ENVIRONMENTAL, SOCIAL, AND GOVERNANCE INITIATIVES PAY OFF: AN ASSESSMENT OF THE CAUSAL RELATIONSHIP BETWEEN ESG AND FIRM VALUE

ABSTRACT

The relationship between environmental, social, and governance (ESG) initiatives and firm financial performance has been a subject that has long attracted researchers' and practitioners' interest. However, studies to date have presented inconclusive results. We argue that the heterogeneity in outcomes may reside in endogeneity problems not adequately addressed in most empirical identification strategies. Thus, this study aims to evaluate the potential causal link between ESG, firm value, and cost of capital. A quasi-natural experiment is employed to overcome this empirical challenge using the enactment of Directive 2014/95/EU as the exogenous shock in difference-in-differences and triple-difference models. This setting is particularly valuable since the regulation made ESG disclosure mandatory to a population of firms throughout the European Union. A propensity score matching procedure is used to establish the treatment and control groups. The final sample consists of 895 firms, with observations from 2009 - 2019. Results show that the regulation was effective in raising the overall level of transparency of corporate ESG practices. More importantly, compared to control firms, treated firms faced a positive incremental impact on their value and a significant reduction in their cost of capital. These findings remained consistent through a series of robustness tests. This study contributes to the development of the field by providing more credible evidence for causal inference. It also presents practical implications for different audiences, such as governments and policy-makers pursuing policy reforms related to the corporate disclosure of non-financial information, managers looking to incorporate sustainability-related initiatives into their firm's strategy, and investors interested in the responsible investing movement.

Keywords: ESG. Financial performance. Firm value. Cost of capital. Mandatory disclosure.

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RESUMO

A relação entre as iniciativas ambientais, sociais e de governança (ESG, na sigla em inglês) e a performance financeira das empresas é um tema que há muito atrai o interesse de pesquisadores e profissionais de mercado. Contudo, os estudos até a presente data apresentaram resultados inconclusivos. Argumentamos que a origem da heterogeneidade nos resultados pode estar em problemas de endogeneidade não endereçados adequadamente nas estratégias empíricas comumente utilizadas. Assim, o objetivo desse trabalho é avaliar a potencial relação causal entre ESG, valor da firma e custo de capital. Um quase-experimento é utilizado para superar esse desafio empírico, usando a sanção da Diretriz 2014/95/EU como choque exógeno em modelos de diferença-em-diferenças e diferenças triplas. Esse contexto é particularmente valioso, tendo em vista que a regulação tornou obrigatória a divulgação de práticas ESG para uma população considerável de empresas em toda a União Europeia. Um procedimento de pareamento por escores de propensão foi utilizado para definir os grupos de tratamento e controle. A amostra final é composta por 895 firmas, com observações no período de 2009 a 2019. Os resultados indicam que a regulação foi efetiva em elevar o nível geral de transparência das ações corporativas de ESG. Mais importante, quando comparadas às empresas de controle, as firmas do grupo de tratamento apresentaram um impacto incremental significativo e positivo no valor de mercado, além de uma redução no custo de capital. Esses resultados se mantiveram consistentes após uma série de testes de robustez. Esse estudo contribui para o desenvolvimento do campo ao fornecer evidências mais robustas para a inferência causal. O trabalho também apresenta implicações práticas para diferentes audiências, como governos e órgãos reguladores buscando avançar com políticas relacionadas à divulgação de informações não financeiras pelas empresas, executivos com a intenção de incorporar iniciativas de sustentabilidade na estratégia de suas empresas e investidores interessados no movimento de investimento responsável.

Palavras-chave: ESG. Performance financeira. Valor da empresa. Custo de capital. Divulgação obrigatória.

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1 Introduction

The link between Environmental, Social, and Governance (ESG) practices and the firm financial performance has been a popular yet controversial subject of inquiry amongst researchers. Since the work of Bragdon and Marlin (1972), several other studies investigating the value-relevance of corporate ESG initiatives have been published in the academic literature. Amongst practitioners, the ESG agenda has also been gaining momentum. By the end of 2019, for instance, there were more than US$ 30 trillion of assets under management on sustainability-related professional investment strategies (HENISZ; KOLLER; NUTTALL, 2019). Additionally, lower interest rates are being granted to responsible firms (LI, 2020), and ESG funds outperformed their traditional counterparts during the global crisis caused by the COVID-19 pandemic (DARBYSHIRE, 2020).

Despite that, there is still much debate about how (and whether) environmental, social, and governance practices affect the firm's financial performance and its value. The empirical evidence is mixed, and the field lacks consensus (ORLITZKY; SCHMIDT; RYNES, 2003; MARGOLIS; ELFENBEIN; WALSH, 2009; MALIK, 2015; BROOKS; OIKONOMOU, 2018). That calls for more research, given the theme's surging relevance and its potential impact on corporate practices.

Hence, the objective of this study is twofold: First, to evaluate the impact of corporate ESG practices on firm value and cost of capital, and the possible causal relationship between them and, second, to check if the way companies disclose their ESG initiatives (i.e., as a stand-alone report or integrated to the annual report) affects how the market values them.

From a theoretical point of view, it is plausible to argue for a positive, negative, or even a non-existent relationship between ESG and financial performance (WADDOCK; GRAVES, 1997). In fact, some studies find that ESG initiatives increase firm value (LEE; YEO, 2016; FLAMMER, 2015; LINS; SERVAES; TAMAYO, 2017; AWAYSHEH et al., 2020), and reduce the cost of capital (CHENG; IOANNOU; SERAFEIM, 2014; DHALIWAL et al., 2011; NG; REZAEE, 2015; EL GHOUL et al., 2011). At the same time, others find opposite results (MANCHIRAJU; RAJGOPAL, 2017; CHEN; HUNG; WANG, 2018; LU et al., 2020; DUQUE-

GRISALES; AGUILERA-CARACUEL, 2019) or no result at all (AUPPERLE; CARROLL; HATFIELD, 1985; MCWILLIAMS; SIEGEL, 2000; MENZ, 2010).

We argue that the origin of the ambiguous results may reside in endogeneity sources not being properly addressed in the employed identification strategies (LIU et al., 2021; MALIK, 2015; MARGOLIS; WALSH, 2003; MARGOLIS; ELFENBEIN; WALSH, 2009). Error in the measures utilized, notably as proxies for ESG performance and disclosure, incipient use of credible causal inference designs (e.g., difference-in-differences (DiD), regression discontinuity design (RDD), and instrumental variable (IV)) and the influence of potential omitted variables are concerns yet to be settled in the field.

In an attempt to tackle this empirical challenge, this study analyzes a set of large publicly listed companies throughout the European Union (EU), from 2009 to 2019. In 2014, the European Parliament and the Council enacted Directive 2014/95/EU, which required large public-interest companies to start disclosing non-financial information in their reports. The passage of the regulation is used in a DiD approach as an exogenous shock. The intention is to evaluate whether the shock to the ESG disclosure practices impacted the firms' value and cost of capital. In order to define the control firms and to assure that treatment and control groups were alike, mitigating endogeneity concerns, the treated European firms were propensity-score-matched by size, leverage, and profitability to two sets of companies: one from the rest of the world and another composed only by European firms arranged according to their ex-ante level of ESG transparency.

This mandatory ESG disclosure setting is particularly valuable for an experimental research design since non-financial disclosure so far had been primarily adopted by companies in a voluntary manner. Some countries, such as South Africa, Denmark, Malaysia, and China, had already introduced legislation requiring companies to disclose their ESG activities (IOANNOU; SERAFEIM, 2019). However, the scope among countries varies on which firms are obligated to comply and on other specific points, often imposing a challenge for generalization. On the other hand, Directive 2014/95/EU affected all the EU's State Members, among which are some of the most reliable and relevant economies in the world.

Results show that the European companies presented a significant incremental impact

on firm value and a relevant decrease in the cost of capital after the enactment of Directive 2014/95/EU, compared to the worldwide control firms. It suggests that the Directive passage in the European Union effectively raised overall ESG disclosure and that the market positively valued it. Access to capital was also facilitated, resulting in a lower cost to raise funds. These findings were not only statistically significant but also economically relevant and remained consistent through a set of robustness checks. Results concerning the value-relevance of integrated reporting were mixed, being significant only for the European-only sample of firms.

This study contributes to the literature in different ways. First, it shows that mandatory disclosure regulations effectively increase the transparency of firms' non-financial matters. Second, it indicates that corporate ESG initiatives indeed are value-increasing and that it is the corporate sustainability practices that lead to a change in firm value and cost of capital - and not the opposite. Third and more importantly, these findings are obtained after employing an identification strategy that provides a reasonable basis for causal inference. Altogether, the evidence provided is valuable for the field's consolidation.

This study's findings also have meaningful, practical implications for governments, regulators and policy-makers, companies' executives, and investors. Governments and regulatory authorities might consider further legislation on ESG disclosure based on the evidence that this type of regulation effectively raises the overall transparency of firms' non-financial activities. Companies' executives might incorporate the ESG agenda into the firm's strategy and make sure that it is properly communicated. On the other side, investors might improve their valuation methods to capture and incorporate the value of corporate sustainability initiatives more precisely.

The remainder of this study is structured as follows: Section 2 discusses the literature on ESG disclosure, ESG performance, firm value, the institutional setting under Directive 2014/95/EU, and the Integrated Reporting (IR) framework. It also develops the hypotheses. Section 3 describes the data, sample, variables, matching techniques, and the identification strategy employed in this study. Section 4 presents and discusses the results. Section 5 concludes.

2 Literature Review and Statement of Hypotheses

2.1 ESG Initiatives and Firm Financial Performance

The relationship between environmental, social, and governance (ESG)[1] initiatives and firm financial performance has been an important topic of investigation in the academic literature in the past few decades. Bragdon and Marlin (1972, p. 17), for instance, study if pollution control measures are related to corporate profitability. They find a positive correlation between the variables and conclude: "we hope that we have made a step in the direction of laying to rest the economic model which poses the alternative, on the level of the firm, of either increasing pollution control or increasing profits." Since then, significant progress has been made regarding the matter, but unfortunately, their aspiration to settle the argument did not come true. Almost 50 years later, there is still much debate around the value-relevance of ESG practices.

