	0.0695***
	(0.476)	(0.084)	(0.008)
IntCov	0.000113***	-0.0000954**	-0.00000425
	(0.001)	(0.024)	(0.471)
VOL	0.00106	0.00704*	0.00346
	(0.834)	(0.088)	(0.285)
M_t_B	0.000102	-0.000106	-0.000457**
	(0.361)	(0.399)	(0.024)
Return_t1	0.0212	-0.00951	0.00148
	(0.210)	(0.428)	(0.834)
Beta	-0.00155	-0.0123**	-0.00204
	(0.742)	(0.020)	(0.636)
Inst_Own_Per	0.0000837	0.0000404	-0.0000200
	(0.215)	(0.505)	(0.646)
Australia	0.0653***	0.0271***	0.0253***
	(0.000)	(0.008)	(0.004)
Europe	0.00179	-0.00982	0.00974***
	(0.798)	(0.173)	(0.007)
_cons	-0.0545	0.0293	-0.0572
	(0.467)	(0.468)	(0.198)
R^2	0.557	0.477	0.454
N	425	445	478