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# ESG performance and cost of equity – the role of materiality

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***"The larger the island of knowledge, the longer the shoreline of wonder."***

– Ralph W. Sockman (former host of the NBC radio)

I recently came across this quote from Ralph Sockman, and I was amazed by how a simple saying could describe so perfectly this whole process of engaging in a master program and writing a dissertation.

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The second part of the Sockman's saying draws our attention to the other side of the learning process – it never ends. Beyond the shoreline of the island of knowledge, there is the mystery of the unknown, which one may embrace or fear. Therefore, these acknowledgements would not be complete without thanking the ones who are always reminding me of the importance of embracing the wonders of the unknown. So, I owe a very special thanks to my loved parents for all the love, encouragement and unconditional support, and also, to my dear friends for making me realize that sometimes a playful approach towards life is the most efficient one.

## Abstract

Companies play a crucial role in the transition towards a more sustainable future. However, the financial resources that they have available to support that transition are limited. Thus, there has to be a match between the company's sustainable strategy and its financial reality. For that reason, although several researches have been already conducted to assess the effects of Environmental, Social and Governance (ESG) practices on financial performance, there is still a lot to learn particularly about the nuances of the relationship.

Therefore, this study aims to investigate the relationship between ESG activities and implied cost of equity as well as the moderating role of materiality considerations. The study covers companies from 15 European countries over the time span 2002 – 2019 and, in methodological terms, it employs two-way fixed effects techniques.

The results of this study suggest that in the recent years (i.e. 2013 – 2019) companies with a better ESG profile seem to benefit from lower costs of equity financing. In addition, we find that this relation ESG performance – implied cost of equity is more evident in sectors where the materiality (economic relevance) of ESG issues is above average.

Nonetheless, when focusing our attention on the top tercile of the distribution of ESG scores, our findings indicate that top-ranking ESG observations are associated with a higher implied cost of equity, which is line with the idea that after a certain point some overinvestments concerns and/or agency problems start to arise.

The contribution of this study to the literature is threefold. Firstly, it has an European context while the majority of the research on this issue is based on either international or US samples. Secondly, this study adds to the research by considering the recent years which yield valuable insights under the light of the legitimacy theory. And, thirdly, it contributes by providing a comparative analysis of top- versus low-raking ESG performances and also by considering the material relevance of ESG issues per sector. Moreover, this study concludes by offering some practical recommendations grounded on these findings.

**Keywords:** ESG performance, Cost of equity capital, Corporate Sustainability

**JEL classification:** G32, M14

## Resumo

As empresas desempenham um papel crucial na transição para um futuro mais sustentável. No entanto, os recursos financeiros que elas têm disponíveis para apoiar essa transição são limitados. Portanto, tem que existir um alinhamento entre os objetivos de sustentabilidade de uma empresa e sua realidade financeira. Por esse motivo, apesar de já existirem diversos estudos acerca das práticas empresariais em matérias de sustentabilidade e o reflexo dessas mesmas práticas em termos financeiros, ainda existem muitos aspetos a explorar nessa relação, nomeadamente, as suas nuances.

Deste modo, este estudo tem como principal objetivo investigar a relação entre as práticas empresariais de sustentabilidade (em termos ambientais, sociais e governativos) e o custo de capital próprio, assim como o papel moderador das considerações de materialidade nessa relação. O estudo abrange empresas de 15 países europeus entre 2002 e 2019 e, em termos metodológicos, o modelo utiliza efeitos fixos.

Os resultados deste estudo sugerem que nos últimos anos (de 2013 a 2019) as empresas com melhores práticas ambientais parecem beneficiar de custos de capital próprio mais baixos. Além disso, as nossas estimativas indicam que essa relação entre desempenho sustentável e custo de capital próprio parece ser mais evidente em setores em que a materialidade (relevância económica) das questões ambientais, sociais e governativas está acima da média.

No entanto, focando a atenção no tercil superior da distribuição das pontuações que refletem o desempenho das empresas em termos de sustentabilidade, os resultados indicam que desempenhos extraordinários aparentam estar associados a um custo de capital mais elevado, o que está em linha com a ideia de que, a partir de certo ponto, começam a surgir dúvidas acerca da rentabilidade e propósito de certos investimentos.

Este estudo contribui para a literatura em três vertentes. Primeiro, é baseado no contexto europeu enquanto que a maioria da pesquisa nesta matéria é baseada em amostras americanas ou internacionais. Segundo, contribui por considerar anos mais recentes. Finalmente, acrescenta novas perspetivas não só por comparar práticas empresariais de sustentabilidade com perfis opostos, mas também por ter em conta aspetos acerca da materialidade dessas mesmas práticas. O estudo termina com recomendações práticas assentes nestes resultados.

**Palavras-Chave**: práticas de sustentabilidade empresarial, custo de capital próprio

**Classificação JEL**: G32, M14

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# 1 Introduction

For a long time, there was the idea that it was not possible to combine profitability with improvements of environmental and social aspects. Fortunately, there has been a shift in the mindset, and nowadays that combination is not only a possibility but also a must. For this reason, corporations are increasingly willing to keep in mind sustainability issues when making their financial decisions. Moreover, lately, that kind of attitude is becoming mandatory, all type of stakeholders ranging from consumers[1] to investors are starting to integrate environmental and social considerations into their decisions, so, firms that do not adopt a climate-friendly and socially responsible attitude can be penalized.

The range of sustainable issues in which a company can invest is extensive, and company's resources are limited, so, if a company wants to succeed, it has to be able to match its sustainability strategy with its economic reality. As Schoenmaker and Schramade (2018, p. 119) referred "*launching new, more sustainable business models can be very risky, just as not becoming more sustainable can be risky*". Therefore, academics and practitioners have been increasingly interested in materiality (and materiality assessments). Essentially, materiality assessments[2] have as main objective the identification of the sustainability issues that might affect the company's ability to create value, that is, the sustainability issues that should be a priority for that company.

The Principles for Responsible Investment, which have more than 2250 signatories with over $80 trillions of assets under management, aims to support its signatories in incorporating Environmental, Social and Governance (ESG) issues into their decision-making process. Recently, these principles pointed out that one of the main reasons for that growing interest is the increasing "*recognition in the financial community that ESG factors play a material role in determining risk and return*" (Principles for Responsible Investment, 2019, p. 6).

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[1] Sharma, Poulose, Mohanta, and Antony (2018) concluded that the CSR activities promoted by companies had a significant influence on the consumer purchase intention.

[2] For example, Unilever, in its website, defines an issue as material if it meets two conditions: (1) it has impact on the company in terms of growth, cost, risk or trust; (2) it is meaningful for the company's stakeholders – consumers, employees, investors, suppliers, and so on. (Retrieved from: Impact Economy Glossary. Definition of Materiality. [online] Available at: https://granito.center/glossary_details.php?id=48 [Accessed 21 Oct. 2019])

Within the aforementioned range of stakeholders, one of the most interested are the equity investors because they are residual claimants, which means they bear most of the risk when companies fail but also enjoy most of the benefits when companies succeed. Several researches have already analyzed the relationship between ESG factors and the cost of equity, most of them concluded that companies with higher ESG/CSR commitments were rewarded with a lower cost of equity (e.g. Dhaliwal, Li, Tsang, & Yang, 2014; El Ghoul, Guedhami, Kwok, & Mishra, 2011; Ng & Rezaee, 2015; Reverte, 2012). Nevertheless, in some circumstances, ESG initiatives can harm the financial performance, for instance, if there are suspects of managerial opportunism behavior (e.g. Barnea & Rubin, 2010; Borghesi, Houston, & Naranjo, 2014), signs of misinvestments (e.g. Brammer, Brooks, & Pavelin, 2006), or even poor legal protection of the investors (see Breuer, Müller, Rosenbach, & Salzmann, 2018).

Therefore, as stated by Brooks and Oikonomou (2018, p. 12) "*there is still a lot to learn about the exact shape of this relationship, the contingencies and dynamic components that alter it, the moderating and mediating factors*". In line with this suggestion, recent studies have contributed to the clarification of the linkage between ESG practices and cost of equity by focusing on specific aspects such as disclosure (Dhaliwal et al., 2014; Ng & Rezaee, 2015; Reverte, 2012) or differing levels of investor protection (Breuer et al., 2018). In addition, materiality might be a moderating factor as well, since its importance has already been empirically tested by Khan, Serafeim, and Yoon (2016) who conclude that companies with strong ratings on material sustainability issues tend to outperform in terms of stock price, while companies with strong ratings on immaterial sustainability issues tend to underperform. Also, Matsumura, Prakash, and Vera-Muñoz (2018) find that materiality expectations are an important explanatory factor when assessing the credibility of managers' risk disclosure decisions. So, a question arises: how well materiality moderates the relation between ESG practices and the cost of equity?

This study aims to shed a new light on the existing literature in the following way. Firstly, it broadens the empirical evidence on the relation between ESG practices and firms' cost of equity, not only by considering an enlarged time framework (from 2002 to 2019) but also by focusing on EU countries. This focus on Europe is relevant because, on the one hand, most of the literature has been conducted in an US context, on the other hand, as EU context is significantly different from US in several ways, thus, the ESG activities and their outcomes can be considerably differently as well (Matten & Moon, 2008).

Also, since 2015, motivated by the Paris Agreement and other initiatives that have called for more actions on sustainability matters, several organizations including companies have started to pay more attention to ESG factors. In this sense, our enlarged time framework can be particularly valuable. Secondly, although a large part of prior research has concluded that high ESG performance is rewarded in financial terms, several studies highlighted that in some cases that may not happen due to concerns respecting the motivation behind those ESG investments as well as their context. Therefore, this study also aims to bring new insights to this discussion by considering the outcomes of ESG activities under the light of newly developed materiality frameworks.

This study uses ESG data provided by Refinitv that is currently available through Datastream. Moreover, the implied cost of equity estimates that are used in this study were computed through four different models (i.e. the ones developed by Claus and Thomas (2001); Easton (2004); Gebhardt, Lee, and Swaminathan (2001); Ohlson and Juettner-Nauroth (2005)). In that sense, this study follows the recent research on this matter (e.g. Breuer et al., 2018; Dhaliwal et al., 2014; El Ghoul, Guedhami, Kim, & Park, 2018; Ferris, Javakhadze, & Rajkovic, 2017; Gupta, 2018).

This research outlines three main conclusions. Firstly, the findings of this study indicate that in the recent years (i.e. 2013 – 2019) companies with an improved ESG performance benefit from lower costs of equity financing. Secondly, the results suggest that companies that are part of sectors where the materiality (economic relevance) of ESG issues is above average obtain higher reductions on the cost of equity due to improvements in the ESG performance. Similar to the previous finding, this relationship only presents statistical significance for the period referring to the recent years. Thirdly, the comparative analysis of top- ranking ESG performances *versus* low-ranking ESG performances performed in this study reveals that top-ranking ESG observations are associated with a higher implied cost of equity, which is line with the idea that after a certain point some overinvestments concerns and/or agency problems start to arise.

The remainder of this report is organized as follows. Section 2 discusses the theoretical background on ESG practices, reviews prior literature relevant to this work and develops the research hypotheses. Section 3 explains the data sources, the methodology employed, and also it includes the sample description. Section 4 exposes the results and their interpretations. Section 5 notes possible limitations and provides concluding remarks as well as suggestions for future research and practical recommendations.

# 2 Literature Review

This chapter provides an overview of the relevant literature within the context of ESG[3] (environmental, social and governance) performance, materiality and cost of equity.

## 2.1 Corporate Social Responsibility Theories

Academics and practitioners have been debating the economic outcomes of ESG practices for decades, and essentially the literature has two contrasting views on the issue. On the one hand, the "doing good while doing well" perspective which argues that there is a positive relation between sustainable and financial performance. On the other hand, the "doing good but not doing well" point of view which refers to a negative relationship between sustainable activities and financial performance.

### 2.1.1 Doing good while doing well

#### 2.1.1.1 Stakeholder and legitimacy theory

The stakeholder theory originated by Freeman (1984), argues that companies that are able to properly take into account the interest of all its stakeholders (employees, customers, suppliers, local communities among others) are more likely to achieve (long-term) financial success in terms of profitability, growth, stability and so forth (Donaldson & Preston, 1995). In a similar vein, the legitimacy theory suggests that organizations have to ensure that their actions are in compliance with the norms of the society in which they operate (Suchman, 1995). In other words, according to the legitimacy theory companies should provide explanations for their environmental and social behavior. Otherwise, if the society does not perceive a company's actions as responsible or legitime, its survival might be compromised in the long run (Davis, 1973). In this sense, these two theories are considered part of the same viewpoint as both suggest that the direct promotion of ESG practices is a matter of

[3] Some authors (e.g. (Fatemi, Glaum, & Kaiser, 2018)) use the terms ESG and CSR (corporate social responsibility) interchangeably. But, Taliento, Favino, and Netti (2019) points out some subtle differences between those two terms; essentially, CSR refers to the company's responsibilities towards society at large, on the other hand, ESG refers to three different but related dimensions within the social awareness concept, so, it is intuitive that ESG factors allow more measurable indicators such as tonnes of carbon emissions avoided. In fact, it can be said that CSR is slightly more rhetorical while ESG factors are more about metrics. In this section, it will be reviewed research referring to both CSR and ESG.

strategy as it has a positive impact on the company's competitiveness and financial standing as well as it might affect the perpetuation (or not) of the organization.

#### 2.1.1.2 The "virtuous cycle"

Within this context (i.e. within the research stream that describes a positive link between social and financial performance) often arise discussions on what is the direction of the causality. Addressing this question, Waddock and Graves (1997) find evidence that corporate social performance is both a predictor and a consequence of financial performance. That is, companies with better financial performance history tend to have improved current levels of corporate sustainability which in turn is positively associated with future financial performance. This relationship was described as a "virtuous cycle", and can be sub-divided in two other theories: slack resources and good management.

The proponents of the slack resources theory argue that companies with prior high financial performance have slack resources available which gives them the opportunity to invest in sustainable development (Adegbite, Guney, Kwabi, & Tahir, 2019; Mattingly & Olsen, 2018; McGuire, Sundgren, & Schneeweis, 1988). In this sense, better corporate sustainability performance is a consequence of higher firm financial resources.

Alternatively, it can be claimed that high corporate sustainability leads to (predicts) a better subsequent financial performance. According to the good management theory, the enhancement of the future financial performance results from good management practices (e.g. product enhancement, better work conditions, and so on) that improve relationships with key stakeholders (such as employees, consumers…) (Cao, Myers, Myers, & Omer, 2015; Fombrun, Gardberg, & Barnett, 2000; Waddock & Graves, 1997).

In this line, Chollet and Sandwidi (2018) find evidence that sustains the virtuous cycle hypothesis. In essence, they demonstrate that good social and governance performance (which can be seen as good management) reduces company's financial risk, and thus increases company's resources (slack resources) which in turn reinforces the company's commitment to good governance and environmental practices. Also, the authors highlight two important aspects about companies with good financial performance (less financial uncertainty): on the one hand, as they do not need to worry about short-term performance, they can make long-term investments (which may include CSR expenses), on the other hand, the managers might have higher discretion to enhance CSR engagements.

### 2.1.2 Doing good but not well

In contrast, some scholars have been expressing a certain degree of criticism towards the ESG concept as it brings additional agency problems to the company. Two of the most vocal opponents of this concept were Levitt (1958) and Friedman (1970) who argued that engaging in ESG practices leads to a misallocation of the company's scarce resources and imposes an unjustified taxation on shareholders. Yet, as Levitt (1958, p. 48) enlightened, he did not mean that "*management has no welfare obligations at all to society. Quite to the contrary. Corporate welfare makes good sense if it makes good economic sense (…) something is good only if it pays."* Moreover, Friedman (1970) also suggests that certain CSR activities are just a way of the managers pursuing their own objectives (such as social, political or economic interests or even career goals), which in turn can be described as an agency issue because in those cases managers are not properly aligning the companies' performance with shareholders' interest (Jensen & Meckling, 1976).

More recently, some papers as the one from Brammer et al. (2006) find evidence that corporate social activities have a negative impact on financial performance which, according to the authors, might have two possible explanations: (1) altruism, in the sense that a certain type of shareholders is willing to forgo returns in order to have a more socially responsible company; or (2) excessive expenditure on some aspects of CSR which is not rewarded by the financial markets.

This perspective is consistent with Barnea and Rubin (2010) who conclude that some insiders, such as managers, tend to overinvest in CSR when they bear a little fraction of the costs (i.e. hold relatively small portion of the company's shares). In a similar vein, Borghesi et al. (2014) suggest that certain types of CEOs (younger CEOs, female CEOs, CEOs that donate to political parties and CEOs who receive more media attention) are significantly more likely to invest in CSR. Yet, both studies clarify that CSR investments are value-enhancing up to a certain point (as the promotion of the social agenda may improve the relations with key stakeholders as well as bring reputational benefits), beyond that point, it is considered overinvestment, which means additional expenditures in CSR harm the shareholder value.

Similarly, Cheng, Hong, and Shue (2013) and Masulis and Reza (2014) report that dividend tax reduction is associated with a decrease on companies' ESG scores (which can be seen as a proxy for a reduction of corporate giving). In other words, the authors provide evidence that a significant amount of ESG investments is driven by agency problems (managers overinvest in corporate goodness motivated by private interests) and delegated

giving as tax avoidance motive (in the sense that dividend taxes may incentive shareholders to favor companies' charitable giving).

By contrast, Ferrell, Liang, and Renneboog (2016) conclude that well-governed companies (i.e. companies that are less likely to have agency issues - because they have tighter cash constraints, higher pay-for-performance sensitivity, strong minority protection, and so forth) engage more in CSR activities; in addition, the authors also find evidence that CSR attenuates the negative impact of managerial entrenchment on firm value.

As a sum up of all the arguments discussed above, there are two possible explanations for that negative correlation between sustainable and financial performance: (1) managerial opportunism: managers use sustainable activities to draw attention away from a weak financial performance or to accomplish personal goal; (2) trade-off theory: as sustainable practices may require some of the company's resources (e.g.: extra investments, human resources, …), those activities may put the company in competitive disadvantage.