From a theoretical point of view, much of the discussion derives from the different understandings researchers have about the firms' and management's fundamental purpose. The two most prominent theoretical lenses through which the topic is investigated are the shareholder (or agency) theory and the stakeholder theory (MCWILLIAMS; SIEGEL; WRIGHT, 2006). The shareholder theory is rooted in the neoclassical school of economics. Based on the theory of the firm and the concept of separation of ownership and control (JENSEN; MECKLING, 1976), this strand argues that management has the fiduciary duty to act on shareholders' best interests (SHLEIFER; VISHNY, 1997). That way, the primary purpose of the management is to create value by engaging in lucrative (i.e., NPV positive) projects in order to maximize shareholders' wealth (FRIEDMAN, 1970). Under this perspective, the sheer existence of investments in ESG matters is considered a misappropriation of the firm's valuable resources by the managers to yield private benefits, such as enhancing personal reputation or the entrenchment as "socially responsible managers" (BUCHANAN; CAO; CHEN, 2018). Thus, by this view, ESG and financial performance must present a negative relationship.

[1] Originally, the terms "social responsibility" or "Corporate Social Responsibility (CSR)" were more commonly used. The term "ESG" was first coined in 2004 in a study by the UN Global Compact entitled "Who Cares Wins". For consistency purposes, throughout this study, the term "ESG" refers to all non-financial corporate issues - including CSR.

On the other hand, stakeholder theory argues that managers must consider the interests of all constituents that somehow affect or are affected by the firm (e.g., customers, employees, suppliers, and local communities) (FREEMAN, 1984). The underlying reasoning is that undertaking non-financial stakeholders' demands on ESG initiatives might benefit the firm, either by raising their engagement with the company's business or avoiding losing their support (MCWILLIAMS; SIEGEL; WRIGHT, 2006). Other benefits discussed in the literature are the firm's enhanced capability to adapt to different internal and external demands (ORLITZKY; SCHMIDT; RYNES, 2003), the improved reputation, operational efficiency, employees' satisfaction, and productivity, and legal risk mitigation (MALIK, 2015). Ultimately, fulfilling the interests of different stakeholders might be pragmatically seen as instrumental in increasing firm financial performance (JONES, 1995). ESG and financial performance should, then, present a positive relationship.

Besides the sign of the relationship, the direction of causation is another major issue that needs to be addressed (WADDOCK; GRAVES, 1997). Assuming the existence of a significant positive relationship between the variables, it is not clear whether ESG leads to better financial performance (i.e., the good management theory) or firms with ex-ante better performance have more resources to spare and, as a consequence, attain better ESG standards (i.e., the slack resource theory).

Early work in the field presented mixed results. Cochran and Wood (1984) studied a set of American companies and found a modest positive link between firms' CSR and financial performance, even after controlling for firms' age (consistent with the stakeholder theory). Similarly, Russo and Fouts (1997, p. 534) focus on environmental ratings and find that "it pays to be green". However, results were also modest. On the other hand, Wright and Ferris (1997) investigated the stock reaction to divestment announcements of South African firms and observed a significant negative effect. They argue that this finding supports the view that non-economic pressures are responsible for management's decisions that are not value-enhancing for the firm (consistent with the shareholder theory). McGuire, Sundgren, and Schneeweis (1988) found a positive relationship. However, they concluded that firms' financial performance in previous periods was more related to future ESG performance than previous ESG investments

were related to future financial performance (consistent with the slack resource theory). In turn, Waddock and Graves (1997) presented evidence that the relationship is positive and significant in both directions (supporting both the good management and the slack resource theories).

More recent systematic literature reviews and meta-analyses concerning the empirical work in the field (MALIK, 2015; ORLITZKY; SCHMIDT; RYNES, 2003; BROOKS; OIKONOMOU, 2018; MARGOLIS; ELFENBEIN; WALSH, 2009) indicate that, overall, results reported are more frequently positive and significant. Nevertheless, Margolis, Elfenbein, and Walsh (2009) alert that these findings may be deceitful since most of the reviewed studies did not present robust identification strategies to address endogeneity concerns adequately. The most common sources of bias discussed in the literature are: (a) the conceivable existence of a reverse causality bias, in which firms with better ex-ante financial performance invest more in ESG practices (LIU et al., 2021; WADDOCK; GRAVES, 1997; HILLMAN; KEIM, 2001; QIU; SHAUKAT; THARYAN, 2016); (b) potential measurement error, distinctively in the ESG proxies, which are usually provided by third parties (e.g., Bloomberg, MSCI/KLD, Eikon) but present low correlation between each other (PAGANO; SINCLAIR; YANG, 2018; BERG; KÖLBEL; RIGOBON, 2019; DIMSON; MARSH; STAUNTON, 2020); and (c) the probable existence of omitted variables, given the number of dimensions ESG encompass and the complexity of their relationship with firm performance (MCWILLIAMS; SIEGEL, 2000; NEKHILI et al., 2017; BOCQUET et al., 2017).

One valuable way of assessing these concerns is by systematically identifying and discussing the potential channels through which ESG initiatives might impact a firm's financial performance. The first channel discussed in the literature is by reducing agency costs (ORLITZKY; SCHMIDT; RYNES, 2003). The increase in stakeholders' awareness and engagement may function as a monitoring mechanism that prevents managers from undertaking sub-optimal initiatives to yield private benefits (HILL; JONES, 1992; JONES, 1995). Naturally, there is a natural asymmetry of information between constituents inside and outside the firm (BRANCO; RODRIGUES, 2006). That way, the higher the firm's ESG activities' transparency, the lower the information asymmetry between the management and stakeholders, and the higher tends to be the stakeholders' activism. ESG disclosure is of great relevance in this setting as an essential

instrument to increase firm transparency (CHENG; IOANNOU; SERAFEIM, 2014).

At the same time, ESG disclosure in most countries is voluntary. It implies that companies with lousy ESG performance may choose not to disclose this information, thus impairing the stakeholder monitoring mechanism. To address this issue and improve transparency, some governments and policy-makers have enacted mandatory ESG disclosure regulations, such as China, South Africa, Denmark, and Malaysia (BARTH et al., 2017; LEE; YEO, 2016; BERNARDI; STARK, 2018; ROWBOTTOM; LOCKE, 2016; IOANNOU; SERAFEIM, 2019).

In this study, we take advantage of the passage of Directive 2014/95/EU in the European Union, which made ESG disclosure mandatory to large public-interest firms. This setting provides invaluable opportunities to test the link between ESG initiatives and firm value. At the same time, Ioannou and Serafeim (2019) highlight that most of these regulations are enacted with a "comply or explain" rule. It means that firms may choose not to disclose this kind of information, provided that the reasons are explained. One concern that emerges from it is that the enforcement policies may not effectively ensure that firms comply with the new regulation. Given that the Directive enactment was a shock to the corporate ESG disclosure practices, it is important first to guarantee that the impacted firms effectively followed the regulation. Thus, the following hypothesis is proposed:

> ***H_1.*** *Mandatory disclosure regulation is effective in increasing overall ESG disclosure.*

A second channel relates to the firm's cost of capital. Cheng, Ioannou, and Serafeim (2014) argue that the disclosure of ESG initiatives may enable cheaper access to capital, given the increased transparency and the reduced agency costs that result from it. Several other empirical studies support this reasoning (DHALIWAL et al., 2011; NG; REZAEE, 2015; EL GHOUL et al., 2011)e.g.,. These findings have important implications for the study of the ESG-firm value link. If ESG initiatives negatively impact firms' cost of capital, there is also an impact on firms' discount rate for future cash flows (i.e., the weighted average cost of capital), thus enhancing the firm's present value.

A third channel is risk management. The literature suggests an "insurance-like" effect for companies that invest in ESG practices (LINS; SERVAES; TAMAYO, 2017; SHIU; YANG,

2017; GODFREY; MERRILL; HANSEN, 2009; JIA; GAO; JULIAN, 2020; KOH; QIAN; WANG, 2014). The reasoning is that ESG responsible firms accrue reputation and moral capital with the stakeholders due to their sustainable practices. In the occurrence of an adverse, unexpected event, the empirical evidence from these studies indicates that these companies' market value is less affected than the value of traditional firms. In this context, ESG initiatives do not increase firms' value but prevent losses in adverse events.

Overall, the empirical evidence seems to provide good support for a relationship between ESG, firm value, and capital cost. At the same time, results previously discussed present considerable heterogeneity regarding the sign of this link. Thus, the following hypothesis is formulated:

> ***H_2.*** *A variation in the level of ESG disclosure will significantly affect firm value and the cost of capital.*

Generally, empirical studies focusing on the ESG-financial performance link can be divided into two groups: a) those investigating the short-term impact of ESG on firm performance, and b) those examining the long-term financial performance (MCWILLIAMS; SIEGEL, 2000). The former usually makes use of event studies and examines the reactions of stock prices to the announcement of specific events, observing whether there exist abnormal returns around the event (see, for example, MANCHIRAJU; RAJGOPAL, 2017; HAWN; CHATTERJI; MITCHELL, 2018; TANG; ZHANG, 2020). However, by construction, these market value fluctuations are ephemeral. On the other hand, the latter measures the long-term firm performance through internal variables, such as accounting measures and profitability (e.g., CHEN; HUNG; WANG, 2018; FLAMMER, 2015; BARNETT; SALOMON, 2012) or through market measures, such as Tobin's Q (e.g., AWAYSHEH et al., 2020; BUCHANAN; CAO; CHEN, 2018; KANG; GERMANN; GREWAL, 2016).

In this study, we evaluate the impact of ESG on firm value and use the approximate Tobin's Q (CHUNG; PRUITT, 1994) as a dependent variable. As discussed in Buchanan, Cao, and Chen (2018) and Price and Sun (2017), the Tobin's Q is a forward-looking measure of a firm's market value that incorporates investors' opinions about the firm's prospects. Additionally, the Tobin's Q captures the effect of several distinct internal and accounting-based firm performance indicators,

such as revenue, profits, and cash flow (PRICE; SUN, 2017; SRIVASTAVA; SHERVANI; FAHEY, 1998). Thus, by investigating the firm value as proxied by the Tobin's Q, this study indirectly also captures these internal effects on firms' valuation. Besides that, this type of analysis better addresses what Jensen (2002) argues that the management's primary objective should be: the firm's long-term value.

Finally, an important exercise is to disentangle the concepts of ESG performance and ESG disclosure since they relate to different dimensions of ESG (NG; REZAEE, 2015). Brooks and Oikonomou (2018) define Social Disclosure as "any information that a firm makes public, typically within or alongside its annual accounts or in a stand-alone report, that relates to its performance, standards or activities under the corporate social responsibility umbrella". Similarly, ESG disclosure may be defined as the act of a company making public their Environmental, Social, and Corporate Governance activities and their impacts on the various stakeholders. Thus, ESG disclosure is directly associated with the transparency of a firm's actions.