### 2.1.3 The impact of financial crisis

What is more, recently, Lins, Servaes, and Tamayo (2017) demonstrate that companies with high CSR ratings had a better stock return performance than companies with low CSR ratings during the 2008-2009 crisis, by contrast, the authors do not find any difference in terms of stock returns between high- and low-CSR companies after the crisis. This suggests that CSR investments can be seen as a risk management/insurance policy that is particularly valuable (i.e. has a higher pay-off) when the market faces a crisis of confidence.

Buchanan, Cao, and Chen (2018) also analyse the impact of CSR on firm value around the financial crisis, in addition, they examine how influential institutional ownership affects the CSR – firm value relation. And, they find that before crisis high CSR firms (with low levels of influential ownership) have higher firm values which means that the conflict-resolution effect dominates (i.e. the mitigation of conflicts between shareholders and non-investing stakeholders appears to be relatively more important during this period). By contrast, the authors report that during the crisis (as agency problems get worse), high influential institutional holdings have a positive effect on CSR-firm value association as overinvestment concerns are alleviated through effective monitoring. Furthermore, Adegbite et al. (2019) suggest that the positive effect of social performance on financial performance is more pronounced during the post-financial crisis period (2009-2015).

### 2.1.4 Summary of the empirical work on CSR

Nevertheless, the majority of empirical work on this issue agrees that ESG activities have either a positive or neutral impact on companies' performance; and that a positive association between the two concepts is likely to occur in the long-run (Friede, Busch, & Bassen, 2015; Lu & Taylor, 2015). Yet, most of those studies only use a single ESG score (compressing the three sub-factor categories) to make the assessment which is a drawback because it gives just a general idea of the benefits of engaging in that kind of activities. Therefore, a more detailed analysis would be advantageous because it is plausible to assume that companies engage in individual E, S and G activities in different degrees, for example, a company may attribute great importance to activities with a positive environmental outcome but not care that much about the social and/or governance dimension of ESG (Limkriangkrai, Koh, & Durand, 2017).

For instance, Fatemi et al. (2018) provide evidence that ESG strengths increase firm value while ESG concerns decrease it. In addition, when analyzing each of the three dimensions separately, the authors conclude that environmental strengths improve the firm's valuation and that weaknesses harm it, by contrast, neither social nor governance strengths increase the valuation, but concerns on those issues decrease it. In the same line of thought, Ng and Rezaee (2015) find that companies with strong ESG exhibit lower cost of equity, yet only the environmental and the governance dimension influence that relationship.

## 2.2 CSR (ESG) performance and the cost of equity

With respect to the relationship between CSR and cost of equity, El Ghoul et al. (2011) assert that high CSR companies benefit from a lower cost of equity than low CSR companies because: (1) they are able to attract a larger investor base; and (2) have a lower perceived risk. Additionally, the authors conclude that not all CSR contribute to a reduction of the cost of equity, for instance, investments in employee relations, environment and product strategies pay off while investments in community, diversity and human rights do not.

Similarly, Dhaliwal, Li, Tsang, and Yang (2011) demonstrate that companies with better CSR performance than their industry peers enjoy a reduction in their cost of equity after start publishing CSR reports because that kind of disclosure attracts dedicated institutional investors as well as it improves analysts coverage. Moreover, the authors state that CSR disclosure initiators try to exploit that reduction of the cost of equity as they are more likely than non-disclosing companies to raise equity capital in the following 2 years.

### 2.2.1 Environmental dimension

ESG elements are a way of examining a company by other things than the traditional financial parameters. For example, environmental factors (E) aim to assess the company's commitment to make a positive impact on the environment, for example, by taking actions to cut emissions and/or to have a better waste management and energy efficiency.

Higher levels of environmental performance can lead to a better financial performance through various pathways; on the one hand, the economic benefits may stem from a "greener" (i.e. more efficient) resource utilization (Guenster, Bauer, Derwall, & Koedijk, 2011), on the other hand, a better environmental risk management may be rewarded with a reduction of the companies' cost of capital. The latter viewpoint is explored in greater detail by Sharfman and Fernando (2008).

Yet, there are asymmetries that should be taken into account[4]. Firstly, according to Guenster et al. (2011) companies viewed as eco-efficient have only a subtle outperformance while least eco-efficient companies strongly underperformed, which is in line with Yadav, Han, and Rho (2016) who reported that the environmental damage score is the main concern of investors. Moreover, the authors also refer that these days market attaches more importance to environmental information about companies, which increases the valuation differential (measured by the Tobin's Q) between high- and low- eco-efficient companies.

Secondly, Albertini (2013) conclude that the payoff of "green" investments is higher when the environmental regulation is less restrictive such as in United States; by contrast, in Europe, since many environmental investments are mandatory in order to comply with regulation, the relation between green investments and financial performance seems to be less positive. Likewise, Gupta (2018) find that improvements in environmental practices are rewarded with a reduction of the implied cost of equity; also, they state that the reward is particularly meaningful in countries where the governance mechanism is weak.

Lastly, firm-size seems to be a relevant factor as well, yet there is no consensus in the literature. On the one hand, some authors suggest that small firms reap more benefits from environmental-friendly investments as they can better implement those programs (i.e. large firms would need to make relatively more substantial investments to make meaningful

[4] The asymmetries discussed in this sub-section could have similar interpretations under the light of the social and governance dimension.

improvements in terms of environmental performance) (Dixon-Fowler, Slater, Johnson, Ellstrand, & Romi, 2013; Yadav et al., 2016). Also, small-cap firms face less pressure and surveillance which gives them more flexibility to allocate their resources (Gupta, 2018). On the other hand, it can also be argued that small firms are more financially constrained which may limit their ability to make green investments.

Nevertheless, El Ghoul et al. (2018) who employed a methodology that took into account several characteristics (such as firm-level features, industry considerations as well as year, and country effects) found evidence that firms with high levels of corporate environmental responsibility enjoy cheaper equity financing and that evidence holds across different legal, economic, and geographic settings.

### 2.2.2 Social dimension

Social factors (S) deal not only with the working conditions topic (for example: workplace health and safety, exposure to child labor practices in the supply chain…) but also with the protection of the local community in which the company operates. With regard to social factors, Edmans (2011) states that the market does not fully incorporate intangibles (e.g. employee satisfaction) into stock valuation even if the company is able to provide certified information on the value of their intangibles. In addition, Ng and Rezaee (2015) suggest that social dimensions may require additional resources but does not directly enhance shareholder value, hence its influence is not directly reflected in the cost of equity. Yet, the authors find evidence that an outstanding social performance strengthens the negative relationship between economic sustainability performance and cost of equity.

### 2.2.3 Governance dimension

With respect to the governance dimension, a possible justification for the mixed results is presented by Bebchuk, Cohen, and Wang (2013) who refer that, after the beginning of the 2000s, good corporate governance no longer generate abnormal returns because market participants and security analysts started to pay more attention to governance matters. Nevertheless, governance factors (G), which can be described as a set of principles that conduct the company's ethics and integrity such as transparency, fair dealing, audit procedures, well-functioning board of directors and so on, are essential to align the interests of the company's stakeholders. These factors gain particular importance in ESG context as some ESG investments may be motivated by managerial opportunism or work as a smokescreen to low performances.

### 2.2.4 Research questions - ESG performance and the cost of equity

The cost of equity describes the required return of an investment based on its risk profile, in other words, investors demand a risk premium equal to what they would receive from investing on other securities with similar risk. Based on this definition and on what was discussed throughout the review, ESG performance can affect the cost of equity through two mechanisms: (1) firm's perceived risk and (2) investor base (e.g. Breuer et al., 2018; Cao et al., 2015; El Ghoul et al., 2018).

Firm's perceived risk: The engagement in ESG practices improves the company's relationships with its key stakeholders which reduces the likelihood of the company's cash-flows being negatively affected by events related to financial, environmental or social controversies. In essence, companies with an adequate ESG profile are less exposed to external and/or internal boycotts (for instance, diminished litigation risks (Sharfman & Fernando, 2008), enhanced employee and customer loyalty (see Ahmed Ahmed, Eliwa, & Power David, 2019; Albuquerque, Koskinen, & Zhang, 2018; Cao et al., 2015; Sharma et al., 2018), improved regulatory approval (e.g. Suchman, 1995), and so forth), therefore, those companies are perceived as less risky (i.e. lower cost of equity).

Moreover, companies with superior social responsibility performance are more likely to disclose information on those issues, which may be associated with higher levels of transparency. Improved transparency lessens information asymmetries between the firm and investors and thereby decreases the cost of equity (see Dhaliwal et al., 2011).

Investor base: Social norms affect investors' preferences and decisions, for that reason companies with an inadequate ESG profile (e.g. companies in "sin" industries) have a relatively smaller investor base (Hong & Kacperczyk, 2009), thus there are fewer investors to share the risk, leading to higher equity financing costs (Merton, 1987). Thus, it is expected that improvements in ESG performance may help to improve the company's access to finance (see Cheng, Ioannou, & Serafeim, 2014) as well as expand its investor base (e.g. Cao et al., 2015; Flammer, 2020) which in turn may help to reduce the company's cost of equity.

For all these reasons, we expect that:

**Hypothesis 1** (H1): There is a negative relationship between the firm's ESG performance and its cost of equity.

Not so consensual in the literature is the direction of causality in the ESG performance – cost of equity link (i.e. the possibility of higher ESG performance to be both a predictor and a consequence of lower cost of equity) which may lead to some endogeneity problems.

Some authors find evidence supporting the good management hypothesis (e.g. Akpinar, Jiang, Gomez-Mejia, Berrone, & Walls, 2008; Cao et al., 2015; Gangi, Meles, Monferrà, & Mustilli, 2020; Waddock & Graves, 1997), in which high ESG performance is predictor of lower cost of equity (due to the aforementioned motives: lower perceived firm risk and/or larger investor base). By contrast, other stream of research provides empirical support for the slack-resources hypothesis (e.g. Adegbite et al., 2019; Mattingly & Olsen, 2018; McGuire et al., 1988), which claims that companies with better financial position (in this context, lower cost of equity) are the ones that have the resources necessary to invest in ESG matters, thereby, better ESG performance is a consequence. Finally, there is evidence supporting both directions, the so-called virtuous cycle (e.g. Chollet & Sandwidi, 2018; Waddock & Graves, 1997). Thus, this study also tests for endogeneity concerns due to the possible existence of a simultaneity bias.

Moreover, despite the predominance of evidence and arguments sustaining the negative relationship between ESG performance and cost of equity, a fraction of the research on this matter demonstrate that in some circumstances a high ESG performance may imply a higher cost of equity. Those circumstances occur due to several reasons, such as: opportunistic managerial behaviour (managers may be using investments in ESG issues to pursue their private goals, that in some cases are not the best for the company) (see Barnea & Rubin, 2010; Borghesi et al., 2014; Friedman, 1970; Levitt, 1958), overinvestment concerns (for example, dividend taxes may in a certain way encourage excessive expenditures in ESG matters) (see Cheng et al., 2013; Masulis & Reza, 2014), or even due to poor legal protection of investors (see Breuer et al., 2018).

In addition, with respect to poor ESG performers there is no clear consensus as well. Based on the findings of El Ghoul et al. (2011) that suggest that companies that are part of "sin" industries have higher implied cost of equity because: (1) there is a smaller investors base willing to own those stocks and thus share the risk and, (2) it can be argue that those companies are more likely to face higher litigation risks, one would expect to find similar results for low-ranking ESG performers. Nevertheless, a recent study from Hmaittane, Bouslah, and M'Zali (2019) which is solely based on companies operating in controversial industry sectors finds that CSR engagement significantly lowers the implied cost of equity for companies belonging to this type of industry. Some plausible justifications for that reduction of the cost of equity may be that, through CSR engagement, companies are able to legitimize the appropriateness of their operations in the eyes of investors, or, at least, are

able to convince the investors that the company is indeed taking credible steps towards more sustainable operations, all of this may have a risk mitigation effect – as it reduces the firm's perceived risk, reduces the asymmetric information and perhaps enlarges the firm's investor base. In the same line of thought, Weber Jessica (2018) provides evidence that poor CSR performers are the ones benefiting from greater cost of equity reductions associated with their disclosures, especially if they have external assurance.

Therefore, we hypothesize that:

**Hypothesis 2** (H2): Top-ranking (low-ranking) ESG performances are associated with a higher (lower) cost of equity.

Also, there is no consensus in the literature respecting the relation between the ESG performance and financial performance across time, particularly for the period around 2008-2009 financial crisis. Some authors argue that during crisis periods the benefits of ESG practices are more evident and value-enhancing as they work as insurance policy, meaning that, those investments help to strengthen stakeholders' trust in the company which assumes a role of extreme importance when market faces a crisis of confidence (Lins et al., 2017). In contrast, others argue that in times of crisis the negative side effects of ESG engagement are exacerbated, for example, the overinvestment concerns (Buchanan et al., 2018). Thus, it is important to analyse the crisis years of Europe.

Furthermore, Adegbite et al. (2019) report that the positive impact of social performance on financial performance is more pronounced during the post-crisis years. The analysis of the post-crisis years (i.e. the years following the 2009- 2012 crisis) is also extremely relevant because in these years there have been several changes in the regulatory framework and societal demands, for example, the introduction of a new directives respecting corporate sustainability practices (e.g. European Parliament, 2014), the signature of the Paris Agreement (whose the consultancy process started in March 2013) (see European Commission, 2013) and an increasing number of activist investors targeting at changes in the corporate ESG practices (Alvarez & Marsal, 2019; Corte et al., 2019). For these reasons, the time span (2013 - 2019) is expected to yield valuable insights under the legitimacy theory, as throughout these years the societal expectations and requirements have evolved, and thus companies have to evolve as well in order to comply with the society's expectations on how businesses should operate.

Therefore, we formulate the following hypothesis:

**Hypothesis 3** (H3): There is a time-varying relationship between ESG performance and the cost of equity.

## 2.3 Materiality

> *"Perhaps the most important has been the failure* ***to place the data in the context of the strategy and the business model*** *of the company, thereby obscuring the relation between sustainability and financial performance."* - Serafeim (2015, p. 37)

Several studies have attempted to understand how ESG practices affect the company's valuation and performance. A stream of that literature has addressed the ESG practices indiscriminately, but, recent studies have started to distinguish between ESG activities and ESG disclosure (e.g. Eliwa, Aboud, & Saleh, 2019; Fatemi et al., 2018) . A possible reason for that distinction may be related to the conclusions of earlier studies as the one from Hawn and Ioannou (2016) who found that companies do not realize the full benefits of their internal actions if those actions are not properly communicated outward.

Moreover, the quantity of ESG information disclosed seems to not be a problem anymore, for almost two decades, the world's largest companies have been producing sustainability reports. In fact, Melloni, Caglio, and Perego (2017, p. 220) agree that there is an excess of corporate information disclosed that might be just "*a smokescreen for low disclosure quality and possibly low firm performance*", this type of concern was tested by Fatemi et al. (2018) who found that ESG disclosure, per se, decreases firm value. In addition, Kotsantonis, Pinney, and Serafeim (2016) discuss why sustainability is still perceived as a cost or low return investment, and suggest that it mainly happens because many mainstream investors and SRI funds rely excessively on exclusionary screens. And, by doing so, they are not properly integrating ESG considerations into their investment decisions, which in turn may not accurately capture the value-added by sustainability practices of certain companies. Thus, those incomplete investment decisions result in lower returns than one would expect.

Utz (2019) suggests that, although ESG ratings (e.g. the ones provided by ASSET4) appear to be reliable, both stakeholders and investors still do not have a proper understanding of what they mean in context of specific business models. Specifically, he finds evidence that aggregated ESG assessments seem to be useless when it comes to predict corporate scandals, that happens because despite the indicators relevant for the scandal being below the average, in general, firms involved in a scandal have aggregated ESG scores significantly above average (e.g. Volkswagen and its emission scandal).

Synthesizing these perspectives, Serafeim (2014) states that in fact there are companies that are able to create economic value through sustainable investments but others are just misusing the money of shareholders by trying to "do good", and adds, which one of the two happens mainly depends on whether the companies understands and tries to improve its performance on issues that are important for the industry that is in.[5] The key to this puzzle seems to be in the company's ability to match its sustainability strategy with its economic reality (Schoenmaker & Schramade, 2018). In other words, the company's dexterity to identify its material sustainability issues.

In context of Finance, there are several possible definitions for materiality. For example, Schoenmaker and Schramade (2018) distinguish "market materiality" from "business materiality"; the former refers to factors that may have a significant impact on the company's stock price, and the latter refers to anything that may considerably affect the company's ability to continue its business model and its cash-generating capacity. As an alternative, there is the definition provided by Unilever which states that an issue is material if it meets two conditions: (1) it may affect the company in terms of growth, cost, risk or trust; (2) it is relevant for the company's stakeholders – consumers, employees, investors, suppliers, and so on.

In short, materiality is about identifying which sustainability issues are important for each company (e.g. for companies involved in oil exploration, transportation or utilities, the environment is a critical factor to take into account [i.e. is a material issue], dissimilarly, for clothing retailers, the social capital is usually the priority). Hence, it is important to take into account that the materiality of ESG issues is different from industry to industry and even within industries there are some variations resulting from differences between the companies' business models and local conditions as well (Kotsantonis et al., 2016; Schoenmaker & Schramade, 2018).

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[5] As an illustrative example, Serafeim (2014, p. 13) says "Yes, climate change is an enormously important global issue. But a bank's carbon emissions from the buildings it occupies are not material to investors or, in this case, to society. For me, a bank making a big deal about leasing space in a LEED Platinum building is a nice gesture at best or a form of greenwashing at worst, like when this is a prominent feature in its corporate social responsibility or sustainability report.".

Therefore, as it was confirmed by Khan et al. (2016), companies that manage and make major efforts to improve its performance in material ESG issues have better future performance ( in terms of better profits margins as well as higher risk-adjusted stock returns) than their peers with poor ratings on the same matters. By contrast, companies making considerable investments on immaterial issues do not outperform comparable firms with poor ratings on those issues.

Materiality has become an increasingly important concept in the financial academic literature because it emphasizes what sustainable issues should be a priority. As an example, materiality has been one of the most important criteria when assessing the quality of a sustainability report (Eccles, Krzus, & Solano, 2019) or the benefits of environmental-related instruments (e.g. Flammer (2020) found that the benefits of the corporate green bonds were much more significative in industries where the environment is financial material).

As a way of answering to at least part of the challenges described previously, the Sustainability Accounting Standards Board (SASB) developed a materiality map[6] which aims to help both companies and investors distinguish, among all ESG information, the issues that are in fact relevant for their decision-making process, also the map can be used as a guide for more insightful disclosures. The concept of the materiality map was first introduced by Lydenberg, Rogers, and Wood (2010), and since then, it has been constantly improved by SASB and increasingly used by researchers (e.g. Eccles et al., 2019; Flammer, 2020; Grewal, Hauptmann, & Serafeim, 2020; Khan et al., 2016; Matsumura et al., 2018).

With respect to the quality of disclosures, according to Eccles et al. (2019), although several frameworks have been developed during the recent years, the average materiality score of the integrated reports has not improved yet. Even so, Grewal et al. (2020) find evidence that companies that voluntarily disclose more information on material issues, have lower stock price synchronicity (which can be interpreted as increased stock price informativeness, in the sense that more firm-specific information is incorporated in stock prices).

[6] The materiality map is available through the following link: https://materiality.sasb.org/

Moreover, the results of Matsumura et al. (2018) suggest that the market expectations on materiality matters serve as a "cross-check" on the credibility of managers' disclosure decisions. In addition, the authors report that market rewards the disclosure of information with a lower cost of equity and that reward is larger for disclosures on material issues, the same goes for the penalties, that is, the penalties are more severe for non-disclosures on materiality topics.

### 2.3.1 Research questions - the moderating role of materiality considerations

Therefore, based on the literature surveyed above, it is noticeable that recent academic research on this matter have been particularly interested in having a more detailed picture of the ESG performance – financial performance relation, for example, by exploring the time-varying feature of the relationship, the under- and over- investment concerns, the managerial opportunism hypothesis, and so forth. Specifically, part of those studies has started to use moderators to have a better understanding of the link; for example: Breuer et al. (2018) study the corporate social responsibility - cost of equity relation under different levels of investor protection; Fatemi et al. (2018) investigate the ESG performance – firm value interaction using disclosure as a moderator; and, Buchanan et al. (2018) analyse how CSR performance affects firm value under different level of influential institutional ownership.

So, to obtain more enlightening results, we also intend to use a moderator: the different material importance of ESG factors across industries, similar to the work that has been conducted by Matsumura et al. (2018). In this context, ESG factors' materiality refers to any sustainability issue that is critical to a certain business model and that has the potential to affect companies in terms of cost, risk, growth or trust. Finally, as it was mentioned in the literature review, SASB has developed a materiality map, which makes it possible to use this "materiality lens" in a quantitative way.

Thus, we will consider to moderating role of materiality in the following hypothesis:

**Hypothesis 4** (H4): The expected reduction of the cost of equity caused by improvements in the ESG performance is higher (lower) for companies with better scores on material (immaterial) issues.

**Hypothesis 5** (H5): The moderator role of materiality in explaining the relation between ESG performance and cost of equity is more evident during the crisis period.

## 2.4 Contribution to the literature

The contribution of this research to the literature is threefold.

Firstly, this study contributes to the debate on whether ESG activities are value-enhancing or not (in terms of cost of equity financing). And, as it was discussed throughout the literature review, even though the majority of studies in this topic suggests that the relationship between the ESG performance and cost of equity is either negative or neutral, a small fraction of research also argues that in some cases a high ESG commitment may be associated with a higher cost of equity due to suspects of managerial opportunism behaviour, signs of misinvestments or poor legal protection of investors. Thus, this study broadens the discussion on the nuances of this relationship by employing two approaches. On the one hand, it is carried out a comparative analysis between top-ranking ESG observations (located in the highest tercile of the ESG score distribution) and low-ranking ESG observations (located in the lowest tercile of the ESG score distribution). On the other hand, by translating the SASB's materiality framework into quantitative terms, this study also investigates the moderating role of materiality considerations (i.e. economic relevance of ESG issues per industry) in explaining the relation between ESG activities and the cost of equity financing.

Secondly, as this study is based on an enlarged sample period (that goes from 2002 to 2019), it enhances the understanding of the time-varying feature of the ESG performance - the cost of equity relationship. On the one hand, this investigation adds to prior researches by examining whether the relationship between ESG practices and cost of equity changes across subperiods or not, namely by dividing the sample in the pre-crisis, crisis period and post-crisis years. On the other hand, this study extents this stream of research by also considering the recent years, which have been marked by important changes in the regulation and social demands. Taking this into account, this study may provide valuable insights under the light of the legitimacy theory.

Thirdly, most of the studies on this matter are based on either US samples (e.g. Cao et al., 2015; El Ghoul et al., 2011) or international samples (e.g. Breuer et al., 2018; El Ghoul et al., 2018; Gupta, 2018). Thus, due to the fact of the research linking the ESG performance to risk measures and the cost of capital being limited within the European context, during the recent years several papers have been providing evidence to fill this research gap.

For example, using an EU sample, Eliwa et al. (2019) examines the relation between ESG practices and the cost of debt whereas Sassen, Hinze, and Hardeck (2016) investigates the link between ESG factors and firms' risk. In that sense, this study also contributes to filling this gap in the literature by analysing the relation between ESG activities and the cost of equity using a sample of European companies.

Moreover, there are several other reasons why Europe is an interesting region to study.

Firstly, a large fraction of the key research on this topic is based on U.S. companies (e.g. El Ghoul et al., 2011). And, as Matten and Moon (2008) highlighted, the corporate social responsibility framework in which U.S. companies operate is considerably different from the European one, which results from their differing institutional frameworks (in other words, it is due to the differences in their political system, financial system, education and labour context, and culture). For instance, most of European governments have either nationalised systems or mandated organizations focused on health, pensions and other social matters, by contrast, U.S. is usually characterised by being less active on those issue, therefore, American companies have greater flexibility and opportunity to fill that kind of niche. Also, another huge difference respects the financial system, on the one hand, stock market is the main financial source for most of the large American companies and the capital is relatively dispersed among shareholders, on the other hand, in the European model banks tend to play a major role and the capital is more concentrated.

Secondly, investors in European markets seem to react more favourably to CSR activities than investors in other markets. For instance, Bird, Momenté, and Reggiani (2012) find evidence that in European markets CSR expenditures lead to higher market valuations, while in U.S., Australia and Japan those activities seem to have neutral impact on market prices. In the same line of thought, Auer and Schuhmacher (2016) suggest that European investors in fact tend to pay a price for socially responsible investing. So, both studies are somehow consistent with the expectations that one may have based on country sustainability rankings, such as the one provided by Robecosam (2019) where Nordic countries (i.e. Sweden, Norway, Denmark and Finland) are world leaders and other European countries such as Portugal stand out because of an outstanding improvement in the country ESG performance over the past 5 years.

# 3 Data and methodology

## 3.1 ESG data

The ESG performance data was retrieved from Datastream. The ESG scores are now produced by Refinitv, and they are an enhancement and a replacement of the ones previously supplied by ASSET4 database. This database covers around 70% of global market cap and has history going back to 2002. The research analysts collect over 400 ESG measures per company (from diverse types of publicly available sources such as annual reports, companies' websites, news and so on). But, then only a subset of 178 indicators is used for the computation of ESG scores (the selection is based on comparability considerations, data availability and industry relevance). Finally, those selected key performance indicators are grouped into 3 pillars (environmental, social and corporate governance) and 10 subcategories.

More specifically, the environmental category refers to the company's policies respecting emissions, responsible resource usage and innovation in terms of environmentally friendly products. The social pillar covers indicators related to the company's workforce and its community as well as measures related to product responsibility and human rights. And, lastly, the governance dimension is subdivided in management, shareholders and CSR strategy (Refinitiv, 2019).

## 3.2 Implied cost of equity

According to recent finance literature, the ex-ante cost of equity (implied by analysts' earnings forecasts and current stock prices) is a better alternative than other measures based on realized stock returns. Particularly, Lee, Ng, and Swaminathan (2009) find evidence that the implied cost of equity is less noisy and more robust than the realized returns measures. That is, as realized returns are backward-looking measures, they do not properly reflect unexpected "shocks" such as unanticipated cash-flow news or fundamentals (Gupta, 2018).

For that reason, this study follows Breuer et al. (2018); Dhaliwal et al. (2014); El Ghoul et al. (2018); Ferris et al. (2017); Gupta (2018), so, we computed the implied cost of equity using the average of the individual estimates obtained from four different models (i.e. the ones proposed by Claus and Thomas (2001); Easton (2004); Gebhardt et al. (2001); Ohlson and Juettner-Nauroth (2005)).

Despite all four models being based on the discounted cash-flow model, they have some major differences respecting the assumptions made about the explicit forecast horizon, short-term and long-term growth rates, and inputs (for example, whether factors such as

inflation or book values per share are considered or not). In fact, those differences can be summarized in two streams, that is, Claus and Thomas (2001) and Gebhardt et al. (2001) can be classified as residual income valuation (RIV) models, whereas Ohlson and Juettner-Nauroth (2005) and Easton (2004) can be defined as variations of the abnormal earnings growth (AEG) valuation model.

### 3.2.1 Common variables and assumptions

In this subsection, we provide a detailed description of the implied cost of equity models used in this study. This description includes not only the definitions of the variables employed on the models but also the mathematical equations and theoretical foundations (and assumptions) of each model.

$K_{CT}$ = implied cost of equity from the Claus and Thomas (2001) model;

$K_{GLS}$ = implied cost of equity from the Gebhardt et al. (2001) model;

$K_{OJ}$ = implied cost of equity from the Ohlson and Juettner-Nauroth (2005);

$K_{ES}$ = implied cost of equity from the Easton (2004) model;

t = valuation year

$\tau$ =forecast year

$P_t$ = current share price at date *t*;

$dpr_t$ = expected dividend payout at time *t*;

$FEPS_{t+\tau}$ = forecasted earnings per share for year $t + \tau$;

$FROE_{t+\tau}$ = forecasted return on equity for year $t + \tau$;

$B_t$ = current book value per share at date *t;*

$B_{t+\tau}$= forecasted book value per share for year $t + \tau$, computed using the clean surplus relationship; that is, $B_{t+\tau} = B_{t+\tau-1} + FEPS_{t+\tau}(1 - dpr_t)$;

$LTG_t$ =long-term earnings growth forecast for time *t;*

$i_t$ = expected perpetual earnings growth at time *t;*

$ae_{t+\tau}$= abnormal earnings for year $t + \tau$ recorded at date *t*.

To apply the following models, we require firms to have positive 1-year ahead and 2-year ahead forecasted earnings per share as well as a forecast for long-term earnings growth (LTG) available at I/B/E/S. If the LTG is missing, we impute it from the growth rate of forecasted earnings per share from year t =2 to year t=3; i.e., $LGT_t = \frac{FEPS_{t+3} - FEPS_{t+2}}{FEPS_{t+2}}$.

As two of the models require earnings forecasts for a longer period, if a forecast is not available, we compute it by considering the previous year forecast and the LTG forecast; i.e., $FEPS_{t+\tau} = FEPS_{t+\tau-1} \times (1 + LTG_t)$.

Similar to El Ghoul 2016, we define the expected dividend payout (dpr) as the average dividend payout over the previous three years. In case this ratio is missing or it is not between 0 and 1, we replace it with the country-year median. Also, we assume the expected dividend payout ratio to be constant as in previous studies (e.g. Breuer et al., 2018).

It is worth noting that the long-term growth forecast is a composite of the expected annual growth in EPS over a 5-year period.

### 3.2.2 Residual Income Valuation (RIV) models

With respect to the first stream, it is worth noting that RIV models, which are based on Ohlson (1995), are known for making the assumption of clean surplus relation, i.e. it is assumed that the fraction of earnings that is not paid out as dividends in a given year is added to the book value of equity the following year, and by doing so this type of model is systematically linking accounting information to equity valuation. Despite having this in common, there are some differences between the two RIV models used in this study.

**Model 1**: Claus and Thomas (2001)

On the one hand, the model proposed by Claus and Thomas (2001) uses abnormal earnings, which are proxied as the difference between forecasted earnings and a charge for the equity financing cost (i.e. the cost of equity of the firm times its book value per share), for a five-year explicit forecast horizon. And, after the fifth year, the model assumes that the forecasted residual earnings will grow at the inflation rate. So, the valuation equation is given by:

$$P_t = B_t + \sum_{\tau=1}^{5} \frac{ae_{t+\tau}}{(1 + K_{CT})^{\tau}} + \frac{ae_{t+5} \times (1 + i_t)}{(K_{CT} - i_t) \times (1 + K_{CT})^5} \qquad \textbf{(3.1)}$$

where $ae_{t+\tau} = FEPS_{t+\tau} - K_{CT} \times B_{t+\tau-1}$.

**Model 2**: Gebhardt et al. (2001)

On the other hand, Gebhardt et al. (2001) firstly considers return on equity forecasts for the three years ahead, and after the third year, it is assumed that the returns will linearly tend to an industry-specific target return on equity until year 12. Beyond the twelfth year, the terminal value presupposes zero incremental economic profits. In that sense, for the first 3

years, $FROE_{t+\tau}$ is defined as the ratio of the $FEPS_{t+\tau}$ to the $B_{t+\tau-1}$. In addition, to compute the target ROE, we retrieved the five-year average ROE for each firm from Worldscope, and then we set the target ROE equal to the country-industry-year median of that measure. In this study, industries are defined according to the economic sectors of the Thomson Reuters Business Classification (TRBC). The rationale behind this adjustment is that in the long-run companies tend to be more representative of their industry peers in several economic aspects. The valuation equation is given as follows:

$$P_t = B_t + \sum_{\tau=1}^{11} \frac{FROE_{t+\tau} - K_{GLS}}{(1+K_{GLS})^{\tau}} \times B_{t+\tau-1} + \frac{FROE_{t+12} - K_{GLS}}{K_{GLS} \times (1+K_{GLS})^{11}} \times B_{t+11} \qquad \textbf{(3.2)}$$

### 3.2.3 Abnormal Earnings Growth (AEG) models

Then, with regard to the abnormal earnings models, the intuition is that they are designed to work only with firm's expected earnings and their growth. By doing so, the assumption of clean surplus relation is relaxed and inputs such as the book value are excluded, which makes this type of model an appealing generalization of the Constant Growth model because it does not restrict the firm's dividend policy. In other words, "*the core of the model shows how the current price depends on forward eps and their subsequent growth as captured by two dividend-policy independent measures of eps growth"* (Ohlson & Juettner-Nauroth, 2005, p. 350).

**Model 3**: Ohlson and Juettner-Nauroth (2005)

In this sense, the Ohlson and Juettner-Nauroth (2005) model[7] (used in this study) considers the one-year-ahead forecasts as well as the expected dividend payout; and then, the forecasted earnings are set to grow at a short-term rate that will gradually decline to a long-term rate and the dividends are designed to be a constant fraction of the forecasted earnings. In this context, the short-term earnings growth rate is computed as the average of I/B/E/S long-term growth rate and the growth of FEPS from year t+1 to t+2. While the long-term growth rate equals the country-specific expected inflation rate. The valuation equation is the following:

$$P_t = \frac{FEPS_{t+1}\left(g_t - i_t + K_{OJ} \times dpr_{t+1}\right)}{K_{OJ} \times \left(K_{OJ} - i_t\right)} \qquad \textbf{(3.3)}$$

[7] Even though this model was only published in 2005, it had started to be disseminated in 2000.

where, $g_t = \frac{1}{2} \times \left( \frac{FEPS_{t+2} - FEPS_{t+1}}{FEPS_{t+1}} + LTG_t \right)$

**Model 4**: Easton (2004)

Finally, in the Easton (2004) model, which is based on Ohlson and Juettner-Nauroth (2005), both 1- and 2-year-ahead earnings forecasts are included; and after the year 2, the abnormal grow in earnings is assumed to be constant. The valuation equation is given by:

$$P_t = \frac{FEPS_{t+2} - FEPS_{t+1} \times (1 - K_{ES} \times dpr_{t+1})}{K_{ES}^2} \quad \textbf{(3.4)}$$

In essence, as our implied cost of equity variable is the average of the four models described above, it can be defined as the internal rate of return that sets the stock price equal to the expected future sequence of abnormal earnings and residual incomes at the valuation date (Hail & Leuz, 2006). So, despite this estimate may suffer from limitations caused by earnings forecasts and growth rate assumptions, it is expected to be fairly representative of the real cost of equity of the firms.

## 3.3 Control variables

Size, leverage and book value to market value

In addition, we include in our analysis the following control variables. Firstly, we control for the risk factors proposed by Fama and French (1992) – size, leverage (LEV) and book value to the market value of equity (BTM). And, even though these three factors were initially meant to control for risk in cases with *ex post* measures (i.e. when realized returns are used as proxy for expected returns), they are also a common presence in implied cost of equity studies (e.g. Breuer et al., 2018; El Ghoul et al., 2018; El Ghoul et al., 2011; Gebhardt et al., 2001; Gupta, 2018).

The size-cost of equity relationship is expected to have a negative sign, in the sense that, according to previous research, larger firms tend to be seen as less risky compared to smaller firms. That happens because size is usually a proxy for the amount of information available (Gebhardt et al., 2001) as well as proxy for the extent of collaterals that a company can offer (Perez-Quiros & Timmermann, 2000). Therefore, larger firms tend to have more information available and are better collateralized, and thus they benefit from lower cost of equity. In this study, the variable "size" is represented by the natural logarithm of total assets.