ESG Performance, on the other hand, relates to the results achieved by a company regarding the ESG dimensions, according to a specific set of tangible measures (e.g., carbon dioxide emissions, child labor policies, and the composition of the board of directors). Based on these definitions, it is plausible to argue that the ESG disclosure serves as a channel through which the company's ESG performance is communicated to the interested parties. That way, the better disclosure practices are, the stronger the firm's performance on environmental, social, and governance initiatives should reflect in its value - for better or for worse. That is, ESG disclosure may moderate the relationship between ESG performance and firm value (GREWAL; RIEDL; SERAFEIM, 2019; MERVELSKEMPER; STREIT, 2017; FATEMI; GLAUM; KAISER, 2018). We examine this proposition by testing the following hypothesis:

> ***H_3.*** *The effects of ESG disclosure on firm value will differ among companies according to their level of ESG performance.*
>
> > ***$H_{3\text{-}a}$.*** *Firms with high ESG performance scores will face value-increasing effect after the enactment of Directive 2014/95/EU.*
> >
> > ***$H_{3\text{-}b}$.*** *Firms with low ESG performance scores will face value-decreasing effect after the enactment of Directive 2014/95/EU.*

2.2 Integrated Reporting, the IIRC, and the IR Framework

The concept of Integrated Reporting (IR) started being formed at the beginning of the year 2000 and developed more firmly around the 2008 global financial crisis and the succession of corporate failures due to weak corporate governance and lack of non-financial issues oversight (DE VILLIERS; HSIAO; MAROUN, 2017). Until then, little ESG reporting was made and, when a firm made some ESG disclosure, it usually happened as stand-alone statements with no apparent connection to the financial results. It also lacked standards for comparability since, generally, no standardized guidelines were followed. In that sense, IR came as an evolution since it is based upon the idea that the ESG disclosure must be integrated with the annual financial reports, clearly making the connection between ESG actions and their impact on financial results (DE VILLIERS; HSIAO; MAROUN, 2017).

IR can be seen as an external means of communication through which a firm can report their ESG activities and respective inter-dependencies to the firm's primary activities. However, more than that, it can be seen as a way to show stakeholders the management orientation towards value maximization, signaling the firm's "differentiated quality" (IOANNOU; SERAFEIM, 2019; VELTE; STAWINOGA, 2017).

Velte and Stawinoga (2017) also argue that bringing together ESG and financial content into one cohesive report is a difficult task. Aiming at dealing with this challenge, the International Integrated Reporting Council (IIRC) was created in 2010, being a "global coalition of regulators, investors, companies, standard setters, the accounting profession and NGOs [sharing the view that] communication about value creation should be the next step in the evolution of corporate reporting" (IIRC, 2013, p. 1). In 2013, the IIRC issued the final version of the IR framework. This framework aims to provide information on a broad range of different types of capital involved in a firm's operation, such as financial, intellectual, human, social, and natural capitals (FLORES et al., 2019). Something interesting about the IIRC framework is that non-financial information is referred to as "prefinancial", with the underlying meaning that this information must further be translated into financial performance at some point.

One concern that some might have about integrating financial and ESG reports to better address all stakeholders' interests is that companies may lose focus. That way, management

might hurt firm value if they have many different minor objectives and various target groups attend (JENSEN, 2002). For that matter, the IIRC makes it clear that the IR framework should primarily address “the financial capital providers”, which may mitigate adverse effects from focusing on heterogeneous target groups:

> *IR promotes a more cohesive and efficient approach to corporate reporting and aims to improve the quality of information available to providers of financial capital to enable a more efficient and productive allocation of capital [...] The primary purpose of an integrated report is to explain to providers of financial capital how an organization creates value over time" (IIRC, 2013, p. 4).*

Despite that, it is plausible to consider that IR is as relevant to investors as to the whole stakeholder chain (VELTE; STAWINOGA, 2017). At the same time, some authors such as Flower (2015) criticize the IIRC statement that the primary users of IR are the providers of financial capital, arguing that critical intervening parts are not properly considered. Whether or not this investor-centric view is beneficial to the firm, however, is not an object of inquiry in this study and might be better addressed in future research.

So far, some studies have already been conducted regarding the relation between IR and firm value. Lee and Yeo (2016) try to show the relation between IR and firm valuation. Under a South African setting, they find that IR and firm valuation have a positive association, concluding that the benefits of adopting an integrated reporting approach exceed the potential costs.

Using a sample of 82 international firms during the 2011-2015 period, Pavlopoulos, Magnis, and Iatridis (2017) find that higher IR disclosure quality is associated with less earnings management and fewer agency costs.

García-Sánchez and Noguera-Gámez (2017) evaluate the relation between IR and the cost of capital using a cross-country sample of firms. They find a negative relationship between the variables, meaning that companies that adopted the IR could access cheaper sources of capital.

Analyzing if the IR adoption according to the IIRC framework affected analyst forecast accuracy, Flores et al. (2019) found that there is a positive relationship between the variables and that this effect is more prominent in North America (a shareholder-centric market) than in Europe (a stakeholder-centric market).

Mervelskemper and Streit (2017) find that IR is associated with superior outcomes compared to stand-alone statements when considering the overall ESG performance and corporate governance performance scores. However, they show that if a company starts reporting according to the IIRC framework and presents ex-ante low ESG performance, the impact on firm value might be negative.

Considering the literature reviewed, hypothesis H_4 is formulated based upon the idea that IR adoption might be capable of yielding superior value relevance when compared to stand-alone ESG reports.

> ***H_4.*** *A firm adopting the Integrated Reporting framework will face significantly higher impact on its value than companies adopting stand-alone reports.*

2.3 Institutional Setting: Mandatory ESG Disclosure Regulations and the Directive 2014/95/EU

In October 2014, the European Parliament and the Council of the European Union enacted Directive 2014/95/EU, which amended Directive 2013/34/EU regarding the disclosure of non-financial and diversity information by certain companies. One of the main changes was the requirement imposed on large public-interest entities obligating them to start reporting their environmental, social, and governance activities in their annual reports, starting with the 2017 results. The European Commission estimated that only around 2.500 out of 42.000 EU large companies formally disclosed ESG activities regularly when Directive 2014/95/EU was being discussed. Also, the little information being disclosed lacked quality. By "large public-interest entities", the Directive meant listed and insurance companies, banks, and other companies designated as such by State Members' national authorities with more than 500 employees (EUROPEAN COMMISSION, 2014). They defined this threshold not to overwhelm small and medium enterprises.

The Directive 2014/95/EU did not establish particular frameworks or guidelines that should be followed, granting companies significant flexibility to disclose relevant ESG information the way they considered best. It was suggested that international, European, or national guidelines would be used. Also, in 2017 the European Commission published non-binding

guidelines to help these large public-interest companies better comply with the requirements.

Despite the considerable discretion allowed for firms to choose how to make their ESG disclosure, some minimum requirements were defined regarding the type of information to be disclosed. Matters such as environmental protection, social responsibility, treatment of employees, respect for human rights, anti-corruption and bribery, and diversity on company boards (in terms of gender, age, and educational and professional backgrounds) were included in the requirements.

Overall, Ioannou and Serafeim (2019) find that mandatory disclosure regulations positively affect the level and the quality of firms' disclosure, even with the "comply or explain" rule they usually encompass. It supports the importance that regulators have on dictating the direction firms should go on ESG matters.

The European Commission also tried to address the problem of insufficient board diversity. According to the Commission's Impact Assessment (2014), lack of board diversity (regarding gender, age, and professional and educational backgrounds) might lead to "narrow group thinking", " which may negatively impact the efficacy of the board of directors. In essence, the Directive may be understood as an effort to increase transparency over the companies' ESG activities and firms' accountability while reducing the asymmetry of information among various stakeholders by increasing relevance, consistency, and comparability of the information disclosed.

3 Methodology

In order to test the hypotheses presented in Section 2, this study employed a difference-in-differences approach in which the passage of the Directive 2014/95/EU was adopted as the exogenous shock. This setting is particularly valuable to the research design since the regulation affected a wide range of firms amongst all the EU's State Members, making the disclosure of non-financial information mandatory for large public-interest entities. The treatment group was formed by 515 publicly listed firms with shares being traded in the EU's most representative stock exchanges. These firms were then propensity-score-matched with companies from the rest of the globe. The resulting control group consisted of 380 worldwide firms. The following subsections discuss the procedures undertaken regarding data collection and data treatment, sampling, matching, variables creation, and the econometric specifications designed for the identification strategy. Throughout this routine, R was used as the statistical software.

3.1 Predictive Validity Framework

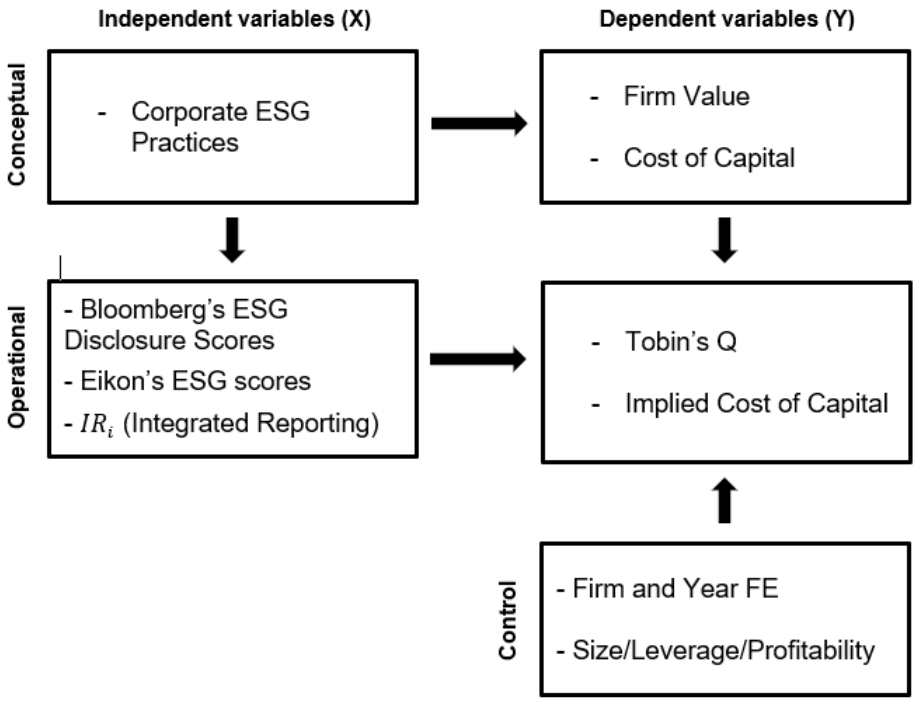
The Predictive Validity Framework - also known as "Libby Boxes" - was proposed by Cornell professor Robert Libby, and intends to "provide a useful description of the hypothesis testing process, focusing [...] on the key determinants of the internal and external validity of a research design" (LIBBY; BLOOMFIELD; NELSON, 2002, p.794). Figure 1 presents the Libby Boxes proposed for this study.