Moreover, both book-to-market ratio and leverage are expected to be positively correlated with the cost of equity. As the name suggests, the book to market ratio is defined as the ratio

of the book value of equity to the market value of equity. And, high book-to-market firms (i.e. firms that have a low stock price compared to their book value) are expected to earn higher *ex post* returns, some authors suggest that this effect (often referred to as value effect) happens because of risk-related factors (Fama & French, 1992; Vassalou & Xing, 2004), others say that it may be due to mispricing (Lakonishok, Shleifer, & Vishny, 1994). With respect to the leverage factor, it is expected that as the amount of debt in the company's capital structure increases, the risk increases as well, which in turn is translated into a higher implied cost of equity (Botosan & Plumlee, 2005; Modigliani & Miller, 1958). In this study, leverage is the long-term debt divided by the total assets.

Volatility, blockholding and analysts' forecasts

In addition, we decide to control for three more firm-level aspects – volatility of stock returns (VOL), blockholding (Block) and analysts' forecasts – that are often mentioned in the literature as influencing factors of the cost of equity.

Firstly, with the intuition that firms with higher stock returns volatility are expected to be riskier, we include the annualized volatility of daily returns over the previous 12 months as a measure of firm risk. Thus, we expect a positive relation between volatility and the cost of equity. It is worth noting that some studies also include the market beta as a control variable (e.g. Breuer et al., 2018), others such as El Ghoul et al. (2018) only use the beta as a robustness check and provide evidence that the findings remain the same when controlling for beta instead of volatility.

Secondly, we include a "blockholding" variable which is defined as the percentage of closely held shares, and we expect a negative relation between this variable and the cost of equity because it is often suggested in the literature that a higher amount of inside ownership is associated with lower agency costs (e.g. Buchanan et al., 2018).

Lastly, we consider the influence of analysts' forecasts by controlling for the analysts' forecast error (Fbias) as well as for the disagreement among their predictions (disp), by doing so we are following (El Ghoul et al., 2018).

As it was mentioned earlier, one of the main advantages of the implied cost of equity approach is that it makes use of analysts' predictions, which may help to improve the accuracy of the cost of equity estimates as it considers forward-looking information rather than just relying solely on historical data. Nevertheless, the use of analysts' forecasts has some disadvantages as well. In essence, previous research has pointed out that those forecasts do not incorporate information in a timely manner (Ali, Klein, & Rosenfeld, 1992; Lys & Sohn,

1990) and also have some bias problems. Specifically, there is evidence that analysts' forecasts tend to be optimistic (Easton & Sommers, 2007; Gu & Wu, 2003), and thus forcing an artificially high implied cost of equity. Therefore, it is important to control for analysts' optimism. In that sense, we define forecast bias as the difference between the 1-year-ahead consensus earnings forecast and realized earnings per share deflated by the stock price.

In addition, a higher dispersion in earnings forecasts signals a wider dissent among analysts, and as a consequence, it is expected that the higher the uncertainty about the forecasts, the higher the implied cost of equity (Guedhami & Mishra, 2009). So, the analysts' earnings forecast dispersion is proxied as the coefficient of variation of one-year-ahead analysts' forecasts of earnings per share.

Inflation and GDP per capita

Then, with respect to country-level control variables, we include the expected inflation rate (infl) and the GDP per capita (LGDPpc). The rational for controlling for inflation is because variables such as stock prices, book values and analysts' forecasts are expressed in nominal terms and local currencies, thus, those inputs (as well as cost of equity estimates based on them) will be reflecting countries' expected inflation rates (Hail & Leuz, 2006). Accordingly, it is expected a positive association between the inflation and the cost of equity. Here, inflation is proxied as the one-year-ahead realized inflation rate. Finally, we consider the GDP per capita in order to control for the countries' economic development. Roughly speaking, the GDP per capita is widely used as a proxy for a country's income level which in turn may be reflex of several country characteristics such as level of investors' protection, regulation, quality of the institutions, and so on. All these characteristics affect the investors perception of risk. Thus, generally speaking, countries with better GDP per capita tend to be perceived as less risky. In that sense, the sign of the relation between the per-capita GDP and the cost of equity is expected to be negative. This variable is defined as the natural logarithm of real GDP per capita.

The summary of the definitions and data sources of all variables is detailed on **Table 12** (available in the Annex I).

All variables considered, our baseline model is the following:

$$K_{AVG_{it}} = \beta_0 + \beta_1 ESG_{score_{it-1}} + \beta_2 Size_{it-1} + \beta_3 BTM_{it-1} + \beta_4 leverage_{it-1} + \beta_5 Vol_{it-1} + \beta_6 Block_{it-1} + \beta_7 Fbias_{it-1} + \beta_8 Disp_{it-1} + \beta_9 LGDpc_{it-1} + \beta_{10} Infl_{it+1} + \varepsilon_{it} \quad \textbf{(3.5)}$$

where i indexes firms, t indexes time, and $K_{AVG}$ refers to the average of the estimates obtained through the four models discussed above.

The model above is in line with the one used by El Ghoul et al. (2018), the main difference is that, in addition to the fact that our study employs an aggregate ESG measure instead a variable referring to a specific sustainability dimension, our research also includes an additional control variable with regard to blockholding aspects (which is widely used as a control variable as well, for example, see Breuer et al. (2018); Gupta (2018)).

### 3.4 Materiality

The effect of materiality will be analysed in a subsample based on the initial one. And, for that purpose, it will be constructed a materiality index similar to the approach employed by Matsumura et al. (2018), that is, by matching the indicators of the ESG database with the ones provided by the materiality map developed by SASB.

Firstly, in order to be able to empirically analyse the role of materiality in explaining the relationship between cost of equity and ESG activities, the first step was to evaluate in which way SASB sustainability issues categories (environment, social capital, human capital, business model and innovation; and, leadership and governance) would fit the three dimensions of the Refinitiv's ESG score. By looking at the detailed description of Refinitiv's ESG score construction as well as the points included in each SASB sustainability category, which are illustrated in **Figure 3** (available in the Annex II), we verify that: the environmental dimension integrates not only environmental issues but also business model and environmental innovation considerations, the social dimension encompasses both the social and human capital, and the governance dimension, as expected, is closely linked to the SASB's leadership and governance category. This tells us that, generally speaking, the points considered for the computation of the ESG scores are also present in the materiality matrix that we will be using in this study. In this sense, the two frameworks seem to be consistent with each other. Nevertheless, as Pavoni (2020) pointed out in a recent article on Financial Times: *"If the problem was once a lack of data, the challenge now is how best to validate and interpret the data being produced*", which may cause a certain "*sustainability reporting fatigue*".

Secondly, another important aspect to take into account is that SASB has its own industry classification – SICS (sustainable industry classification system). The need for a new industry classification system arises because the traditional ones do not always group industries that share common sustainability characteristics (i.e. similar sustainability risks and opportunities). In that sense, SICS builds on and complements traditional classification systems by categorizing sectors and industries "*in accordance with a fundamental view of their business models, their resource intensity and sustainability impacts, and their sustainability innovation potential*" (SASB, 2017, p. 16). To obtain the SICS classification associated with each company of our sample, we inserted the name of the companies one by one in the search engine available at SASB's website; and then we match the given output with the cross-sections of our sample.

Finally, we use the SASB's materiality map to build a proxy for the market expectations on the materiality of sustainability activities. This map is the resulting output of materiality tests that assessed the importance of 30 sustainability issues based on the evidence of (actual or potential) impact on the financial or operating performance as well as on the likelihood of the sustainability topic to be of interest to the reasonable investor. As the sector level materiality matrix is based on a scale of three colors, we assign to each color a score in order to translate the matrix into quantitative terms. This points system can assume one of three possible values: one, three or five, depending on the likelihood of a certain sustainability topic to be material for that sector. So, if a sustainability issue is highlighted with dark-grey, it means that it is likely to be material for more than 50% of the industries in that sector, for that reason we assign to these issues the maximum value of the range (five). In addition, if a topic is colored as light-grey, it means that it is likely to be material for fewer than 50% of the industries in that sector, thus we assign to these issues the intermediate value (three). Finally, if an issue is marked with a white label, it means that it is not likely to be material for any of the industries in the sector, thus, we assign the minimum value (one) to that issue. The visual representation of this proxy is presented in **Figure 4** (available in the Annex II)

## 3.5 Sample

The sample used in this study covers the period 2002 – 2019 and it is composed by companies headquartered in 15 EU countries (i.e. the 15 European countries that Eliwa et al. (2019) included in their study on ESG practices and the cost of debt). These 15 European countries were selected because these are the ones for which there is already solid empirical research on their country sustainability characteristics, namely the widely used country-level stakeholder orientation score proposed by Dhaliwal et al. (2011, 2014). Moreover, Norway, despite not being a member of European Union, it has been included in the sample because it follows the same regulations and accounting standards as other EU members; and it also has information on its level of stakeholder orientation.

The first step of the construction of this sample was to identify all the companies that meet our requirements. With that purpose in mind, we used the Thomson Reuters' screener tool, which allowed us to apply the following criteria. Firstly, we started by restricting our universe of potential companies to the 15 EU countries already mentioned, which resulted in a starting sample of 5718 firms. Secondly, we excluded the companies that were classified as financials according to the Thomson Reuters Business Classification (TRBC framework[8]) which left us with 3930 companies. The financials economic sector includes banking and investment services, insurance, real estate, collective investments and holding companies. By excluding this sector, we are following prior research (e.g. Buchanan et al., 2018; Gupta, 2018; Lins et al., 2017). The exclusion of financials is a common practice in empirical finance because this sector has a business model very different from other companies; on the one hand, things like "*high leverage that is normal for these firms probably does not have the same meaning as for nonfinancial firms, where high leverage more likely indicates distress*"(Fama & French, 1992, p. 429); on the other hand, financials are likely to hold a large amount of assets from other companies with differing levels of ESG performance (Schoenmaker & Schramade, 2018). Another reason for this exclusion is pointed out by Lins et al. (2017) who say that, during the financial

[8] Refinitv uses the TRBC industry group as the benchmark to compute the environmental and social, therefore we will follow that framework as well. This framework consists of 10 economic sectors, 28 business sectors and 54 industry groups. In this study we only considered 9 of the 10 economic sectors of TRBC as we exclude the financials economic sector

crisis, several financial firms received substantial support from governments, which is another factor that would reduce the comparability between companies.

These companies are indeed part of the countries and industries that are relevant for our study, but when applying the final criteria, that is, the requirement to have an ESG score available in any of the last 18 years, only 1027 firms met this condition. But not all those companies had an ESG information track record since 2002, in fact, for that pool of 1027 companies, there were only 8985 firm-year observations.

The next stage of this study was to compute for all the observations the respective cost of equity according to the four models described above, in order to do so and following prior research (e.g. El Ghoul et al., 2018), we eliminated firm-year observations that did not have positive one- and two- year-ahead earnings forecasts, as well as we removed the ones that did not have either a three-year-ahead or a long term growth forecast. At the end, only 8000 firm-year observations had the required I/B/E/S information available, and thus were eligible for the application of the cost of equity models.

To find the cost of equity associated with each firm-year observation, we computed the second part of equations (3.1) to (3.4), and then we ran the VBA code detailed in **Figure 5** (available in the Annex II) to find which cost of equity would make that second part of the equation equal to the current share price.

Finally, we were able to obtain at least one implied cost of equity estimate as well as all the control variables for 7985 observations. Nevertheless, it was not possible to obtain the four implied cost of equity estimates (i.e. estimates obtained through the four aforementioned models) for all the observations. Thus, as our dependent variable is based on the average of those estimates, in order to have consistency, we only included companies that had four implied cost of equity estimates yield by the four models discussed above. By doing so, we were left with a sample of 6624 observations.

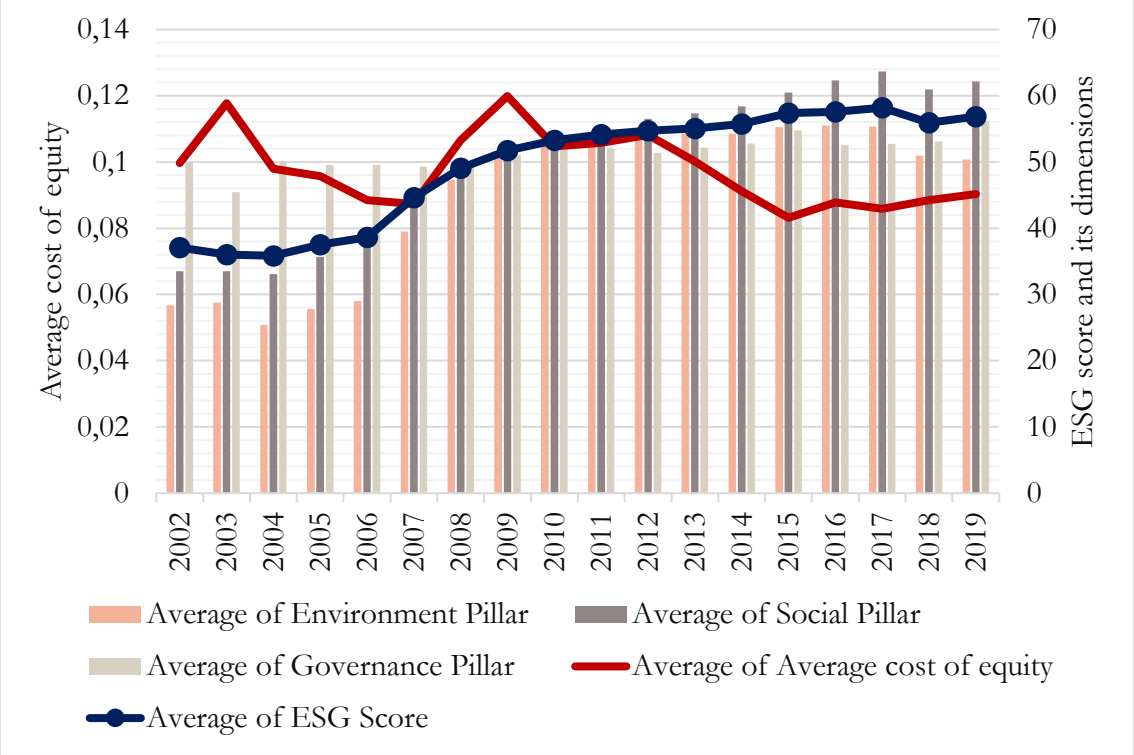
**Table 13** (available in the Annex I) reports the number of companies in our sample per industry and country. As we can see, the three major economies in Europe (France, Germany and UK) comprise the majority of the sample. And, with respect to economic sectors, industrials and consumer cyclicals are the most well-represented in the sample.

Moreover, by looking at **Figure 6** (available in the Annex II), and as expected, it is clear that the number of observations increases with time. Nevertheless, it is worth noting the limited number of observations during the period of crisis.

### 3.6 Descriptive Statistics

The **Figure 1** provides visual information on the evolution of the implied cost of equity estimates and the ESG scores and its components over the sample period (2002 -2019).

**Figure 1** - Evolution of the cost of equity and ESG components over the sample period




With regard to the implied cost of equity estimates, they have two peaks, one in 2003 and other around the 2008-2009 crisis. With respect to the overall ESG performance, generally speaking, it has been presenting an upwards trend throughout the years 2006 – 2015, after which it seems to have stagnated. Moreover, when focusing on the ESG score individual dimensions, we can see that from 2002 to 2007, the governance pillar is the one with higher scores. On the other hand, during the recent years, the social dimension has been assuming the spotlight, that is, it presents the highest average among the three pillars. Finally, the environment dimension shows some improvements during the 2006 -2015 subperiod, but then it stabilized. And, in fact, in the last two years of the sample period (2018-2019), the environment score has been indicating a downward trend.

**Table 1** - Descriptive statistics of the main variables used in this study

| | **Mean** | **SD** | **Distribution** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | 5th | 25th | 50th | 75th | 95th | Max |
| KCT | 0,0919 | 0,0324 | 0,0174 | 0,0560 | 0,0739 | 0,0875 | 0,1038 | 0,1398 | 1,1403 |
| KGLS | 0,0712 | 0,0332 | 0,0088 | 0,0301 | 0,0497 | 0,0665 | 0,0871 | 0,1246 | 0,9851 |
| KOJ | 0,1097 | 0,0373 | 0,0216 | 0,0663 | 0,0877 | 0,1041 | 0,1247 | 0,1715 | 1,2000 |
| KES | 0,1127 | 0,0444 | 0,0083 | 0,0648 | 0,0866 | 0,1041 | 0,1281 | 0,1901 | 1,2395 |
| **Kavg** | 0,0964 | 0,0310 | 0,0307 | 0,0610 | 0,0779 | 0,0917 | 0,1087 | 0,1463 | 1,1412 |
| **ESG Score** | 0,5121 | 0,2065 | 0,0000 | 0,1676 | 0,3535 | 0,5173 | 0,6764 | 0,8326 | 0,9448 |
| Lev | 0,20 | 0,15 | 0,00 | 0,00 | 0,09 | 0,19 | 0,28 | 0,46 | 2,31 |
| Size | 15,52 | 1,54 | 10,49 | 13,15 | 14,42 | 15,42 | 16,53 | 18,22 | 20,09 |
| BtM | 0,50 | 0,44 | -1,56 | 0,09 | 0,24 | 0,39 | 0,63 | 1,20 | 8,91 |
| Vol | 0,31 | 0,12 | 0,06 | 0,17 | 0,22 | 0,28 | 0,36 | 0,55 | 1,55 |
| Block | 0,24 | 0,23 | 0,00 | 0,00 | 0,02 | 0,17 | 0,43 | 0,67 | 1,00 |
| Disp | 0,14 | 0,64 | 0,00 | 0,02 | 0,04 | 0,07 | 0,12 | 0,36 | 35,00 |
| Fbias | 0,01 | 0,05 | -0,78 | -0,03 | 0,00 | 0,01 | 0,01 | 0,04 | 1,30 |
| Infl | 0,02 | 0,01 | -0,02 | 0,00 | 0,01 | 0,02 | 0,03 | 0,04 | 0,05 |
| NLGDPPC | 10,66 | 0,22 | 9,67 | 10,26 | 10,60 | 10,67 | 10,77 | 11,00 | 11,54 |

The **Table 1** reports the descriptive statistics for the sample used in this study which consists of 6624 firm-year observations from 15 European countries over the period 2002-2019. The definitions and data sources of all variables are detailed on **Table 12** (available in the Annex I).

Moreover, as it can be seen on **Table 1** , in general, the abnormal growth models (Koj and Kes) yield slightly higher estimates (10,97% and 11,27% respectively) compared with the residual income valuation models (Kct and Kgls) estimates (9,19% and 7,12% respectively), which is in line with Hail and Leuz (2006) and El Ghoul et al. (2011). Nevertheless, the models yield fairly close estimates, in fact, the mean of the average of the four models implied cost of equity (Kavg) across the models is 9,64% with a standard deviation of 3,1%.

**Table 14** (available in the Annex I) reports the correlation between the implied cost of equity estimates of each model. The exhibit shows that OJ model estimates (Koj) are the ones with the higher correlation with Kavg, whereas Kgls presents a lower correlation with Kavg. The relatively low correlation exhibit by the estimates of the Gebhardt, Lee, and Swaminathan (2001) model may result from the fact that this model has the longest explicit forecasting horizon (12 years) and, on top of that, it also incorporates industry information.

None of the variables used in the regressions presents a correlation above 0.7 (see **Figure 2** and/or **Table 14**), and using that value as a thumb rule, we may expect that multicollinearity among control variables not to be a problem. To test that expectation, we checked the

variance inflation factor (VIF) (see **Table 2**) from the main regression, and as none of the variables has a VIF value above 10, that suggests that there is no multicollinearity problem (see Kutner, Nachtsheim, Neter, & Li, 2005, p. 409).

**Table 2** - Variance Inflation Factor (VIF) testing for the baseline model

| Variable | Coefficient Variance | Uncentered VIF | Centered VIF |
|---|---|---|---|
| C | 0,003644 | 86941,40 | NA |
| Esg_score_ratio | 0,000009 | 59,48 | 1,21 |
| Lev | 0,000030 | 29,59 | 1,23 |
| Size | 0,000005 | 29343,85 | 5,19 |
| Btm | 0,000107 | 585,52 | 7,22 |
| Vol | 0,000125 | 269,55 | 2,99 |
| Blockholding | 0,000009 | 13,47 | 1,45 |
| Fbias | 0,001996 | 7,93 | 5,86 |
| Disp | 0,000002 | 2,15 | 1,38 |
| Infl | 0,003101 | 25,36 | 1,45 |
| Nlgdppc | 0,000036 | 97993,31 | 1,47 |

Nevertheless, taking a closer look, it can be found a statistically significant and expressive positive correlation between the variable size and the ESG score (0,59) (see **Table 14**). This is in line with previous studies, as larger companies are expected to have greater resources to engage in ESG activities. Yet, size is the only control variable that does not have the expected sign with the average cost of equity as discussed in subsection **3.3**.

Finally, and taking into account the main question of this study, we highlight that the ESG score has a statistically insignificant (approximately null) correlation with our estimate for the average implied cost of equity (Kavg) (see **Figure 2**). Moreover, we disaggregated the implied costs of equity estimates by the different levels of ESG performance (**Table 3**), and roughly speaking, that output also suggests a negative relation between ESG score and the cost of equity.

**Table 3** - Descriptive statistics for the cost of equity categorized by values of ESG score

| ESG_SCORE | Mean | Std. Dev. | Obs. |
|---|---|---|---|
| [0, 20) | 0,0990 | 0,0539 | 493 |
| [20, 40) | 0,0961 | 0,0292 | 1586 |
| [40, 60) | 0,0970 | 0,0295 | 2117 |
| [60, 80) | 0,0958 | 0,0271 | 1841 |
| [80, 100) | 0,0950 | 0,0259 | 587 |
| All | 0,0964 | 0,0310 | 6624 |

**Figure 2** - Correlation plot of the main variables of the baseline model

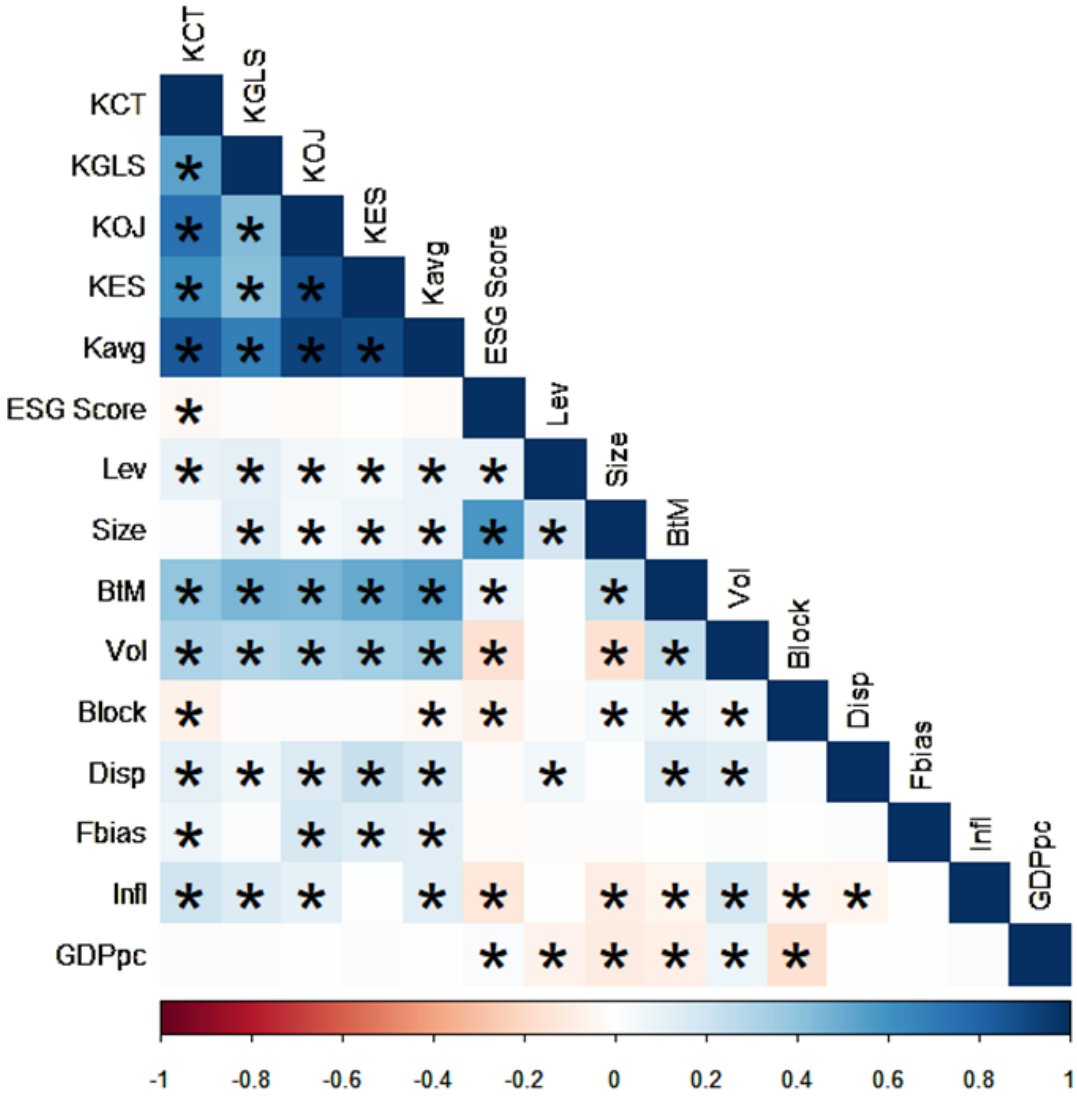



**Figure 2** exhibits the correlation plot which essentially helps to visualize the relationships between the set of variables used in this study by displaying their correlations using a range of colours. In this figure, the dark blue signalizes strong positive correlations, whereas the dark red signalizes strong negative correlations; and, the colour white indicates that there is no correlation. Moreover, the asterisk indicates a 5% level of significance. The correlation matrix *per se* is presented in **Table 14** (available in the Annex I). The definitions and data sources of all variables are detailed on **Table 12** (available in the Annex I).

# 4 Results and discussion

In this Chapter, we present and discuss the results of our empirical analysis. The starting point of this empirical analysis consisted of deciding which panel data estimation technique (fixed-effects, random effects or pooled OLS estimation) was the most appropriate one for our sample. The results of this assessment are presented in the Appendix I .

To examine our first hypothesis, that is, whether companies with high ESG performance benefit from lower cost of equity, we regress the model presented in equation **3.5.**

**Hypothesis 1 (H1):** There is a negative relationship between the firm's ESG performance and its cost of equity.

The **Table 4** presents the output of the regressed two-way fixed effects model with robust standard errors. The results (regression Full Sample) show us that the coefficient of the ESG score is not statistically significant (with a p-value of 0.62)[9]. With respect to the control variables, the book to market variable, the leverage ratio, the annualized volatility and the inflation have the expected signs (based on the literature reviewed) and also have statistical significance. The remaining variables have no statistical significance.

As referred in the literature review, a common concern in studies similar to ours is the possible existence of endogeneity caused by a simultaneity bias (recall the discussion on the virtuous cycle, for example). In this sense, a detailed analysis and econometric tests on this matter are provided in the Appendix II. And, based on that analysis, we conclude that there is no evidence of endogeneity underlying our results.

So, we proceed our empirical analysis by testing our second hypothesis. To do so, we split the original sample by terciles. That is, the observations located in the lowest tercile of the ESG score distribution were grouped into the low-ranking ESG performance subsample. Whereas the observations located in the highest tercile of the ESG score were assigned to the top-ranking ESG performance subsample. And, then we regress the baseline model in each of the described subsamples. The results are exhibited in **Table 4** as well (regressions Low ESG score and High ESG score).

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[9] As several research papers taken as a reference for this study (for example, El Ghoul et al. (2018) and Gupta (2018)) used the individual dimensions of the ESG score instead of the aggregated measure in their models, we also performed a regression of our model using the dimensions separately instead of the overall ESG score. Nevertheless, the variables associated with the individual dimensions did not present statistical significance.

**Table 4** - Regression results for the full sample and the subsamples (low- *vs* top- ranking ESG score)

| | | **Full sample** | **Low ESG score** (33th percentile) | **High ESG score** (66th percentile) |
|---|---|---|---|---|
| | | | ESG score < 0.41 | ESG score > 0.62 |
| **Dependent Variable**: Average cost of equity | | | | |
| **Expected sign** | **Variable** | **Coeff.** | **Coeff.** | **Coeff.** |
| | C | 0,0131<br>(0,0748) | 0,0840<br>(0,1337) | -0,0738<br>(0,0848) |
| - | ESG_SCORE | 0,0017<br>(0,0037) | -0,0010<br>(0,0097) | 0,0158**<br>(0,0079) |
| - | SIZE | -0,0033<br>(0,0025) | -0,0047<br>(0,0030) | 0,0006<br>(0,0018) |
| + | BTM | 0,0336***<br>(0,0114) | 0,0583***<br>(0,0215) | 0,0210***<br>(0,0029) |
| + | LEV | 0,0312***<br>(0,0069) | 0,0360***<br>(0,0094) | 0,0371***<br>(0,0077) |
| + | VOL | 0,0251**<br>(0,0124) | 0,0278<br>(0,0186) | 0,0362***<br>(0,0083) |
| - | BLOCK | -0,0004<br>(0,0038) | -0,0048<br>(0,0068) | 0,0009<br>(0,0044) |
| + | FBIAS | 0,0634<br>(0,0491) | 0,1457<br>(0,1046) | 0,0433***<br>(0,0143) |
| + | DISP | 0,0021<br>(0,0018) | 0,0012<br>(0,0013) | 0,0031**<br>(0,0014) |
| - | NLGDPPC | 0,0092<br>(0,0077) | 0,0031<br>(0,0122) | 0,0106<br>(0,0076) |
| + | INFL | 0,2389***<br>(0,0670) | 0,3499***<br>(0,1225) | 0,2870***<br>(0,0706) |
| **Total panel (unbalanced) observations** | | 6624 | 2179 | 2241 |
| **Cross-sections** | | 870 | 577 | 379 |
| **Period** | | 2002 -2019 | | |
| **Year effects** | | Yes | Yes | Yes |
| **Firm effects** | | Yes | Yes | Yes |
| **R-squared** | | 0,6353 | 0,6882 | 0,7680 |
| **Adj. R-sq.** | | 0,5783 | 0,5688 | 0,7168 |
| **Robust standard errors** | | White period standard errors | White diagonal standard errors | White diagonal standard errors |

**Table 4** shows the output of the two-way fixed effects regression of the implied cost of equity on the ESG score and control variables. The first column presents the results for the full sample as described in subsection **3.5**, the second and third column exhibit the results for the low- and high-ESG score, respectively. The sample split was based on the terciles of the ESG score distribution,

that is, the low ESG score subsample is located in the lowest tercile of the distribution and the high ESG score subsample is placed in the highest tercile. The definitions and data sources of all variables are detailed on **Table 12** (available in the Annex I**)**. The heteroskedasticity-corrected standard errors are presented between parentheses. Statistical significance is denoted by *** if p-value < 0.01, ** if p-value < 0.05, * if p-value < 0.1.

**Hypothesis 2 (H2**): Top-ranking (low-ranking) ESG performances are associated with a higher (lower) cost of equity.

This comparative analysis of different ESG profiles (low *versus* high) yields several insights that are worth being discussed.

First of all, with respect to our main variable of interest (the ESG score), it has only presented statistical significance for the top-ranking ESG score subsample. And, the sign assigned to the coefficient is positive which is in line with what was expected based on the literature reviewed. That is, for top-ranking ESG performers, a high ESG score is associated with a higher cost of equity. Thus, this finding is consistent with the "doing good but not doing well" viewpoint discussed in the literature review. According to this perspective, ESG practices may worsen the financial performance (in the case of this subsample, it aggravates the cost of equity financing). That damage may have several underlying causes such as managerial opportunism (meaning that, investments in ESG matters may be motivated by either the pursuit of personal goals or the window dressing of weak financial performance through engagement in sustainability activities) or overinvestment concerns. The thinking underlying those overinvestment arguments is that improvements in ESG aspects imply a trade-off, that is, the company's scarce resources being allocated to ESG investments that may be value-enhancing or not. More precisely, even if up to a certain point those investments are able to create value through the enhancement of the corporate reputation, reduction of the firm's risk, attraction of an appropriate investors base, and so on, after a certain level of ESG performance, it is plausible to assume that extra investments in ESG matters may be putting the company in competitive disadvantage. As we have been pointing out throughout this research, the corporate resources are limited and not all ESG matters are material (economically relevant) for a certain company, thus, it is reasonable to assume, for example, that investments on immaterial sustainable issues may not be properly rewarded by the financial markets.

Also, another plausible explanation for this result is that if, as suggested by Utz (2019), aggregated ESG ratings are useless when it comes to predict corporate scandals, and many

companies with excellent ESG scores also suffered from extremely costly corporate scandals, then, in those cases a high ESG performance does not mean lower firm risk neither less information asymmetry. In fact, in those cases one may say that an excellent ESG performance has a certain degree of greenwashing.

Another aspect that is worth being highlighted is that the analysts' forecasts control variables only exhibited statistical significance for the high ESG score subsample. Therefore, these findings may have two implications. On the one hand, as one may recall from the subsection **3.3**, optimistic analysts' earnings forecasts tend to force an artificially high implied cost of equity. As the coefficient associated with the variable forecast bias is positive, we may say that the analysts' optimism about their predictions is particularly evident for top-ranking ESG performers. On the other hand, higher dispersion on analysts' earnings forecasts (i.e. the lack of consensus among analysts) reflects a higher degree of uncertainty about those forecasts, which in turn is associated with a higher implied cost of equity. And, as we can see in **Table 4**, the variable with regard to the disagreement among analysts also presents a statistically significant positive coefficient for the top-ranking ESG observations.

Some plausible justifications for the optimism and uncertainty associated with the analysts' forecast for the high ESG score subsample may be, on the one hand, the lack of common reporting standards for corporate sustainability reports, and, on the other hand, an excessive level of ESG disclosure associated with top-ranking ESG performance.

And, if up to a certain point, disclosure is a good thing as it reduces the information asymmetry. After a certain level, those benefits may start to vanish as a very high level of sustainability practices disclosure, especially without common standards, may generate clusters of information that analysts are not able to interpret with the desired degree of objectiveness (higher disagreement and bias). The regulation and standards on non-financial reporting are not as developed as those on financial reporting; and, this lack of standardization may cause analysts to have some difficulties in analyzing and classifying the information disclosed on ESG practices, which in turn may in some cases distort the concrete impact of ESG activities on the company's future value (Schulz, 2016). For example, while some analysts may interpret all corporate sustainability disclosure as a positive thing, others may see the excess of disclosed information as attempts to justify poor investment decisions, for example.

With respect to the low ESG score subsample, our results do not provide additional insights for current discussion going on among researchers (as described in the research

hypothesis development of this question – hypothesis 2 (H2), available in the subsection **2.2.4**) as the ESG score variable does not have statistical significance for this subsample.

All things considered, and in order to link our results to the theoretical foundation that was laid on the chapter **2**, we may state that our empirical results (so far) do not provide statistically significant support for the "doing good while doing well" viewpoint, according to which it was expected that a better ESG performance would be associated with better equity financing conditions. On the other hand, our findings strengthen, at least in some extent, the shareholder theory and the agency theory, meaning that at some point (especially when a company already has a high ESG profile), additional ESG activity may be seen as an unnecessary cost for the company.

**Hypothesis 3** (H3): There is a time-varying relationship between ESG performance and the cost of equity.

Another major objective of this research project is to test if the relationship between the cost of equity and ESG performance has changed over time, and if so, how that relation has evolved through the years. One of the main motivations to pose this hypothesis is because during the sample period there were several changes in terms of societal demands as well as modifications in the economic environment and legal framework in which companies operate. Having this in mind, we divided our sample period into three subperiods: 2002 - 2007, 2008 – 2012 and 2013-2019.