3.2 Data

The database used in this study was composed by information from multiple sources, collected in a yearly basis across an 11-year time span, from 2009 to 2019. ESG disclosure scores and financial and accounting data were retrieved from Bloomberg. Refinitiv Eikon (former Thomson Reuters Eikon) was used to collect ESG performance scores. Also, when Bloomberg lacked some data point, Eikon was used to draw contingent financial information for some observations to improve the overall quality of the main data set.

The Institutional Brokers Estimate System (I/B/E/S) was used to gather analysts' forecasts

Figure 1: Libby Boxes



on earnings per share (EPS) and stock prices needed to compute each firm's implicit cost of capital.

Finally, the IIRC's and the firms' websites were examined and compared in order to collect information about the status (i.e., reporting or non-reporting) as well as the type (i.e., stand-alone or integrated) of ESG reporting. This procedure was necessary since there was no such data available on the searched third-party providers. The choice to use both the IIRC's and the firms' websites is because firms recurrently may classify their reports as "integrated" when they do not follow the IIRC framework (FLORES et al., 2019). Luckily, IIRC itself provides a database of companies whose reporting practices were recognized by the institution as compliant to their guidelines [2].

3.3 Sample and Propensity Score Matching

The sample for this study consists of large firms with more than 500 employees listed in the most relevant stock exchanges from the European Union and firms from the rest of the world, encompassing the period from 2009 to 2019. The cut on 500 employees was established based

[2]The IIRC database is available at: <http://examples.integratedreporting.org/home>

on the Directive 2014/95/EU criteria to define large public-interest companies (EUROPEAN COMMISSION, 2014).

The European firms formed the treatment group since the legislation used as a shock to the ESG disclosure practices exclusively affected them. The data sets retrieved from Bloomberg and Refinitiv Eikon returned few observations for some of the EU's countries (e.g., Malta, Cyprus, Croatia, and Greece). At the same time, the sum of these countries' stock market capitalization is unrepresentative compared to the European Union's whole market. Therefore, the treatment group was composed of 515 companies from 8 countries, based on the relevance of their stock market capitalization: United Kingdom, France, Germany, Netherlands, Sweden, Spain, Italy, and Belgium. Altogether, they correspond to more than 92% of EU's total market cap (WORLD BANK, 2018).

As for the control group, a set of 1471 firms from the rest of the world was assembled based on data available from the sources described in Subsection 3.2. To achieve this number, first, all public firms listed outside the European Union were gathered. Then, firms with missing values for relevant variables (e.g., total assets, ESG scores, and EPS forecasts) or without consistent data through 2010 to 2018 (i.e., 4 year before and 4 years after the shock) were excluded from the sample.

Finally, firms from China, Malaysia, and South Africa were also discarded. Despite the relevance some of those countries have for the world economy and world stock market capitalization - remarkably in the Chinese case - this procedure was necessary since all of these countries had approved mandatory ESG disclosure regulations before 2014 (BARTH et al., 2017; LEE; YEO, 2016; BERNARDI; STARK, 2018; ROWBOTTOM; LOCKE, 2016; IOANNOU; SERAFEIM, 2019). Thus, dropping the firms from these nations is essential to treat a potential endogeneity source since including them in the control group could result in an attenuation bias, as they had been impacted before by a somehow similar shock.

The resulting 515 European treated companies were then matched to the pool of 1471 control firms through a one-to-one propensity score matching (PSM) procedure, according to their size, leverage, and profitability in 2013 (i.e., the year before the Directive enactment). The scores were obtained through a logit binomial model, and the PSM was implemented through

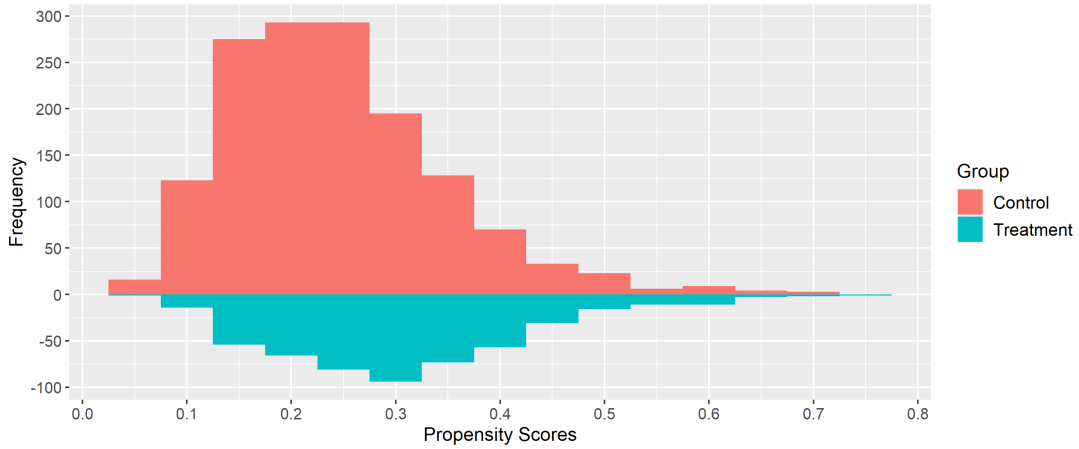
the nearest neighbor approach. Following the recommendation of Roberts and Whited (2013), we also use replacement during the matching procedure.

The matching is of utmost importance to alleviate endogeneity concerns since observations in the treatment and control groups could differ in fundamental characteristics related to how companies act on and are impacted by ESG matters, such as size, profitability, and leverage. Relevant divergence in those aspects, in consequence, could compromise the parallel trends assumption necessary to render a valid DiD model. Figure 2a shows the propensity scores for both treatment and control groups pre-matching.

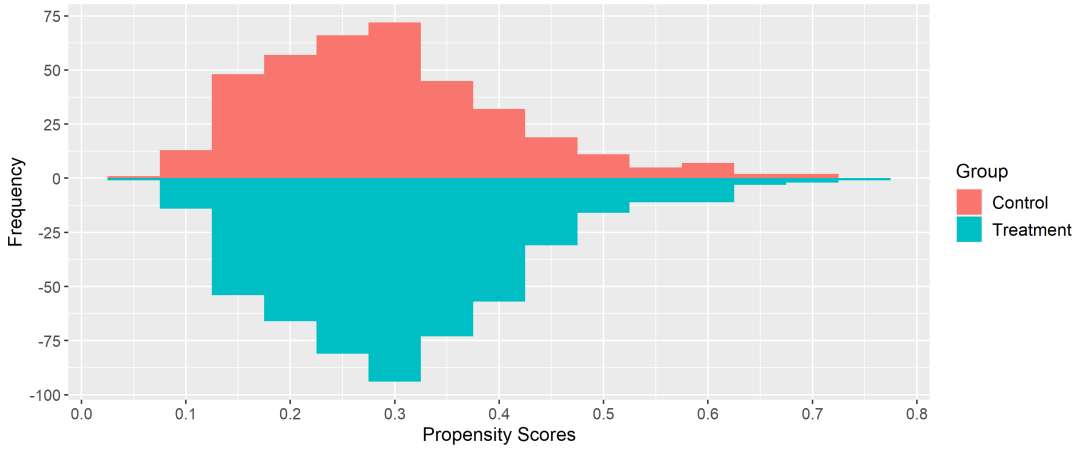
Figure 2: **Propensity Scores Distribution**

Treatment and control groups were matched through a propensity score matching (PSM) procedure. Propensity scores were obtained by a logit binomial model which considered firms' size, leverage, and profitability in 2013 (i.e., the year before the Directive enactment). The matching was implemented based on a one-to-one nearest neighbor approach with replacement. Figure (a) presents the propensity scores of being treated for firms in both groups, before the PSM. Figure (b) presents the propensity scores of the resulting sample of matched treated and control firms.

(a) Distribution of Propensity Scores Pre-Matching



(b) Distribution of Propensity Scores Post-Matching



It is possible to note that the distribution has different concentrations for each category. Treatment firms tend to have higher propensity scores than companies in the control group. This elementary observation is an important one since, by construction, firms in the treatment group should be more prone to being treated. Another relevant observation that can be verified in Figure 2a is that there are firms in the control group for almost every propensity score bin in which treated firms are present. There is also a significant number of firms for each bin. This is relevant because it alleviates endogeneity concerns about a possible measurement error caused by the scarcity of relevant peers for the European companies.

From a total of 1471 potential control companies, 380 were matched to the treatment firms, 1091 were not matched, and no firm within the treatment group was left unmatched. Figure 2b presents the propensity score distributions for treatment and control group post-matching. It is possible to observe that the distributions became much more alike in terms of dispersion and frequency. This is a good indicator of the matching procedure's success.

Table 1 brings an analysis in means for each matching variable for both control and treatment groups, before and after the PSM was handled. Standardized mean differences (SMD) show that there was a significant improvement in the samples' quality, in the sense that treatment and control groups became much more alike given the key variables used in the PSM. All variables presented an SMD which laid under the 0.1 threshold after being matched. Altogether, the evidence suggests that the matching was successful in assuring the similarity among samples.

Table 1: **Standardized Mean Differences Pre and Post PSM**

This table presents comparative data between treatment and control groups in 2013 (i.e., the year right before the enactment of Directive 2014/95/EU) according to firms' size, leverage and profitability, before and after the propensity score matching. $Leverage$ is computed as total liabilities divided by total assets. $Size$ is computed as the natural logarithm of the total assets. ROA is computed as net income divided by total assets. Smd is the standardized mean difference between both groups. Results for $Leverage$, $Size$, and ROA are the means for each variable, while standard deviations are shown in parentheses. N corresponds to the number of firms in each group.

	Pre-PSM			Post-PSM		
	Control	Treatment	smd	Control	Treatment	smd
N	1471	515		380	515	
$Leverage$	0.53 (0.19)	0.60 (0.17)	0.386	0.58 (0.19)	0.60 (0.17)	0.082
$Size$	8.89 (1.29)	8.47 (1.58)	0.289	8.59 (1.27)	8.47 (1.58)	0.083
ROA	0.05 (0.05)	0.05 (0.05)	0.036	0.05 (0.05)	0.05 (0.05)	0.011

Table 2 shows summary statistics for the main variables. Panel A shows the information

for the treatment group, while Panel B describes the control sample. N consists of firm-year observations, and market capitalization is in US$ million.

Table 2: **Descriptive Statistics**

The sample consists of 895 firms, being 515 European treated companies and 380 worldwide control companies that were propensity score matched according to their size, leverage and profitability. Data was collected in a yearly basis and covers the period from 2009 - 2019. Panel A displays the statistics for the treatment group, while Panel B describes the control group. N corresponds to the number of firm-year observations. ESG Disclosure corresponds to the Bloomberg's ESG Disclosure scores, ranging between 0 and 100. ESG Performance is proxied by the Eikon's ESG Combined scores, which also ranges from 0 to 100. Size is computed as the natural logarithm of the total assets. Leverage is computed as total liabilities divided by total assets. ROA is computed as net income divided by total assets. Tobin's Q is computed as in Chung and Pruitt (1994) and is a proxy for firm value. ICC is the implied cost of capital and is computed as in Ng and Rezaee (2015). Market Cap numbers are presented in US$ millions. All variables are measured as in the last day of each fiscal year.

	N	Mean	St. Dev.	Min	p25	Median	p75	Max
Panel A: Treated Group								
ESG Disclosure	5,292	37.86	14.17	2.89	27.69	38.02	48.76	77.27
ESG Performance	5,292	54.25	17.19	1.89	42.50	54.36	67.22	92.99
Size	5,292	8.491	1.574	5.838	7.300	8.416	9.550	11.56
Leverage	5,292	0.604	0.173	0.163	0.491	0.607	0.727	0.95
ROA	5,292	0.051	0.046	-0.043	0.022	0.047	0.080	0.13
Tobin's Q	5,292	1.065	0.592	-0.224	0.605	0.935	1.477	2.09
ICC	5,292	0.074	0.027	0.011	0.055	0.071	0.091	0.12
Market Cap	5,292	12,624	26,252	17	1,375	3,551	10,193	279,200
Panel B: Control Group								
ESG Disclosure	3,995	29.06	13.61	3.31	16.53	26.86	40.50	68.18
ESG Performance	3,995	42.76	19.07	0.12	27.86	42.11	57.38	93.06
Size	3,995	8.597	1.283	5.838	7.689	8.556	9.508	11.56
Leverage	3,995	0.578	0.203	0.163	0.439	0.590	0.717	0.95
ROA	3,995	0.050	0.049	-0.043	0.018	0.044	0.082	0.13
Tobin's Q	3,995	1.116	0.619	-0.261	0.626	0.979	1.628	2.09
ICC	3,995	0.066	0.030	0.011	0.047	0.064	0.083	0.12
Market Cap	3,995	11,293	28,304	18	2,025	4,545	10,408	551,834

For further understanding of the sample, Tables 3 and 4 were assembled, showing the firms' distributions per country and per industry for each group. Table 3 presents a particular concentration in some countries, such as the United Kingdom for the treatment group and the United States and Japan for the control group. However, it is also possible to observe good heterogeneity and representativeness in terms of frequency for most nations. In general, the distribution should not be a cause of concern.

Table 4 was assembled around the The Global Industry Classification Standard (GICS),

which is a globally standardized taxonomy system developed by the Morgan Stanley Capital International (MSCI) and Standard & Poors (S&P) to classify companies according to their industries, based on a four-tiered model (MSCI, 2020). The four-digit industry group codes were used to classify sampled firms. Aside from the insurance industry that did not count with firms in a significant quantity, sampled companies were well distributed throughout the industry groups. This is important to alleviate possible uneasiness about the results being driven by a limited set of firms concentrated in a particular sector that could be intrinsically more prone to be affected by ESG matters (e.g., competitive vs. non-competitive industries).

Table 3: **Sample of Matched Firms by Country**

The final sample for this study consists of 895 firms: 515 in the treatment group and 380 in the control group. Panel A presents the distribution of treated firms according to their country of exchange. The size of the stock market capitalization was used to define which countries would be included in the sample. These companies' shares are traded in the stock exchanges of the top 8 European countries in terms of stock market capitalization. Altogether, these nations are responsible for more than 92% of the EU's total market cap. Panel B presents the distribution of the control firms according to their country of exchange. These companies were selected by a propensity score matching procedure, from a worldwide sample of firms with data available in Bloomberg's and Refinitiv Eikon's databases. Firms from China, South Africa, and Malaysia were discarded since similar ESG disclosure regulations had already been approved in those countries before 2014.

Panel A: Distribution of the European Treated Firms by Country of Exchange					
Country	Frequency	%	Country	Frequency	%
United Kingdom	188	36.50	Italy	36	6.99
France	88	17.09	Spain	36	6.99
Germany	81	15.73	Netherlands	26	5.05
Sweden	44	8.54	Belgium	16	3.11
Panel B: Distribution of the Worldwide Control Firms by Country of Exchange					
Country	Frequency	%	Country	Frequency	%
United States of America	170	44.74	Brazil	2	0.53
Japan	66	17.37	Indonesia	2	0.53
Australia	36	9.47	Israel	2	0.53
Canada	35	9.21	Mexico	2	0.53
Hong Kong	16	4.21	Taiwan	2	0.53
India	10	2.63	Turkey	2	0.53
Switzerland	9	2.37	New Zealand	1	0.26
Singapore	8	2.11	Philippines	1	0.26
South Korea	5	1.32	Thailand	1	0.26
Norway	5	1.32	United Arab Emirates	1	0.26
Chile	4	1.05			

Table 4: **Sample of Matched Firms by Industry**
This table presents the sample distribution by industry, according to the four-digit GICS codes.

	Treatment Firms		Control Firms			
Industry	Frequency	%	Frequency	%	Total	%
Capital Goods	102	19.81	41	10.79	143	15.98
Materials	46	8.93	46	12.11	92	10.28
Utilities	33	6.41	24	6.32	57	6.37
Energy	21	4.08	27	7.11	48	5.36
Media & Entertainment	34	6.60	14	3.68	48	5.36
Retailing	25	4.85	22	5.79	47	5.25
Commercial & Professional Services	29	5.63	15	3.95	44	4.92
Food, Beverage & Tobacco	24	4.66	19	5.00	43	4.80
Transportation	18	3.50	25	6.58	43	4.80
Consumer Services	20	3.88	17	4.47	37	4.13
Software & Services	19	3.69	17	4.47	36	4.02
Consumer Durables & Apparel	28	5.44	6	1.58	34	3.80
Pharmaceuticals, Biotechnology & Life Sciences	20	3.88	14	3.68	34	3.80
Technology Hardware & Equipment	13	2.52	15	3.95	28	3.13
Health Care Equipment & Services	12	2.33	13	3.42	25	2.79
Diversified Financials	13	2.52	11	2.89	24	2.68
Automobiles & Components	14	2.72	9	2.37	23	2.57
Real Estate	3	0.58	18	4.74	21	2.35
Food & Staples Retailing	12	2.33	7	1.84	19	2.12
Telecommunication Services	14	2.72	5	1.32	19	2.12
Semiconductors & Semiconductor Equipment	7	1.36	8	2.11	15	1.68
Household & Personal Products	8	1.55	6	1.58	14	1.56
Insurance	0	0.00	1	0.26	1	0.11

3.4 Variables

In addition to the raw financial and accounting data, it was necessary to create the following variables: firm size, calculated as the natural logarithm of total assets; leverage, calculated as the total liabilities over total assets; profitability, measured by the return on equity (ROE) and the return on assets (ROA); firm value, proxied by the approximate Tobin's Q (CHUNG; PRUITT, 1994); and cost of capital, proxied by the Implied Cost of Capital (ICC) (NG; REZAEE, 2015). These variables were then winsorized at the 5th and 95th percentiles to avoid problems with extreme observations that could be potentially harmful to the regressions'

outcomes.

Size, leverage, and profitability were used during the matching procedure and as controls in the tests specifications. Tobin's Q and the ICC were used as the main dependent variables in the models, and their calculations are discussed in detail in Subsection 3.4.1. For clarity's sake, Table 5 lists all the relevant variables used throughout the study, along with their description and sources.

Table 5: **Variables Definitions**
This table presents the definition of each variable used in our models. They are classified as dependent, independent and control variables.

Variable	Description	Source
Dependent Variables		
$Firm\ Value_{i,t}$	Firm value for firm i in time t measured by Tobin's Q.	Bloomberg
$ICC_{i,t}$	Implicit Cost of Capital for firm i in time t. The result of the quotient between $E_t(EPS_{i,\ t+1})$ and $P_{i,t}$, following Ng and Rezaee (2015).	I/B/E/S
$Disclosure_{i,t}$	ESG disclosure score for firm i in time t.	Bloomberg
Independent Variables		
Law_t	Whether Directive 2014/95/EU had been enacted in year t. Equals 1 if time t is equal or greater than 2014 and 0 otherwise.	Bloomberg
$Treatment_i$	Whether a firm is in control or treatment group. Equals 1 if firm i is in treatment group and 0 otherwise.	Bloomberg
$HighESG_i$	Equals 1 if the ESG Combined Score for firm i in 2013 is above median and 0 otherwise.	Refinitiv Eikon
$IR_{i,t}$	Equals 1 if a treated firm i starts disclosing ESG issues in year t as an integrated report (according to IIRC framework) and 0 otherwise.	IIRC's and firms' websites
Control Variables		
$Size_{i,t}$	Natural logarithm of the total assets' book value for firm i in time t.	Bloomberg
$Leverage_{i,t}$	Total liabilities divided by the book value of total assets for firm i in time t.	Bloomberg
$ROA_{i,t}$	Net income divided by the book value of total assets for firm i in time t.	Bloomberg

3.4.1 Dependent Variables

The analyses carried out in this study rely on 3 dependent variables: (1) firm value, proxied by the firms' Qs; (2) cost of capital, calculated by the Implied Cost of Capital, as in Ng and Rezaee (2015); and (3) ESG disclosure, proxied by the ESG Disclosure Score from Bloomberg.

Tobin's Q is a ratio between a firm's market value and the replacement value of its assets. However, it is often hard to precisely account for the assets' replacement value, as it differs from their book value. Some good algorithms were developed over the years to calculate Q values, such as the Lindenberg and Ross (1981) and Lang and Litzenberger (1989) models, but most of them are complex and challenging to reproduce. With that in mind, Chung and Pruitt (1994) developed an equation for approximate Q values that only consider data easily accessible in financial statements. This model accounts for at least 96.6% of Lindenberg and Ross (1981) more accurate model. The approximate Q equation was then widely used in several research studies (see, for example, KIM; KIM; QIAN, 2018; KANG; GERMANN; GREWAL, 2016; GRAHAM, 2000).