Even though the awareness for sustainability issues has increased during the whole sample period, these three subperiods are characterized by very different economic conditions and events. Specifically, the first subperiod, which follows the economic downsizing of the dot.com bubble crisis, covers the years from 2002 to 2007 and it is a period of high growth for Europe. Then, the second subperiod which includes the years from 2008 to 2012 is marked by a profound economic recession as this timeframe compresses both the global financial crisis of 2008/2009 and the European sovereign debt crisis. Finally, the third subperiod includes the most recent years, and it is characterized by the development of new legislation respecting sustainability issues; more precisely, in 2014, it was introduced a new directive requiring companies (with more than 500 employees and located within the European Union) to disclose ESG information of their business activities (European Parliament, 2014).

In the context of the hypothesis 3, we had the main purpose of testing whether the relationship between ESG performance and the implied cost of equity is time-varying. As it

was discussed in the subsection **2.2.4**, this question was posed, not only, because of the dissent that exists in the literature with regard to the crisis period (that is, the need to rebuild social trust *versus* the need for effective monitoring), but also because the increasing external pressure (both in terms of changes in the regulatory framework and societal demands) for companies to adopt more sustainable behaviours, in the recent years. The test of this hypothesis yielded two interesting findings which are presented in **Table 5**.

**Table 5** - Regression results for the subperiods: pre-crisis, crisis and post-crisis

| | | **Pre-crisis** | **Crisis** | **Post-crisis** |
|---|---|---|---|---|
| **Dependent Variable**: Average cost of equity | | | | |
| **Expected sign** | **Variable** | **Coeff.** | **Coeff.** | **Coeff.** |
| | C | -0,8076**<br>(0,3864) | 0,2732<br>(0,2220) | -0,0566<br>(0,0920) |
| - | ESG_SCORE | 0,0007<br>(0,0055) | -0,0062<br>(0,0086) | -0,0107**<br>(0,0054) |
| - | SIZE | -0,0017<br>(0,0036) | 0,0055<br>(0,0037) | -0,0005<br>(0,0018) |
| + | BTM | 0,0522**<br>(0,0206) | 0,0251***<br>(0,0042) | 0,0252***<br>(0,0046) |
| + | LEV | 0,0178**<br>(0,0081) | 0,0113<br>(0,0107) | 0,0369***<br>(0,0075) |
| + | VOL | -0,0173<br>(0,0131) | 0,0243**<br>(0,0113) | 0,0309***<br>(0,0083) |
| - | BLOCK | 0,0012<br>(0,0070) | 0,0119*<br>(0,0061) | -0,0018<br>(0,0038) |
| + | FBIAS | 0,2145**<br>(0,1015) | 0,0289*<br>(0,0151) | -0,0134<br>(0,0306) |
| + | DISP | 0,0008<br>(0,0098) | 0,0013<br>(0,0020) | 0,0019<br>(0,0012) |
| - | NLGDPPC | 0,0853**<br>(0,0384) | -0,0261<br>(0,0191) | 0,0122<br>(0,0085) |
| + | INFL | 0,1528<br>(0,1467) | 0,0892<br>(0,1141) | 0,1348<br>(0,0821) |
| **Total panel (unbalanced) observations** | | 1553 | 1960 | 3111 |
| **Cross-sections** | | 415 | 512 | 849 |
| **Period** | | 2002 - 2007 | 2008 - 2012 | 2013 -2019 |
| **Year effects** | | Yes | Yes | Yes |
| **Firm effects** | | Yes | Yes | Yes |
| **R-squared** | | 0,7320 | 0,7323 | 0,8029 |
| **Adj. R-sq.** | | 0,6297 | 0,6343 | 0,7271 |
| **Robust standard errors** | | White diagonal standard errors | | |

**Table 5** shows the output of the two-way fixed effects regression of the implied cost of equity on the ESG score and control variables. The first column presents the results for the subperiod 2002-2007 (named as "pre-crisis" period), the second shows the results for the subperiod that goes from 2008 to 2012 (denoted as "crisis" period) and, finally, the third column exhibits the results for subperiod 2013-2019 (labelled as "post-crisis" period). The sample split was based on, not only, on major events such as the global financial crisis 2008/2009 and the European sovereign debt crisis (2012), but also, in changes in the regulatory framework and societal demands, for example, the introduction of new directives respecting corporate sustainability practices and the signature of the Paris Agreement (whose the consultancy process started in March 2013). The definitions and data sources of all variables are detailed on **Table 12** (available in the Annex I). The heteroskedasticity-corrected standard errors are presented between parentheses. Statistical significance is denoted by *** if p-value < 0.01, ** if p-value < 0.05, * if p-value < 0.1.

Firstly, the results obtained for the post-crisis period, in particular, the statistically significant negative coefficient of the ESG score variable may have a meaningful interpretation under the light of the legitimacy theory. As discussed earlier in the literature review, the legitimacy theory is built on the idea that a company is a part of a social system that has embedded its own beliefs, norms and values. And as such, a company must seek to legitimize its operations, that is, companies must make sure that their actions are within the boundaries established by the society.

As we already mentioned, in the recent years, there were several changes in the "social system" in which companies operate (e.g. the introduction of more legislation as well as the establishment of international agreements on sustainability matters). Thus, in this context, companies may improve their ESG performance with the intent of gaining social legitimacy. And, by doing so, companies avoid being sanctioned by the society as well as pave way to maintain and enhance their corporate reputation. All things considered, it can be argued that, especially in the recent years (2013-2019), the improvements in the ESG performance may reduce the firm risk, which in turn is reflected in a lower cost of equity. Therefore, it is not surprising that the findings of this study suggest that, (only) for the subperiod that goes from 2013 to 2019, as the ESG score increases, the implied cost of equity tends to decrease.

As discussed in the literature review, several researchers have been investigating the relationship between ESG (CSR) performance and financial metrics such as stock returns (Lins et al., 2017) or firm value (Buchanan et al., 2018) around the financial crisis period. The rationale behind these studies was to analyse which corporate sustainability effect was exacerbated during times of crisis, that is, to evaluate whether during the crisis period it was

more important to rebuild the trust of stakeholders or to alleviate overinvestment concerns. In contrast to previous research, our main variable of interest (ESG score) does not have statistical significance for the crisis subperiod.

Linking these results to our motivation for selecting a sample of European companies as the object of study, one may argue that, despite the fact that European countries tend to be characterised for having good sustainability performances, it does not seem to be enough anymore. In other words, our findings may suggest that, nowadays, more than ever, society expects the companies to be an active part of the transition towards a more sustainable future.

Secondly, and in contrast to what was initially posed, the presence of large owners (blockholders) does not seem to reduce agency problems but rather exacerbate them. As it can be found a statistically significant positive coefficient describing the relationship between the blockholding variable and the implied cost of equity for the crisis time span. Thus, this finding is broadly in line with the results of Thomsen, Pedersen, and Kvist (2006) who find that in Continental Europe there is a negative relation between blockholder ownership and firm value or accounting returns in the following period.

Now, we move our discussion for the research questions respecting the materiality of ESG issues and its role as a moderator on the relationship between ESG performance and the implied cost of equity.

**Hypothesis 4** (H4): The expected reduction of the cost of equity caused by improvements in the ESG performance is higher (lower) for companies with better scores on material (immaterial) issues.

**Hypothesis 5** (H5): The moderator role of materiality in explaining the relation between ESG performance and cost of equity is more evident during the crisis period.

To test the hypothesis 4, we regress once again the model expressed in the equation 3.5 with two-way fixed effects but now we only considered the firms that are part of sectors where ESG issues are indeed material; that is, sectors for which the likelihood of the sustainability issues being economically relevant is above average (which in the context of this study means an overall ESG classification, according to the points system used in this study (described in detail in the subsection **3.4** and illustrated in **Figure 4** – available in the Annex II) equal to or above 7.2. Nevertheless, the results of this regression (presented in **Table 6**) do not present meaningful differences compared to our baseline regression results (i.e. the ones resulting from the test of H1). A plausible justification for that lack of significant

differences is that, compared to our sample period (that goes from 2002 to 2019), the introduction of the concept of materiality in research is relatively recent as well as it is the development of materiality frameworks such as the one developed by SASB.

Then, to test the hypothesis 5, we followed the previous procedure with the main difference that now we intent to perform a more nuanced analysis, thus, we have also divided our analysis in three subperiods (i.e. the same three subperiods that we used to test the hypothesis 3). And, for these regressions, we obtained more interesting results.

Firstly, the time period being analysed is a fundamental element to take into account when studying the sustainability-cost of equity relationship, and that idea is reinforced by our findings (not only the ones being presently discussed but also the ones that resulted from the test of hypothesis 3). In essence, the division of sample period in subperiods, and the findings that resulted from subsequent test of hypothesis (3 and 5), suggest that sustainability matters have received more attention and have gained increasingly more importance in the decision-making process of shareholders in the recent years (2013 -2019), this inference stems from the fact that ESG score – cost of equity financing relation only has presented a negative sign as well as statistical significance for this subperiod.

Secondly, the introduction of the concept of materiality also generated more leads on the dynamics of the relationship between ESG performance and cost of equity. Particularly, for sectors where the likelihood of the sustainability matters being material is above average (both in terms of risks and opportunities), our main variable of interest (the ESG score) exhibits a higher (negative) value and an improved statistical significance (from 5% to 1%). compared to the case where materiality is not taken into account. So, our findings suggest that when a company is part of a sector where ESG matters are particularly material, investments that aim to improve the corporate sustainable performance are more likely to be seen as value-enhancing, and thus benefit from a lower cost of equity.

Therefore, our results are consistent with other recent studies that have also analysed the role of materiality, specifically with the findings of Matsumura et al. (2018) which suggest that the market materiality expectations on sustainability issues indeed allow inferences about the credibility and informativeness of ESG activities. In this sense, materiality matrices have the potential to work as a "cross-check" and to provide guidance on how sustainability investments can be value enhancing.

Finally, it is also worth noting that, with respect to the subperiod that goes from 2013 to 2019), the statistical significance of the ESG score variable is slightly better for the context

that considers the concept of materiality. So, it is plausible to consider that this may be related to the following idea posed by Khan et al. (2016, p. 1698): "*If the discrimination is meaningful, then exploiting variation in materiality across sustainability issues has the potential to improve the signal-to-noise ratio in testing the future performance implications of sustainability investments*."

Despite some slight differences between the results of **Table 5** and the ones from **Table 6**, one may argue that, theoretically, those differences should be more evident. A plausible explanation for those differences not being accentuated enough may be the lack of clarity about what is the threshold to classify a certain issue as material. In fact, a recent report from the CFA institute (2019, p. 59) poses the following: "*Because investors have different definitions of materiality as well as different thresholds for materiality, knowing when to integrate ESG factors is difficult*."

**Table 6** - Regression results for materiality and temporal considerations

| | | **Materiality of ESG dimensions** above average (i.e. >= 7.2) | | | |
|---|---|---|---|---|---|
| | | **Full Sample** | **Pre-crisis** | **Crisis** | **Post-crisis** |
| **Dependent Variable**: Average cost of equity | | | | | |
| **Expected sign** | **Variable** | | **Coeff.** | **Coeff.** | **Coeff.** |
| | C | -0,0205<br>(0,0586) | -0,4623<br>(0,3529) | 0,5724**<br>(0,2475) | -0,0154<br>(0,1068) |
| - | ESG_SCORE | 0,0000<br>(0,0030) | -0,0033<br>(0,0057) | -0,0076<br>(0,0085) | -0,01720***<br>(0,0065) |
| - | SIZE | -0,0004<br>(0,0010) | 0,0073***<br>(0,0025) | 0,0011<br>(0,0045) | -0,0012<br>(0,0022) |
| + | BTM | 0,0202***<br>(0,0025) | 0,0191***<br>(0,0060) | 0,0199***<br>(0,0042) | 0,0252***<br>(0,0062) |
| + | LEV | 0,0290***<br>(0,0063) | 0,0235**<br>(0,0092) | 0,0196*<br>(0,0109) | 0,0354***<br>(0,0101) |
| + | VOL | 0,0232***<br>(0,0065) | -0,0182*<br>(0,0106) | 0,0167<br>(0,0118) | 0,0239**<br>(0,0102) |
| - | BLOCK | 0,0020<br>(0,0028) | 0,0009<br>(0,0062) | 0,0119*<br>(0,0063) | -0,0053<br>(0,0047) |
| + | FBIAS | 0,0016<br>(0,0173) | 0,0310**<br>(0,0150) | 0,0154<br>(0,0136) | -0,0209<br>(0,0350) |
| + | DISP | 0,0031**<br>(0,0016) | 0,0178***<br>(0,0059) | 0,0004<br>(0,0021) | 0,0020<br>(0,0013) |
| - | NLGDPPC | 0,0087<br>(0,0053) | 0,0405<br>(0,0334) | -0,0471**<br>(0,0216) | 0,0097<br>(0,0095) |
| + | INFL | 0,2518***<br>(0,0513) | 0,2828**<br>(0,1301) | 0,0173<br>(0,1275) | 0,1850**<br>(0,0912) |

| | | | | |
|---|---|---|---|---|
| **Total panel (unbalanced) observations** | 4517 | 1020 | 1347 | 2150 |
| **Cross-sections** | 590 | 282 | 354 | 580 |
| **Period** | 2002 - 2019 | 2002 - 2007 | 2008 - 2012 | 2013 -2019 |
| **Year effects** | Yes | Yes | Yes | Yes |
| **Firm effects** | Yes | Yes | Yes | Yes |
| **R-squared** | 0,6789 | 0,7261 | 0,7238 | 0,7947 |
| **Adj. R-sq.** | 0,6282 | 0,6139 | 0,6202 | 0,7161 |
| **Robust standard errors** | White diagonal standard errors | | | |

**Table 6** shows the output of the two-way fixed effects regression of the implied cost of equity on the ESG score and control variables. This output is based on companies of the original sample (as described in subsection **3.5**) that are part of industries where the materiality (economic relevance) of sustainability matters is above average (more details on subsection **3.4** and **Figure 4** – available in the Annex II). Also, in order to be able to apply the SASB framework, only companies that were classified according to the SASB's industry classification – SICS (sustainable industry classification system)- were considered. It is worth noting that even though the financials were excluded, exclusion based on the Thomson Reuters Business Classification, some companies of our original sample now according to the SICS were designed as financials. Those companies were not considered as well. The first column presents the results for the subperiod 2002-2007 (named as "pre-crisis" period), the second shows the results for the subperiod that goes from 2008 to 2012 (denoted as "crisis" period) and, finally, the third column exhibits the results for subperiod 2013-2019 (labelled as "post-crisis" period). The sample split was based on, not only, on major events such as the global financial crisis 2008/2009 and the European sovereign debt crisis (2012), but also, in changes in the regulatory framework and societal demands, for example, the introduction of new directives respecting corporate sustainability practices and the signature of the Paris Agreement (whose the consultancy process started in March 2013). The definitions and data sources of all variables are detailed on **Table 12** – available in the Annex I. The heteroskedasticity-corrected standard errors are presented between parentheses. Statistical significance is denoted by *** if p-value < 0.01, ** if p-value < 0.05, * if p-value < 0.1.

# 5 Limitations and conclusions

## 5.1 Limitations

Before going into the main conclusions of the results previously discussed, it is important to note some potential caveats of our study. In essence, this research is limited by the fact that our main variables: ESG performance, implied cost of equity and materiality had to be proxied as they cannot be directly observed, thus the replication of this study may result in different findings because of the following reasons.

The first is that the proxy for the ESG performance is highly dependent on the ESG measurement method adopted by the rating institution that provides the data. And, as it was already discussed throughout this study, the ESG performance of a company is difficult to quantify. Because, on the one hand, there are not (yet) universal standards for sustainability reports, on the other hand, in some countries the issuance of that kind of report is still voluntary. Therefore, it is reasonable to assume that the valuation criterions are likely to differ between rating institutions. In fact, Berg, Kölbel, and Rigobon (2020) document that the correlation between six different sustainability ratings (namely, KLD, Sustainalytics, Vigeo Eiris, RobecoSAM, Asset4 [Refinitiv], and MSCI) is on average 0.54, and ranges from 0.38 to 0.71. But, even when using the same data source, one must be cautious as these ratings are by nature frequently updated (e.g. Refinitiv, 2020).

Furthermore, the computation of the implied cost of equity as well as the proxy for the materiality matrix can also give rise to measurement errors. With respect to the former, as discussed in subsection 3.3, the analysts' forecasts (which are heavily used in our four cost of equity valuation models) sometimes can be biased. Nevertheless, we attempted to address that issue by adding two control variables: one related to the forecast bias *per se* and other regarding the disagreement among analysts (see subsection 3.3). Moreover, the implied cost of equity models did not yield solutions for all the firm-year observations; thus, in order to assure consistency among estimates, we only considered observations whose average implied cost of equity was based on the values provided by all four models. Finally, with respect to the proxy for materiality matrix, as it was a translation from graphic data to quantitative terms, certainly, there are several alternative ways to do that conversion, which in turn may modify the final outcome.

## 5.2 Conclusion

In this study, we investigate the value relevance of ESG activities. Specifically, we test the effect of the ESG performance of companies on their implied cost of equity as well as the role of materiality considerations in explaining that relation. To achieve that purpose, we used a sample of companies from 15 European countries over the period 2002 – 2019.

Our first hypothesis consisted of testing if a higher ESG performance was associated with a lower cost of equity. For this first step, our results indicated that the coefficient of the ESG score variable was almost zero and statistically insignificant. But then, as one of the main objectives of this research was to broaden the discussion on the nuances and dynamics of the relationship between ESG activities and cost of equity, we moved our analysis from a general to a more specific point of view. To do so, three distinct approaches were employed.

Firstly, it was performed a comparative analysis between top-ranking ESG observations and low-ranking ESG observations, and this investigation revealed that top-ranking ESG performance is associated with a higher cost of equity. Plausible justifications for this finding are that very high ESG scores may raise some concerns about the quality of the investment decisions as well as suspects of managerial opportunism behaviour. In addition, top-ranking ESG performers are not always less risky when compared to their peers (for example, in terms of ESG scandals as Utz (2019) has explored in detail), that happens in cases where the ESG investments are not being properly targeted at the critical (material) ESG issues of the company.

Secondly, as our sample period comprises very distinct years (in terms of economic conditions, regulatory frameworks, societal demands, and so further). To have a better understanding of the time-varying feature of the relationship between ESG performance and implied cost of equity, we divided our analysis in three subperiods: pre-crisis (2002-2007), crisis period (2008-2012) and post-crisis (2013-2019). Based on what was discussed in the literature review, one would expect to find either the concerns regarding the quality of the investment decisions or the need to rebuild the trust of stakeholders exacerbated during the crisis period. With respect to that matter, our main variable of interest (ESG score) did not present statistical significance for the crisis period. Nevertheless, when focusing on the post-crisis years (the subperiod that goes from 2013 to 2019), the findings of this study suggest that enhancements on the ESG practices can lead to a reduction of the implied cost of equity. As we know, these years have been marked with the introduction of new regulation respecting ESG performance disclosure (European Parliament, 2014), structuring of

international agreements for climate change collaboration (European Commission, 2013) as well as increasing investors' activism (Alvarez & Marsal, 2019; Corte et al., 2019; Dam & Scholtens, 2013). Thus, this finding may provide valuable insights, particularly, under the light of the legitimacy theory.

Thirdly, in the last stage of this research project, we studied the moderating role of materiality considerations (that is, the economic relevance of sustainability issues for each industry) in explaining the relationship between ESG performance and the implied cost of equity. The main motivation to consider a "materiality lens" as moderator was because recent research has been finding evidence that sustainability disclosures on issues that are considered to be financially material (on the industry of the disclosing company) are associated with higher stock price informativeness (Grewal et al., 2020) and also are perceived as more credible, and thus tend to be rewarded with a lower cost of equity (Matsumura et al., 2018). To investigate the effect of materiality, we built a quantitative proxy based on the materiality standards developed by the Sustainability Accounting Standards Board (SASB), and then we regress our baseline model but now to evaluate this issue we only considered companies that were part of industries where the materiality of ESG issues was above average. Similar to the results discussed above, we only find a negative sign with statistical significance assigned to the relationship ESG performance-cost of equity for the subperiod that goes from 2013 to 2019. The main difference between these results and the previous ones is that, here, the coefficient of the variable ESG score (with the material considerations) presented a statistically significance at 1% whereas the aforementioned results (that is, the ones without the materiality considerations) exhibit a statistical significance of 5%. In addition, the coefficient with the materiality considerations also indicate a higher (negative) value compared to the one without the materiality "filter". In this sense, a plausible interpretation of this improvement in the statistically significance as well as in the magnitude of the coefficient is that enhancements in ESG matters that are financially material for a given sector are likely to be perceived as more credible, and thus are more likely to benefit from a lower cost of equity.

So, none of the main theories discussed in the literature review fully explains our findings, meaning that it is possible to do good while doing well (in particular, during the recent years and in industries where the materiality of ESG is above average) but only up to a certain level.

## 5.3 Practical recommendations

In this subsection, we discuss some practical recommendations for both firm managers and policymakers that can be derived from the findings of this study.

As the results of this research revealed, in the recent years, improvements in the ESG performance tend to be rewarded with a lower cost of equity and that it is likely to occur in industries where the financial materiality of sustainable matters is above average. On this basis, materiality assessments are increasingly gaining more importance, especially from a reporting standpoint (for example, companies are starting to display materiality matrices on their websites, and countries are gradually promoting regulation that makes mandatory the issuance of integrated reports - linking the financial data with the sustainability information). Thus, to make the most of materiality assessments, practitioners should consider going beyond the reporting purpose (which is essentially backward looking), and to integrate materiality considerations in their strategies as well. By doing so, organizations are adopting a forward-looking viewpoint which gives them the chance to spot trends and to anticipate emerging issues before it is too late. Ultimately, by adopting this action-oriented mindset, companies will be using ESG practices more effectively as a risk-management tool, and in turn benefiting from lower costs of financing.

In addition, our study has shown that top-ranking ESG observations seem to be associated with a higher implied cost of equity, which may reflect some concerns regarding the quality of the investment decisions or even suspects of managerial opportunism behaviour. Thus, to prevent this from happening, practitioners should consider integrating ESG experts in the board composition (see, for example, Homroy & Slechten, 2019; Post, Rahman, & McQuillen, 2015). By doing so, companies would be ensuring that the board has indeed the right expertise and knowledge to properly understand the ESG risks and opportunities, and thus the oversight provided by the board would be more effective, which in turn would have the potential to reduce some of the aforementioned concerns.

## 5.4 Further research

All in all, our results highlight the complexity of the relation between corporate sustainable performance and the implied cost of equity. As such, in this subsection, we outline some possible avenues for further research. Firstly, maybe it would be interesting to explore models that could take into account the non-linear feature in a more in-depth way, for example, models that could consider the possible existence (or not) of some kind of optimal point.

Secondly, as previously discussed, it is challenging to properly capture and analyse the relation between ESG scores and the cost of equity as there are several nuances to be taken into account. In that sense, it is reasonable to assume that the corporate sustainable performance is too complex to be aggregated into only one measure. In addition, as it was debated throughout this study (e.g. see **Figure 4** – available in the Annex II), the materiality (economic relevance) of individual sustainability matters highly varies across industries. Therefore, perhaps it would be beneficial to carry out more industry-specific studies.

Finally, as our findings suggest, the time-period is a key factor to be considered when analysing the ESG performance - cost of equity relationship. Throughout the years analysed in this study, there were several drivers pushing for more sustainable behaviours, for example, changes in the regulatory framework, changes in the societal demands, development of technologies that enhanced resource efficiency and promoted the search for new business models, and so on. Nevertheless, our sample period does not include the current year (2020) which has been marked by the outbreak of the covid-19 virus and its catastrophic consequences for the economies. In this scenario, making profits has become much harder. Thus, many have been highlighting that the pandemic is the first real test of how genuinely committed companies are to sustainability. For now, as the pandemic is far from over, one can only speculate about its real impact. So far, Google Trends data seems to indicate an increasing interest on the topic: "Environment, social and corporate governance" (see **Figure 7** - available in the Annex II). Moreover, some voices have been arguing that with the current crisis "*companies are increasingly expected to do good as well as make money*" (Mooney, 2020). In that sense, future research can analyse whether it was or not the case.

# Appendices

## Appendix I:

## Selection of the estimation technique for the study's panel data sample

Panel data can be analysed using the following methods: (1) pooled OLS regression model; (2) Fixed effects least-squares dummy variable (LSDV) model; or, (3) Random effects model. The main objective of this subsection is to find out which one is the best way to estimate our panel data equation.

1) Pooled regression: This type of approach neglects the cross-section and time series nature of data, in other words, it neglects the heterogeneity that usually exists, that happens because this method involves pooling all observations and then, estimating a "grand" function. In addition, by using a pooled OLS estimation we are assuming that the coefficients of the function remain the same across time and cross-sections, for this reason, this type of model can also be referred to as the constant coefficient model.
2) Fixed effects model: On the other hand, this type of model allows for heterogeneity/ individuality among observations. In that sense, the rationale behind this method is to include dummy variables in such a way that each cross-section entity and/or each time period is allowed to have its own different intercept.
3) Random effects model: This approach assumes that the intercept value of each cross-sectional unit is a random drawing from a large "intercept distribution", which is centred around a mean intercept value. Thus, for any particular observation, the intercept value tends to be independent of the error term.

One of the main advantages of the random effects model over the fixed effects model is that the former tends to have quite a few more degrees of freedom than the later. This happens because in fixed effects models one degree of freedom is lost for every dummy variable included in the equation, note that, in this approach there is a dummy variable for each cross-section entity and/or time unit. Nevertheless, fixed effects models tend to be helpful in avoiding the omitted variable bias caused by unobservable heterogeneity.

To decide which model (fixed effect or random effect) is more suitable to our data, we applied the Hausman test. In this test, our null hypothesis is that the random effects model is the appropriate approach; by contrast, the alternative hypothesis is that the fixed effects model is, in fact, the model that should be considered. Thus, if we get a statistically significant p-value, we apply the fixed effects model; otherwise, we choose the random effects model.

The results of the Hausman test are presented in **Table 7**. And, as it can be seen, the random effects model is not the appropriate methodology to follow because the p-value of the estimated chi-square statistics is zero and the computed chi-square value (133.44) clearly exceeds the critical chi-square value for the given 10 degrees of freedom and a level of significance of 5% (18.31). This may also indicate that the random error terms $\varepsilon_i$ are likely to be correlated with one or more regressors, thus, fixed effects model is preferred to random effects model.

**Table 7** - Hausman test output

**Correlated Random Effects - Hausman Test**
Equation: Estimation with random Effects
Test cross-section random effects

| Test Summary | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob. |
|---|---|---|---|
| Cross-section random | 133,447692 | 10 | 0,0000 |

Cross-section random effects test comparisons:

| Variable | Fixed | Random | Var(Diff.) | Prob. |
|---|---|---|---|---|
| ESG_SCORE_RATIO | -0,002722 | -0,006225 | 0,000002 | 0,0146 |
| SIZE | -0,000489 | 0,001156 | 0,000001 | 0,0500 |
| BTM | 0,017599 | 0,017979 | 0,000000 | 0,1269 |
| LEV | 0,016876 | 0,020571 | 0,000006 | 0,1412 |
| VOL | 0,049307 | 0,057914 | 0,000001 | 0,0000 |
| BLOCKHOLDING | -0,001266 | -0,007350 | 0,000004 | 0,0015 |
| FBIAS | 0,030067 | 0,038038 | 0,000002 | 0,0000 |
| DISP | 0,003674 | 0,003699 | 0,000000 | 0,8949 |
| NLGDPPC | -0,004413 | 0,000734 | 0,000005 | 0,0157 |
| INFL | 0,286090 | 0,277188 | 0,000063 | 0,2613 |

Furthermore, to find out whether the fixed effects model is more adequate than the OLS pooled model or not, we considered the pooled model as a restricted version of the fixed effects model, and then we applied the F-test. Also, we used the same reasoning to decide if it was worth adding time dummies to the model; that is, we compared the one-way fixed effects model (i.e. it allows the intercepts to differ among cross-sections but not over time) with the two-way fixed effects model (i.e. this allows differences among cross-sections and over time as well). As a result, and as it can be seen in **Table 8**, in both cases, the F-value is highly significant, suggesting not only that the fixed effects model is the more appropriate approach but also that we should include both firm- and year-fixed effects.

Finally, we did not include country- and industry fixed effects because they would be very correlated with the firm-fixed effects already considered in our regression. Also, by considering fixed-effects in our analysis, we are being consistent with similar studies (e.g. Breuer et al., 2018; El Ghoul et al., 2018; Gupta, 2018).

**Table 8** - Output of the F-tests performed to compare the appropriateness of the pooled OLS versus the fixed effects methodology

| **Pooled OLS** vs **Fixed effects** (firm) | | **Fixed effects** (firm) vs **Fixed effects** (firm + year) | | **F-test formula** |
|---|---|---|---|---|
| **Unrestricted R-squared** | 0,48682 | **Unrestricted R-squared** | 0,528189 | $F = \frac{\frac{(R_{ur}^2 - R_r^2)}{m}}{\frac{(1 - R_{ur}^2)}{(n-k)}}$ |
| **Restricted R-squared** | 0,28716 | **Restricted R-squared** | 0,48682 | |
| m | 925 | m | 17 | |
| n | 7985 | n | 7985 | |
| k | 936 | k | 953 | |
| **F** | 2,96 | **F** | 36,27 | |
| **Critical F-value** | 1,08 | **Critical F-value** | 1,62 | |

## Appendix II:

## Testing for endogeneity concerns

A common concern in studies similar to ours is the potential existence of endogeneity. Roughly speaking, endogeneity refers to situations in which there is a correlation between an explanatory variable and the model error term. Endogeneity problems may occur under several circumstances such as: (1) omission of explanatory variables, (2) measurement errors or (3) simultaneity bias (Gujarati, 2014; Wooldridge, 2002).

The omitted variable bias may, for instance, refer to situations in which there is a missing factor (usually hard to quantify) that can drive both the ESG performance and the implied cost of equity. Nevertheless, this issue can be substantially mitigated by including fixed effects which, as we mentioned earlier, helps to address cases of unobservable heterogeneity.

Measurement errors may happen for several reasons such as reporting errors, missing data or sheer human errors. For that reason, we avoid including observations that had missing data for one or more control variables as well as we did not considerate observations that did not have the cost of equity estimates for the four models discussed in subsection **3.2**. Otherwise, we would have to do some interpolations which could lead to some inaccuracies.

In cases of suspected errors of measurement, it is often suggested the use of instrumental or proxy variables. However, as Gujarati (2014, p. 142) pointed out, "*this remedy may not always be available*", as such, much of what can be done about measurement errors is to be "*very careful in collecting the data and making sure that some obvious errors are eliminated*".

Lastly, and perhaps one of the most important forms of endogeneity that needs to be checked in this type of study is the simultaneity bias. This kind of endogeneity arises when the dependent variable is influenced by one or more explanatory variables, which in turn are influenced by the dependent variable; in other words, the dependent variable is a response to the explanatory variables as well as a predictor of them. As discussed throughout the literature review, this is often called the virtuous cycle.

So, taking into account that endogeneity tests as well as remedies for endogeneity usually require the use of instrumental variables, we start the analysis of this hypothesis by identifying the instruments being used.

According to Gujarati (2014), there are three conditions that a certain variable must fulfill to be a valid instrument. Firstly, the instrument must be relevant, that is, it must be correlated (positively or negatively) with the endogenous variable (in our case, the ESG score). Secondly, the instrument must not be correlated with the error term. And, thirdly, the instrument variable must not be a regressor in its own right, meaning that it does not belong in the original model.

Therefore, by following previous research related to corporate sustainability performance and financial indicators (e.g. Gupta, 2018; Schreck, 2011) as well as by considering studies on econometric matters such as Reed (2015), we decided to use a lagged ESG score as instrumental variable to test for endogeneity issues in the relationship between the ESG performance and the implied cost of equity. The referred authors argue that using lagged values as instruments fulfills the aforementioned requirements for an instrument to be valid, meaning that the lagged ESG score is highly correlated with the contemporaneous ESG score, whereas the correlation between the instrument and the implied cost of equity is expected to be low.

**Table 9** - Two-stage least squares (2SLS) estimation

| **Method**: Panel Two-Stage Least Squares | | |
|---|---|---|
| **Dependent Variable**: Average cost of equity | | |
| **Expected sign** | **Variable** | **Coefficient** |
| | C | 0,0066<br>(0,0533) |
| - | ESG_SCORE_RATIO | 0,0067<br>(0,0056) |
| - | SIZE | -0,0007<br>(0,0009) |
| + | BTM | 0,0226***<br>(0,0028) |
| + | LEV | 0,0277***<br>(0,0045) |
| + | VOL | 0,0357***<br>(0,0075) |
| - | BLOCKHOLDING | 0,0024<br>(0,0027) |
| + | FBIAS | 0,0122<br>(0,0163) |
| + | DISP | 0,0046**<br>(0,0022) |
| - | NLGDPPC | 0,0060<br>(0,0048) |
| + | INFL | 0,2415***<br>(0,0504) |
| | | |
| **Instrument specification**: C **ESG_SCORE_RATIO (-1)** SIZE BTM LEV VOL BLOCKHOLDING FBIAS DISP NLGDPPC INFL | | |
| Total panel (unbalanced) observations | | 5754 |
| Cross-sections | | 666 |
| Period | | Sample (adjusted): 2003 2019 |
| Year effects | | Yes |
| Firm effects | | Yes |
| R-squared | | 0,6852 |
| Adj. R-sq. | | 0,6422 |
| Robust standard errors | | White diagonal standard errors |

**Table 9** shows the output of the two-stage least squares (2sls) regression of the implied cost of equity on the ESG score and control variables (using as an instrument the lagged ESG score). This output is based on an adjusted version of the full sample described in subsection **3.5** as it uses a lagged value of the ESG score. The definitions and data sources of all variables are detailed on **Table 12** – available in the Annex I. Statistical significance is denoted by *** if p-value < 0.01, ** if p-value < 0.05, * if p-value < 0.1.

As we can see in **Table 9**, the results obtained with a two-stage least squares using the lagged ESG score as instrument are very similar to the ones presented in **Table 4**. This suggests that our results are robust to endogeneity concerns. But, to further substantiate our results, we also perform the Wu-Hausman test for endogeneity which explicitly tests the endogeneity of a regressor. This test consists of two steps. Firstly, we regress the variable that we suspect to be endogenous on all the (non-endogenous) regressors of the equation 3.5 plus the instrumental variable (lagged ESG score); and then we save the residuals. Moreover, it is worth noting that this first step also allows us to assess if our instrument is weak or strong. According to Gujarati (2014), the rule of thumb says that if the value of the F-statistics in the first step of the Hausman test is greater than 10, then, that may suggest that our instrument is strong. As our value of the F-statistics for this step is about 61 (see **Table 10**), which clearly exceeds the threshold value of 10, we may say that our instrument is reliable.

**Table 10** - Hausman test of endogeneity: first step result

| **Method**: Panel Least Squares | |
|---|---|
| **Dependent Variable**: ESG_SCORE_RATIO | |
| **Variable** | **Coefficient** |
| C | -0,3475<br>(0,2234) |
| ESG_SCORE_RATIO (-1) | 0,4945***<br>(0,0164) |
| SIZE | 0,0190***<br>(0,0039) |
| BTM | -0,0021<br>(0,0037) |
| LEV | 0,0103<br>(0,0153) |
| VOL | -0,0155<br>(0,0161) |
| BLOCKHOLDING | -0,0068<br>(0,0106) |
| FBIAS | -0,0001<br>(0,0248) |
| DISP | 0,0011<br>(0,0016) |
| NLGDPPC | 0,0322<br>(0,0207) |
| INFL | -0,2608<br>(0,1894) |

| | |
|---|---|
| Total panel (unbalanced) observations | 5754 |
| Cross-sections | 666 |
| Period | Sample (adjusted): 2003 2019 |
| Year effects | Yes |
| Firm effects | Yes |
| R-squared | 0,8929 |
| Adj. R-sq. | 0,8783 |
| **F-statistic** | **61,0991** |
| Prob(F-statistic) | 0,0000 |
| Robust standard errors | White diagonal standard errors |

In the second stage, we regress the implied cost of equity on all the regressors, including the ESG score and the residuals saved from the first step. The results of this second step are given in **Table 11**, and since the coefficient of the residuals variable is not statistically significant, we conclude that the ESG score does not seem to be an endogenous variable.