Following this strand, the approximate Q was chosen to be used in this study and it was calculated as follows. All values are computed at the end of each period t for each firm i.

$$Tobin's\ Q = \frac{COMST + STL - CAS + LTDEBT}{TA} \tag{1}$$

Where:

$COMST$ is thefirm's share price times the number of common shares outstanding;

STL is the book value of short-term liabilities;

CAS is the book value of current assets;

$LTDEBT$ is the book value of long term debt;

TA is the book value of total assets.

Additionally, the Implied Cost of Capital as in Ng and Rezaee (2015) was used as an alternative dependent variable to the Tobin's Q. Although both variables do not measure the same concepts, this choice is explained as both measures are intrinsically connected since a

variation on the cost of capital directly impacts the firm value.

As Hypothesis H_2 predicts a positive relation between ESG practices and firm value measured by firms' Qs, by switching the dependent variable to the ICC, it is expected to find a negative coefficient. ICC is computed as follows:

$$ICC_{i,t} = \frac{E_t(EPS_{i,\,t+1})}{P_{i,t}} \tag{2}$$

Where:

$E_t(EPS_{i,\,t+1})$ is the I/B/E/S mean analysts' forecast in time t for the Earnings per Share of firm i at time $t + 1$; and

$P_{i,t}$ is the stock price for firm i at time t.

Finally, the $Disclosure_{i,t}$ dependent variable is composed by the ESG Disclosure Score provided by Bloomberg, for firm i in time t. Bloomberg's ESG disclosure scores are given as an overall score and decomposed in its three dimensions: environment, social, and governance. The scores are based exclusively on company-sourced information, such as annual reports, government filings, CSR or ESG stand-alone reports, the firm's website, and a survey conducted by Bloomberg directly with the companies. These features make scores transparent and fully traceable to the source, which increases data reliability (IOANNOU; SERAFEIM, 2019; SHAHZAD et al., 2019). Bloomberg's methodology intends to measure the level of ESG transparency of a firm (i.e., how many and how well issues are reported) and do not assess the quality of the ESG initiatives.

3.4.2 Independent Variables

This study relies on a set of 4 dummy variables on the right-hand side: (1) $Treatment_i$ and (2) Law_t, which are the typical DiD terms and define, respectively, treatment and control groups and time of treatment. $Treatment_i$ equals 1 if firm i is subject to Directive 2014/95/EU and 0 otherwise. Law_t equals 1 if period t is 2014 or later, and 0 otherwise; (3) $IR_{i,t}$, which characterizes whether a firm adopted the Integrated Reporting framework during the 2 years following the enactment of Directive 2014/95/EU; and (4) $High\ ESG_i$, which indicates whether a firm was a high performer in terms of ESG prior to the Directive 2014/95/EU enactment. Firms

that presented above-median ESG Combined Scores in 2013 (the year prior to the enactment of Directive 2014/95/EU) were considered high performers (i.e., $High\ ESG_i = 1$), while below-median firms were considered low performers (i.e., $High\ ESG_i = 0$).

Eikon's ESG Score is a widely used measure in the literature as a proxy for companies' ESG performance (see, for example, DUQUE-GRISALES; AGUILERA-CARACUEL, 2019; MERVELSKEMPER; STREIT, 2017; CHENG; IOANNOU; SERAFEIM, 2014; MARSAT; WILLIAMS, 2014; GARCIA; MENDES-DA-SILVA; ORSATO, 2017; AOUADI; MARSAT, 2018) and differs from Bloomberg's ESG scores.

While the latter focuses on how many and how well ESG activities are being reported, Eikon's scores tend to reflect more the ESG performance of firms. Their combined ESG measure includes a controversy overlay that considers 23 distinct topics (e.g., business ethics, tax fraud, and child labor) traced on high-impact media channels and non-governmental organizations' websites. If a company is found to be involved in a corruption scheme, this will hurt its ESG Combined Score, thus better reflecting its actual ESG performance. This data triangulation is necessary since scores do not rely exclusively on firm-sourced information.

3.4.3 Control Variables

In most specifications, the following variables are used as controls: firm size (measured as the logarithm of total assets), leverage (total liabilities over total assets), and return on assets (ROA) as a proxy for firms' profitability. These control variables were proposed in several previous studies in the field of ESG and firm financial performance (CLARKSON et al., 2008; CHO; PATTEN, 2007; JO; HARJOTO, 2011; DUQUE-GRISALES; AGUILERA-CARACUEL, 2019); and in the fields of ESG disclosure and Integrated Reporting (IOANNOU; SERAFEIM, 2019; SERAFEIM, 2015; BERNARDI; STARK, 2018; FLORES et al., 2019), intending to reduce the effect of bias in the estimators.

3.5 Identification Strategy

Difference-in-differences and triple-difference approaches were used to evaluate the effect of the ESG disclosure on firm value, in which the enactment of Directive 2014/95/EU was

used as a shock to the ESG disclosure practices of the European large publicly listed companies (i.e., with more than 500 employees). A summary view of the main variables used in the identification strategy models can be verified in Table 5.

A propensity score matching between the European firms and companies from the rest of the world was handled to define the control group. Details on matched samples are presented in Section 3.3. In all models, standard errors were clustered at the firm level to avoid serial correlation on observations for the same firm in different years.

3.5.1 Effectiveness of Mandatory Disclosure

In order to test Hypothesis H_1 (i.e. mandatory ESG disclosure regulations affect the overall level of disclosure), the following generalized difference-in-differences model was employed:

$$Disclosure_{i,t} = \beta_0 + \beta_1(Treatment_i \times Law_t) + \beta' X_{i,t} + \mu_i + \delta_t + \epsilon_{i,t} \quad (3)$$

Where:

$Disclosure_{i,t}$ is the ESG disclosure scores from Bloomberg for firm i in period t;

$Treatment_i$ equals 1 if firm i is subject to Directive 2014/95/EU and 0 otherwise;

Law_t equals 1 if period t is equal or greater than 2014 and 0 otherwise;

$X_{i,t}$ is a vector of control variables, namely: $Size_{i,t}$, $Leverage_{i,t}$ and $ROA_{i,t}$;

μ_i and δ_t are, respectively, firm and year fixed effects.

Treated firms were obligated to report non-financial information starting with the 2017 fiscal year. However, they could adopt the European Commission's orientation before that. Thus, 2014 (i.e., the year of the Directive enactment) onward is considered the treatment period. It is expected that the results show a significant variation in the level of disclosure for the treatment group compared to the control group.

Bloomberg's ESG disclosure scores are also presented as decomposed measures according to the environmental, social, and governance dimensions (BLOOMBERG, 2020). It might be plausibly argued that the impact of mandatory disclosure of non-financial information might differ along these dimensions. A practical implication is that results might be better explained if the individual scores are used in the equation rather than the aggregated one.

This analysis may shed some light on important issues, for instance if companies improved their ESG disclosure equally across the environmental, social, and governance dimensions. Also, it may be possible to verify if all of them present the same coefficient signal or if there are concurrent effects amongst them - which could help explain the previously reported divergence among findings in the literature.

3.5.2 ESG Disclosure and Firm Value

To test Hypothesis H_2, Equation (4) was employed using Tobin's Q as the dependent variable to account for firm value:

$$Firm\ Value_{i,t} = \beta_0 + \beta_1(Treatment_i \times Law_t) + \beta' X_{i,t} + \mu_i + \delta_t + \epsilon_{i,t} \tag{4}$$

Where:

$Firm\ Value_{i,t}$ is the firm value for firm i in period t measured by firms Tobin's Q.

The implied cost of capital (ICC) as developed in Ng and Rezaee (2015) and discussed in Subsection 3.4 was also used as an alternative dependent variable. The underlying assumption is that a possible channel through which the firm value might be affected is by the facilitated access to capital due to the reduction of information asymmetry caused by the improvement of overall ESG disclosure. This would lower the firm's cost of capital (i.e., the discount rate for future cash flows), which would positively affect the firm value.

3.5.3 ESG Performance and Firm Value

To test Hypothesis H_3 (i.e. the effects of ESG disclosure variation on firm value will differ according to companies' ESG performance) and its sub-components $H_{3\text{-}a}$ and $H_{3\text{-}b}$, the following generalized triple difference model was employed:

$$\begin{aligned} Firm\ Value_{i,t} = {} & \beta_1(Law_t \times High\ ESG_i) + \beta_2(Law_t \times Treatment_i) + \\ & + \beta_3(Law_t \times Treatment_i \times High\ ESG_i) + \beta' X_{i,t} + \mu_i + \delta_t + \epsilon_{i,t} \end{aligned} \tag{5}$$

Where:

$High\ ESG_i$ equals 1 if the firm's i Combined ESG performance score from Refinitiv

Eikon is above the median level in the year before the Directive 2014/95/EU enactment (i.e, 2013), and 0 otherwise. The other variables were already defined in Equation (3).

Given that the Directive's purpose was to increase the level of ESG disclosure in the European Union, it is plausible to argue that companies with ex-ante better ESG performance would benefit more from increased transparency than poor performers on ESG matters.

3.5.4 Integrated Reporting and Firm Value

Finally, in order to test Hypothesis H_4 the subset of treated firms that started reporting ESG information after the enactment of Directive 2014/95/EU was selected. The following triple-difference approach was then employed:

$$\begin{aligned} Firm\ Value_{i,t} = \beta_1(Law_t \times IR_{i,t}) + \beta_2(Law_t \times Treatment_i) + \\ + \beta_3(Law_t \times Treatment_i \times IR_{i,t}) + \beta' X_{i,t} + \mu_i + \delta_t + \epsilon_{i,t} \end{aligned} \tag{6}$$

Where:

$IR_{i,t}$ equals 1 if the treated firm i starts reporting ESG activities integrated to financial statements in year t and 0 if the stand-alone format was chosen.

This test's reasoning is that firms that adopted the IIRC's IR framework should face a higher level of value-increase compared to the ones that adopted stand-alone reports due to the eligible superior transparency and superior ease of interpretation that result from integrated reports. Since the reporting status of a firm may have varied during the entire period of the study, this test considered a cut in the sample accounting for a period of 2 years after and 2 years prior to the Directive 2014/95/EU enactment (i.e., 2012 - 2016). This seems reasonable since a change in reporting type requires considerable effort and is unlikely to change in the declared time frame.

4 Results

The present study's primary goal is to evaluate whether the disclosure of non-financial information significantly impacts the value and the cost of capital of a firm. This objective was originated from the perceived need found in the literature to understand better if the ESG practices of a company matter for the market. If so, their disclosure would help mitigate the information asymmetry between firms and stakeholders, thus enhancing firm value and possibly facilitating access to capital.

Results are presented in this section under the hypotheses developed in Section 2 and the specifications discussed in Section 3. The main tests were run with and without the control variables to verify their relevance and suitability. In every model, robust standard errors are shown in parentheses and are clustered at the firm level to avoid serial correlation. All models also present the number of firm-year observations for each specification. For the sake of brevity, in some robustness checks, only the main model (i.e., Equation 4) is tested, and the results reported consider the control variables along with the firm and year fixed effects.

4.1 Effectiveness of Mandatory ESG Disclosure

Table 6 presents the outcomes of the Equation 3 regarding the effectiveness of mandatory disclosure of non-financial information in the European setting. In total, eight models were run for the overall ESG Disclosure Score and its sub-components. Models (I) to (IV) did not include control variables, while models (V) to (VIII) did.

Our estimates show that the regulation effectively raised the overall level of ESG disclosure in both scenarios. In model (V), the variable of interest ($Law_t \times Treatment_i$) was positive in the order of 1.1052, significant at the 5% level, meaning that the level of ESG disclosure of treated firms significantly improved when compared to control firms after the enactment of Directive 2014/95/EU. To illustrate, the mean ESG disclosure score for the treated group in 2013 was 37.86, which implies an increase of roughly 2,92% on firms' transparency on ESG issues.

Table 6: **The Effectiveness of Mandatory ESG Disclosure Regulation**

This table presents results of estimating the following generalized difference-in-differences regression model:

$$Disclosure_{i,t} = \beta_0 + \beta_1(Treatment_i \times Law_t) + \beta' X_{i,t} + \mu_i + \delta_t + \epsilon_{i,t}$$

where $Disclosure_{i,t}$ is the Bloomberg's ESG disclosure scores (i.e., overall, environmental, social, and governance) for firm i in period t; $Treatment_i$ equals 1 if firm i is subject to Directive 2014/95/EU, and 0 otherwise; Law_t equals 1 if period t is 2014 or later, and 0 otherwise; $X_{i,t}$ is a vector of control variables; μ_i and δ_t are, respectively, firm and year fixed effects. Models (I) to (IV) consider only the interaction term of interest. In models (V) to (VIII), we allow the use of the control variables to test the robustness of the proposed model. The regression is estimated over the period 2009-2019. Sample sizes are presented in firm-year observations. Robust standard errors are shown in parenthesis and are clustered at the firm level.

	ESG Disclosure Scores - No Controls				ESG Disclosure Scores - With Controls			
	Overall (I)	Environmental (II)	Social (III)	Governance (IV)	Overall (V)	Environmental (VI)	Social (VII)	Governance (VIII)
$Law_t \times Treatment_i$	0.8379^{*}	0.1474	-0.5333	1.5271^{***}	1.1052^{**}	0.3164	-0.2855	1.6043^{***}
	(0.4947)	(0.6660)	(0.6467)	(0.3873)	(0.4854)	(0.6517)	(0.6363)	(0.3875)
$Size$					3.2515^{***}	4.1631^{***}	3.3956^{***}	0.8160^{**}
					(0.5121)	(0.7058)	(0.6360)	(0.3839)
$Leverage$					1.8296	0.2555	2.3007	0.0546
					(1.6614)	(2.3503)	(2.0904)	(1.2970)
ROA					7.6484^{***}	5.8376	2.3271	7.3605^{***}
					(2.9629)	(3.8968)	(3.7103)	(2.5440)
Observations	9287	8090	8937	9285	9287	8090	8937	9285
Firm FE?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls?	No	No	No	No	Yes	Yes	Yes	Yes
R^2	0.8669	0.8526	0.8424	0.7593	0.8699	0.8557	0.8446	0.7602
Adjusted R^2	0.8525	0.8346	0.8246	0.7334	0.8558	0.8380	0.8270	0.7342

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Further analyses considering the decomposed disclosure scores showed that only the Governance dimension presented significant results (models (IV) and (VIII)). It means that the overall results were driven by treated firms focusing mainly on the disclosure of corporate governance matters. En masse, our findings support Hypothesis H_1 in the sense that the mandatory ESG disclosure regulation is effective in raising firms' level of non-financial disclosure.

4.2 ESG Disclosure and Firm Value

Table 7 shows the results for Hypothesis H_2. Models (I) and (II) used Tobin's Q as the dependent variable, while models (III) and (IV) used the Implied Cost of Capital as the dependent variable.

Table 7: **ESG Disclosure and Firm Value**

This table presents results of estimating the following generalized difference-in-differences regression model:

$$Firm\ Value_{i,t} = \beta_0 + \beta_1(Treatment_i \times Law_t) + \beta' X_{i,t} + \mu_i + \delta_t + \epsilon_{i,t}$$

where $Firm\ Value_{i,t}$ is the firm value for firm i in period t; $Treatment_i$ equals 1 if firm i is subject to Directive 2014/95/EU, and 0 otherwise; Law_t equals 1 if period t is 2014 or later, and 0 otherwise; $X_{i,t}$ is a vector of control variables; μ_i and δ_t are, respectively, firm and year fixed effects. Models (I) and (II) consider the approximate Tobin's Q (CHUNG; PRUITT, 1994) as the proxy for firm value. In models (III) and (IV), the Implied Cost of Capital (NG; REZAEE, 2015) is used as an alternative dependent variable. Models (I) and (III) do not consider control variables, while models (II) and (IV) do. The regression is estimated over the period 2009-2019. Sample sizes are presented in firm-year observations. Robust standard errors are shown in parenthesis and are clustered at the firm level.

	Tobin's Q		Implied Cost of Capital	
	(I)	(II)	(III)	(IV)
$Law_t \times Treatment_i$	0.0487**	0.0526**	-0.0064***	-0.0055***
	(0.0240)	(0.0211)	(0.0014)	(0.0014)
$Size$		-0.0698***		0.0071***
		(0.0224)		(0.0017)
$Leverage$		0.2765***		0.0189***
		(0.0924)		(0.0052)
ROA		3.3831***		0.1245***
		(0.2044)		(0.0135)
Observations	9287	9287	9287	9287
Firm FE?	Yes	Yes	Yes	Yes
Year FE?	Yes	Yes	Yes	Yes
Controls?	No	Yes	No	Yes
R^2	0.8106	0.8388	0.5979	0.6171
Adjusted R^2	0.7902	0.8213	0.5544	0.5756

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Compared to the world control group, the European firms presented significant results after the enactment of Directive 2014/95/EU for both Tobin's Q and the Implied Cost of Capital.

On average, treated firms faced a positive effect on Tobin's Q in the order of 0.0526, significant at 5% level. At the same time, there was a negative impact on ICC of 0.55 percentage points, significant at 1% level. The sign of both coefficients agrees with the predicted outcomes.

Taken together, these results strongly support Hypothesis H_2. For illustration purposes, the mean Tobin's Q value for the treatment group shown in Table 2 was 1.065, while the mean ICC was 0.074. It corresponds to a difference in Qs of approximately 4.9% and cost of capital of around 7.4%. In other words, besides the statistical significance, the observed outcomes are also economically relevant, presenting a meaningful impact on firms' financial performance.

These results show that treated firms had their market value positively affected when compared to control firms. Also, treated firms had their access to capital facilitated, which resulted in a lower implicit cost of capital. This outcome is of particular interest given the quasi-experimental nature of our specifications since it provides more consistent evidence for the causal relation between corporate ESG disclosure and firm value and the effect's direction.

4.3 ESG Performance and Firm Value

The ESG disclosure intends to increase a firm's transparency and availability of information on environmental, social, and governance practices. A valid argument is that the disclosure might work as a channel by which the market values a firm's ESG performance (i.e., how good are its ESG practices) - and may not be a driver of firm value by itself (GREWAL; RIEDL; SERAFEIM, 2019; MERVELSKEMPER; STREIT, 2017; FATEMI; GLAUM; KAISER, 2018).

If that claim is true, firms with an ex-ante higher level of ESG performance might face a stronger impact on their value than firms with an ex-ante lower ESG performance. Bad performers could even face a value-decreasing effect since their bad practices in ESG would be more visible. Table 8 shows the results for the triple-differences model discussed in Subsection 3.5.3. Unlike expected, treated firms that presented an ex-ante higher level of ESG performance faced a negative impact on their value measured by their Qs, but only when controlling for size, leverage, and profitability (model II). In this scenario, high ESG firms presented a contraction in their value in the order of 0.0818. Also, in model (III), it is possible

to see that firms with high ESG performance presented a significant reduction in their cost of capital. However, when controlled by firm size, leverage, and ROA, this effect disappeared.

Suppose a firm that performed better than its peers in terms of environmental, social, and governance practices before the passage of Directive 2014/95/EU were already valued accordingly by the market. In that case, the new disclosure requirements may have imposed additional costs to the company operations without yielding the value-increasing benefits of the enhanced transparency. Notwithstanding this possible explanation, results were inconclusive and insufficient to support Hypothesis H_3 or to indicate a different conclusion.

Table 8: **ESG Performance and Firm Value**

This table presents results of estimating the following generalized triple difference regression model:

$$Firm\ Value_{i,t} = \beta_1(Law_t \times High\ ESG_i) + \beta_2(Law_t \times Treatment_i) + \\ + \beta_3(Law_t \times Treatment_i \times High\ ESG_i) + \beta' X_{i,t} + \mu_i + \delta_t + \epsilon_{i,t}$$

where $Firm\ Value_{i,t}$ is the firm value for firm i in period t; $Treatment_i$ equals 1 if firm i is subject to Directive 2014/95/EU, and 0 otherwise; Law_t equals 1 if period t is 2014 or later, and 0 otherwise; $High\ ESG_i$ equals 1 if the firm's i Combined ESG performance score from Refinitiv Eikon is above the median level in the year prior to the Directive 2014/95/EU enactment (i.e, 2013), and 0 otherwise; $X_{i,t}$ is a vector of control variables; μ_i and δ_t are, respectively, firm and year fixed effects. Models (I) and (II) consider the approximate Tobin's Q (CHUNG; PRUITT, 1994) as the proxy for firm value. In models (III) and (IV), the Implied Cost of Capital (NG; REZAEE, 2015) is used as an alternative dependent variable. Models (I) and (III) do not consider control variables, while models (II) and (IV) do. The regression is estimated over the period 2009-2019. Sample sizes are presented in firm-year observations. Robust standard errors are shown in parenthesis and are clustered at the firm level.