**Table 11** - Hausman test of endogeneity: second step results

| **Method**: Panel Least Squares | | |
|---|---|---|
| **Dependent Variable**: Average cost of equity | | |
| **Expected sign** | **Variable** | **Coefficient** |
| | C | 0,0066<br>(0,0533) |
| - | ESG_SCORE_RATIO | 0,0067<br>(0,0056) |
| - | SIZE | -0,0007<br>(0,0009) |
| + | BTM | 0,0226***<br>(0,0028) |
| + | LEV | 0,0277***<br>(0,0045) |
| + | VOL | 0,0357***<br>(0,0075) |
| - | BLOCKHOLDING | 0,0024<br>(0,0027) |
| + | FBIAS | 0,0122<br>(0,0164) |
| + | DISP | 0,0046**<br>(0,0022) |
| - | NLGDPPC | 0,0060<br>(0,0048) |
| + | INFL | 0,2415***<br>(0,0504) |
| | RESID | -0,0064<br>(0,0068) |

| | |
|---|---|
| Total panel (unbalanced) observations | 5754 |
| Cross-sections | 666 |
| Period | Sample (adjusted): 2003 2019 |
| Year effects | Yes |
| Firm effects | Yes |
| R-squared | 0,6854 |
| Adj. R-sq. | 0,6424 |
| Robust standard errors | White diagonal standard errors |

**Table 10** and **Table 11** exhibit the first and the second step of the Hausman test, respectively. The first step enables, to some extent, the assessment of the strength of the instrument by showing the F-Statistics of the regression of the suspected endogenous variable on all the non-endogenous regressors of the equation 3.5 plus the instrumental variable (lagged ESG score). The second step has as its main objective the evaluation of the statistically significance of the residuals of the regression performed in the first step. Statistical significance is denoted by *** if p-value < 0.01, ** if p-value < 0.05, * if p-value < 0.1.

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# Annexes

## Annex I – Additional tables

**Table 12** - Variable definitions and data sources

| Variables | Definitions | Sources |
|---|---|---|
| Panel A: dependent variables | | |
| **$K_{CT}$** | Implied cost of equity estimated from the Claus and Thomas (2001) model | Author's calculation based on I/B/E/S datatypes |
| **$K_{GLS}$** | Implied cost of equity estimated from the Gebhardt et al. (2001) | As above |
| **$K_{OJ}$** | Implied cost of equity estimated from the Ohlson and Juettner-Nauroth (2005) | As above |
| **$K_{ES}$** | Implied cost of equity estimated from the Easton (2004) | As above |
| **$K_{AVG}$** | Average of the four models above | As above |
| Panel B: independent variables | | |
| **ESG score** | The ESG Score is an overall score essentially based on the companies' self-reported information in the environmental, social and corporate governance pillars, and then processed and compiled by Refinitiv's analysts | Refinitiv (previously known as Asset4) |
| **BTM** | Book value to the market value of equity. | Author's calculation based on I/B/E/S datatypes |
| **Size** | Natural logarithm of total assets in $ million. | Author's calculation based on Worldscope data |
| **Leverage** (Lev) | The leverage ratio is the long-term debt divided by the total assets. | As above |
| **Volatility** (Vol) | Firm risk is defined as the annualized volatility of daily stock returns over the previous 12 months | Author's calculation based on the daily share price available through Datastream |
| **Blockholding** (Block) | Blockholding is the percentage of closely held shares | Worldscope |
| **Forecast dispersion** (Disp) | Analysts' earnings forecast dispersion is proxied as the coefficient of variation of one-year-ahead analysts' forecasts of earnings per share | I/B/E/S |
| **Forecast bias** (Fbias) | Forecast bias as the difference between the 1-year-ahead consensus earnings forecast and realized earnings per share deflated by the stock price | Author's calculation based on I/B/E/S data |
| **Inflation** (Infl) | Inflation is proxied as the one-year-ahead realized inflation rate | IMF |
| **GDP *per capita*** (NLGDPPC) | Natural logarithm of GDP per capita | IMF |

**Table 13** - Distribution of the companies included in the sample per country and activity sector

| Country of Headquarters | TRBC Economic Sector Name | | | | | | | | | Number of companies |
|---|---|---|---|---|---|---|---|---|---|---|
| | Basic Materials | Consumer Cyclicals | Consumer Non-Cyclicals | Energy | Healthcare | Industrials | Technology | Telecommunications Services | Utilities | |
| Austria | 5 | 1 | 1 | 2 | - | 9 | 3 | 1 | 2 | 24 |
| Belgium | 5 | 3 | 3 | 1 | 4 | 3 | 4 | 3 | 1 | 27 |
| Denmark | 1 | 2 | 5 | 1 | 7 | 11 | 3 | 1 | - | 31 |
| Finland | 7 | 4 | 2 | 1 | 1 | 11 | 3 | 2 | 1 | 32 |
| France | 8 | 35 | 10 | 6 | 10 | 31 | 12 | 3 | 4 | 119 |
| Germany | 16 | 24 | 6 | 2 | 9 | 35 | 18 | 4 | 6 | 120 |
| Greece | - | 3 | - | 2 | - | 1 | - | 1 | 2 | 9 |
| Ireland | 2 | 4 | 5 | 1 | 1 | 1 | - | - | - | 14 |
| Italy | 2 | 17 | 3 | 4 | 3 | 12 | 3 | 1 | 10 | 55 |
| Netherlands | 6 | 5 | 5 | 6 | 1 | 11 | 4 | 2 | - | 40 |
| Norway | 4 | 4 | 7 | 6 | - | 4 | - | 1 | - | 26 |
| Portugal | 5 | - | 2 | 1 | - | 2 | - | 2 | 2 | 14 |
| Spain | 4 | 9 | 2 | 4 | 4 | 14 | 2 | 1 | 5 | 45 |
| Sweden | 6 | 22 | 10 | 1 | 3 | 30 | 5 | 2 | - | 79 |
| UK | 22 | 65 | 23 | 12 | 14 | 68 | 21 | 3 | 7 | 235 |
| **Total** | **93** | **198** | **84** | **50** | **57** | **243** | **78** | **27** | **40** | **870** |

**Table 14** - Correlation matrix of the main variables of the baseline model

| Variables | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) KCT | 1.000 | | | | | | | | | | | | | | |
| (2) KGLS | 0.535 | 1.000 | | | | | | | | | | | | | |
| (3) KOJ | 0.742 | 0.430 | 1.000 | | | | | | | | | | | | |
| (4) KES | 0.615 | 0.412 | 0.870 | 1.000 | | | | | | | | | | | |
| (5) Kavg | 0.847 | 0.684 | 0.921 | 0.890 | 1.000 | | | | | | | | | | |
| (6) ESG_Score | -0.035 | -0.019 | -0.023 | -0.005 | -0.023 | 1.000 | | | | | | | | | |
| (7) Lev | 0.093 | 0.118 | 0.050 | 0.045 | 0.087 | 0.083 | 1.000 | | | | | | | | |
| (8) Size | 0.022 | 0.126 | 0.046 | 0.076 | 0.081 | 0.590 | 0.184 | 1.000 | | | | | | | |
| (9) BtM | 0.399 | 0.454 | 0.450 | 0.507 | 0.542 | 0.085 | -0.003 | 0.237 | 1.000 | | | | | | |
| (10) Vol | 0.303 | 0.281 | 0.310 | 0.337 | 0.368 | -0.155 | 0.008 | -0.159 | 0.231 | 1.000 | | | | | |
| (11) Blockholding | -0.073 | -0.015 | -0.019 | -0.013 | -0.034 | -0.079 | -0.014 | 0.044 | 0.075 | 0.050 | 1.000 | | | | |
| (12) Disp | 0.110 | 0.064 | 0.155 | 0.223 | 0.173 | -0.010 | 0.053 | 0.002 | 0.156 | 0.134 | 0.020 | 1.000 | | | |
| (13) Fbias | 0.079 | 0.015 | 0.172 | 0.137 | 0.125 | -0.021 | -0.018 | -0.017 | -0.010 | 0.012 | -0.004 | 0.015 | 1.000 | | |
| (14) Infl | 0.210 | 0.142 | 0.104 | 0.006 | 0.126 | -0.126 | -0.001 | -0.092 | -0.054 | 0.180 | -0.045 | -0.051 | -0.002 | 1.000 | |
| (15) NLGDPPC | -0.014 | -0.016 | 0.001 | 0.011 | -0.004 | 0.028 | -0.069 | -0.106 | -0.083 | 0.072 | -0.160 | -0.009 | 0.009 | 0.022 | 1.000 |

## Annex II – Additional figures

**Figure 3** - Comparison between Refinitiv's framework and SASB's framework

| Refinitiv framework | | | SASB framework | |
|---|---|---|---|---|
| **Pillars** | **Categories** | **Themes** | **Dimension** | **General Issue Category** |
| **Environmental** | **Emmission** | Emissions | **Environment** | GHG Emissions |
| | | Waste | | Air Quality |
| | | Biodiversity | | Energy Management |
| | | Environmental management systems | | Water & Wastewater Management |
| | **Innovation** | Product Innovation | | Waste & Hazardous Materials Management |
| | | Green revenues | | Ecological Impacts |
| | | R&D/Capex | **Business Model & Innovation** | Product Design & Lifecycle Management |
| | **Resource use** | Water | | Business Model Resilience |
| | | Energy | | Supply Chain Management |
| | | Sustainable packaging | | Materials Sourcing & Efficiency |
| | | Environmental supply chain | | Physical Impacts of Climate Change |
| **Social** | **Community** | | **Social Capital** | Human Rights & Community Relations |
| | **Human rights** | | | Customer Privacy |
| | **Product responsibility** | Responsible Marketing | | Data Security |
| | | Product quality | | Access & Affordability |
| | | Data privacy | | Product Quality & Safety |
| | **Workforce** | Diversity and inclusion | | Customer Welfare |
| | | Career development | | Selling Practices & Product Labeling |
| | | Training | **Human Capital** | Labor Practices |
| | | Working conditions | | Employee Health & Safety |
| | | Health and safety | | Employee Engagement, Diversity & Inclusion |
| **Governance** | **CSR strategy** | CSR strategy | **Leadership & Governance** | Business Ethics |
| | | ESG reporting and transparency | | Competitive Behavior |
| | **Management** | Structure (independence, diversity, committees) | | Management of the Legal & Regulatory Environment |
| | | Compensation | | Critical Incident Risk Management |
| | **Shareholders** | Shareholder rights & Takeover defenses | | Systemic Risk Management |

**Figure 4 -** Materiality framework (based on the SASB's framework) with the points system used in this study

| Dimension | Consumer Goods | Extractives & Minerals Processing | Food & Beverage | Health Care | Infra-structure | Renewable Resources & Alternative Energy | Resource Transformation | Services | Technology & Communications | Transpor-tation |
|---|---|---|---|---|---|---|---|---|---|---|
| Environment | 1 | 5 | 5 | 3 | 3 | 3 | 3 | 1 | 3 | 5 |
| | 1 | 5 | 1 | 1 | 3 | 3 | 3 | 1 | 1 | 5 |
| | 3 | 3 | 5 | 3 | 3 | 5 | 5 | 3 | 5 | 3 |
| | 3 | 5 | 5 | 1 | 3 | 5 | 3 | 3 | 3 | 1 |
| | 1 | 5 | 3 | 3 | 3 | 3 | 5 | 1 | 3 | 3 |
| | 1 | 5 | 3 | 1 | 3 | 3 | 1 | 3 | 1 | 3 |
| Business Model & Innovation | 5 | 3 | 5 | 3 | 5 | 5 | 5 | 1 | 5 | 3 |
| | 1 | 3 | 1 | 1 | 5 | 1 | 1 | 1 | 1 | 1 |
| | 5 | 3 | 5 | 3 | 1 | 3 | 3 | 1 | 3 | 3 |
| | 3 | 1 | 5 | 1 | 3 | 5 | 5 | 1 | 5 | 3 |
| | 1 | 1 | 1 | 3 | 3 | 3 | 1 | 3 | 1 | 1 |
| Social Capital | 1 | 3 | 1 | 3 | 1 | 3 | 3 | 1 | 1 | 1 |
| | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 5 | 1 |
| | 3 | 1 | 3 | 5 | 1 | 1 | 3 | 3 | 5 | 1 |
| | 1 | 1 | 1 | 5 | 3 | 1 | 1 | 1 | 1 | 1 |
| | 5 | 1 | 5 | 5 | 3 | 1 | 5 | 3 | 1 | 3 |
| | 1 | 1 | 5 | 5 | 1 | 1 | 1 | 3 | 1 | 1 |
| | 1 | 1 | 5 | 5 | 1 | 1 | 1 | 3 | 1 | 1 |
| Human Capital | 3 | 3 | 3 | 1 | 3 | 1 | 1 | 3 | 3 | 3 |
| | 1 | 5 | 3 | 3 | 5 | 3 | 3 | 3 | 3 | 5 |
| | 3 | 1 | 1 | 3 | 1 | 1 | 1 | 3 | 5 | 1 |
| Leadership & Governance | 1 | 3 | 1 | 5 | 3 | 1 | 3 | 3 | 1 | 3 |
| | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 3 | 5 | 3 |
| | 1 | 3 | 1 | 1 | 1 | 3 | 3 | 1 | 1 | 1 |
| | 1 | 5 | 1 | 1 | 3 | 3 | 3 | 1 | 1 | 5 |
| | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 3 | 1 |
| **Average ESG materiality** | 5,5 | 8,3 | 7,3 | 7,5 | 7,4 | 6,7 | 7,4 | 6,1 | 7,6 | 7,2 |

The average ESG materiality is the sum of the average materiality of the individual E, S and G dimensions – we match the SASB's dimensions with the ones from Refinitiv.

**Figure 5** - VBA code used to find the solutions for the cost of equity equations

**The VBA code**

```
Sub Macro_solver_cost_of_equity_models()

' "i" refers to the number of the line where each firm-year observation is located

Dim i As Integer
For i = 2 To 8010

    SolverReset
    SolverOk SetCell:=Cells(i,A), MaxMinVal:=3, ValueOf:=0, ByChange:=Cells(i,C), Engine:= _
        1, EngineDesc:="GRG Nonlinear"
    SolverOk SetCell:=Cells(i,A), MaxMinVal:=3, ValueOf:=0, ByChange:=Cells(i,C), Engine:= _
        1, EngineDesc:="GRG Nonlinear"
    SolverSolve (True)
    'Approve the solution given by the solver and avoid the popups
    SolverSolve userFinish:=True
    SolverFinish KeepFinal:=1

Next i

End Sub
```

**Description of the code**

| | |
|---|---|
| A → | Refers to the **column where the result of the <u>following operation is placed</u>**:<br>= Value obtained for the second part of the cost of equity models' equation – Current share price |
| B → | <u>The solver allows one of three options</u>: to find the maximum value for something, the minimum or to set a certain operation equal to a value defined by the user. <u>The number 3 means we chose the third option</u>. Then, we specify that we want <u>the result of the **operation above** to be **equal to zero**</u>. |
| C → | Refers to the column where the cost of equity for the firm-year observation "i" is placed. And, this step means that we want to achieve the purpose described above (i.e. the aforementioned operation equal to zero) by changing the cost of equity. |

**Figure 6** - Distribution of the observations per year

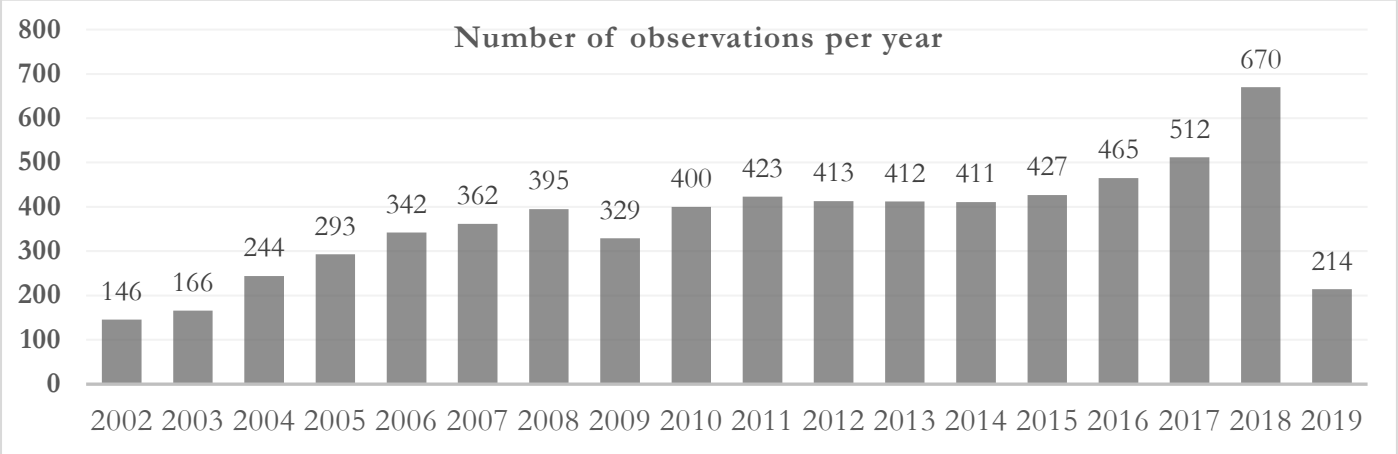


**Figure 7** - Relative search volume in Google for the topic "Environmental, social and corporate governance"