	Tobin's Q		Implied Cost of Capital	
	(I)	(II)	(III)	(IV)
$Law_t \times High\ ESG_i$	0.0873**	0.0752**	0.0014	0.0010
	(0.0375)	(0.0329)	(0.0024)	(0.0023)
$Law_t \times Treatment_i$	0.0511	0.0655*	-0.0030	-0.0024
	(0.0396)	(0.0343)	(0.0023)	(0.0022)
$Law_t \times Treatment_i \times High\ ESG_i$	-0.0689	-0.0818*	-0.0053*	-0.0043
	(0.0502)	(0.0436)	(0.0032)	(0.0031)
$Size$		-0.0821***		0.0074***
		(0.0242)		(0.0018)
$Leverage$		0.3032***		0.0174***
		(0.0960)		(0.0055)
ROA		3.2614***		0.1279***
		(0.2120)		(0.0143)
Observations	8253	8253	8253	8253
Firm FE?	Yes	Yes	Yes	Yes
Year FE?	Yes	Yes	Yes	Yes
Controls?	No	Yes	No	Yes
R^2	0.8142	0.8414	0.5897	0.6103
Adjusted R^2	0.7942	0.8243	0.5458	0.5684

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

These results may also raise concerns about the quality of the proxy for ESG performance. Eikon's scores are commonly used in the literature for that purpose. In this study we used the ESG Combined Score, which also considers the media coverage on ESG matters to compose the final grade. It is not clear, though, if the way these news pieces affect the final score represents the actual firms' ESG performance. Adding this controversy overlay might be over or underestimating the actual ESG performance. That being said, more research is needed in order to address this possible bias.

4.4 Integrated Reporting and Firm Value

Table 9 brings the results from the triple-differences model discussed in Subsection 3.5.4, designed to test Hypothesis H_4 on the value-relevance of the integrated reporting practices. Integrated reporting is expected to yield superior transparency from corporate disclosure since environmental, social, and governance matters are reported along with the financial information, in an interrelated manner.

Compared to stand-alone sustainability reports, the IR should reduce information asymmetry and better inform the stakeholders about the firm's prospects. In this context, increased transparency could impact a firm's value and its cost of capital since shareholders would better understand the ESG practices and their direct and indirect impacts on financial terms. Contrary to expected, results for the triple interaction term were inconclusive and not significant across all specifications. Apparently, the adoption of the International Integrated Reporting Council (IIRC) Integrated Reporting framework did not yield any incremental effect on the value of firms affected by the Directive 2014/95/EU, compared to the worldwide control firms.

4.5 Robustness Tests

A reasonable concern that might emerge about the research design in this study is that a European macro effect might be driving the results. If the economic prospects for the EU's State Members from 2014 onward were significantly better than the prospects for the rest of the world, the results captured by our identification strategy could capture this macro variation instead. A new sample was assembled to address this possible omitted variable bias and alleviate

Table 9: **Integrated Reporting and Firm Value**

This table presents results of estimating the following generalized triple difference regression model:

$$Firm\ Value_{i,t} = \beta_1(Law_t \times IR_{i,t}) + \beta_2(Law_t \times Treatment_i) + \\ + \beta_3(Law_t \times Treatment_i \times IR_{i,t}) + \beta' X_{i,t} + \mu_i + \delta_t + \epsilon_{i,t}$$

where $Firm\ Value_{i,t}$ is the firm value for firm i in period t; $Treatment_i$ equals 1 if firm i is subject to Directive 2014/95/EU, and 0 otherwise; Law_t equals 1 if period t is 2014 or later, and 0 otherwise; $IR_{i,t}$ equals 1 if the treated firm i starts disclosing ESG activities in year t according to the integrated reporting guidelines, and 0 otherwise; $X_{i,t}$ is a vector of control variables; μ_i and δ_t are, respectively, firm and year fixed effects. The regression is estimated over the period 2012-2014 (i.e, 2 years prior and 2 years after the Directive 2014/95/EU enactment). Models (I) and (II) consider the approximate Tobin's Q (CHUNG; PRUITT, 1994) as the proxy for firm value. In models (III) and (IV), the Implied Cost of Capital (NG; REZAEE, 2015) is used as an alternative dependent variable. Models (I) and (III) do not consider control variables, while models (II) and (IV) do. Sample sizes are presented in firm-year observations. Robust standard errors are shown in parenthesis and are clustered at the firm level.

	Tobin's Q		Implied Cost of Capital	
	(I)	(II)	(III)	(IV)
$Law_t \times IR_{i,t}$	0.0335	0.0265	0.0036	0.0053
	(0.0861)	(0.0875)	(0.0063)	(0.0060)
$Law_t \times Treatment_i$	0.0601**	0.0624***	-0.0058***	-0.0050***
	(0.0250)	(0.0217)	(0.0015)	(0.0015)
$Law_t \times Treatment_i \times IR_{i,t}$	-0.1116	-0.0947	-0.0068	-0.0078
	(0.0959)	(0.0948)	(0.0069)	(0.0065)
$Size$		-0.0706***		0.0071***
		(0.0224)		(0.0017)
$Leverage$		0.2785***		0.0191***
		(0.0919)		(0.0052)
ROA		3.3781***		0.1244***
		(0.2039)		(0.0135)
Observations	9287	9287	9287	9287
Firm FE?	Yes	Yes	Yes	Yes
Year FE?	Yes	Yes	Yes	Yes
Controls?	No	Yes	No	Yes
R^2	0.8109	0.8390	0.5981	0.6173
Adjusted R^2	0.7904	0.8215	0.5546	0.5758

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

endogeneity concerns, considering only the European firms. All the main specifications were re-run in this new setting.

Moreover, two additional robustness checks were employed. First, the non-parametric version of the Equation 4 was run. This procedure allows the researcher to check the effect of treatment in the dependent variable in each year and provides reassurance about the validity of the parallel trends assumption. Second, the year 2017 was tested as an alternative shock period since the enactment of Directive 2014/95/EU occurred in 2014, but the measures were effectively enforced starting with the 2017 fiscal year.

4.5.1 European-Only Treatment and Control Firms

To mitigate the risk of possible diverse macroeconomic factors driving the results, the models described in Subsection 3.5 were also run using a sample composed exclusively of European firms, in which the companies with ex-ante higher ESG disclosure scores were used as the control group. This procedure should alleviate concerns about an essential disparity in macro variables between treatment and control groups. From the pool of 515 European firms discussed in Subsection 3.3, those with ESG Disclosure Scores above the median in 2013 were designated to the control group, and the ones in the lowest quartile were defined as the treatment group. A PSM was then conducted according to the procedures discussed in Subsection 3.3, which left us with 135 treated firms and 135 untreated firms. Table 10 shows the results for Hypothesis H_1 in this new setting.

The estimate for the overall ESG disclosure score was positive and significant at the 1% level, while the coefficients for all decomposed measures were also positive and significant, but at the 5% level. More importantly, the size of the effects was considerably larger than the ones found in Table 6. These results confirm the findings reported in Subsection 4.1, endorsing that mandatory ESG disclosure regulations are effective in raising overall ESG disclosure. Still using the European-only sample, Table 11 presents the outcomes for the Hypothesis H_2 DiD specification, which takes the Tobin's Q and the ICC as dependent variables.

The result for model (II), which measures the impact on firm value, presents a positive incremental effect for treatment firms compared to their control pairs in the order of 0.0921, significant at the 1% level. The result for model (IV), on the other hand, presented a negative effect of 0.70 percentage points on firms' cost of capital, also significant at 1% level. It conveys that firms indeed benefit from adopting ESG practices and properly disclosing them, facing a significant increase in their value and decrease in their cost of capital. Taken together, these results are consistent with our previous findings using the worldwide control group and strongly support Hypotheses H_1 and H_2. They also reinforce the understanding that there is a causal link between ESG initiatives and firm financial performance, in which the former leads to the latter.

Following with the proposed investigation, Table 12 shows the results for the specification designed to test hypothesis H_3, which states that ESG disclosure moderates the relationship

Table 10: **Mandatory ESG Disclosure Regulation - EU-Only Sample**

This table presents results of estimating the following generalized difference-in-differences regression model:

$$Disclosure_{i,t} = \beta_0 + \beta_1(Treatment_i \times Law_t) + \beta' X_{i,t} + \mu_i + \delta_t + \epsilon_{i,t}$$

where $Disclosure_{i,t}$ is the Bloomberg's ESG disclosure scores (i.e., overall, environmental, social, and governance) for firm i in period t; $Treatment_i$ equals 1 if firm i is part of the treatment group, and 0 otherwise; Law_t equals 1 if period t is 2014 or later, and 0 otherwise; $X_{i,t}$ is a vector of control variables; μ_i and δ_t are, respectively, firm and year fixed effects. Only European firms subject to the Directive 2014/95/EU are considered in this test. Bloomberg's ESG Disclosure Scores in 2013 were used to establish the treatment and control groups, both derived from the original set of 515 treatment companies. The treatment group is composed by firms with scores in the lowest quartile. The control group is composed by firms with above median scores that were matched to the treated companies according to their size, leverage, and profitability. The final sample consists of 135 treated firms and 135 control firms. The regression is estimated over the period 2009-2019. Sample sizes are presented in firm-year observations. Control variables are considered in all models. Robust standard errors are shown in parenthesis and are clustered at the firm level.

	ESG Disclosure Scores			
	Overall	Environmental	Social	Governance
	(I)	(II)	(III)	(IV)
$Law_t \times Treatment_i$	4.3843***	2.4375**	3.0134**	1.9681**
	(1.0079)	(1.1976)	(1.1992)	(0.9031)
$Size$	2.1489**	2.5118**	2.8210***	-0.7686
	(0.8817)	(0.9891)	(1.0566)	(0.8107)
$Leverage$	1.0983	2.8422	-4.4787	-2.2208
	(3.4199)	(4.0430)	(4.0008)	(3.2141)
ROA	2.1413	-1.8815	-5.3913	6.6444
	(6.1267)	(7.6321)	(7.3308)	(5.9274)
Observations	2727	2446	2567	2725
Firm FE?	Yes	Yes	Yes	Yes
Year FE?	Yes	Yes	Yes	Yes
Controls?	Yes	Yes	Yes	Yes
R^2	0.8401	0.8419	0.8075	0.7619
Adjusted R^2	0.8216	0.8213	0.7836	0.7343

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

between ESG performance and firm value.

Similar to the results from Table 8, the coefficients for all the four models run were not statistically significant. That way, no differential effect was found when considering the treated firms' level of ESG performance. Here, it is relevant to highlight once more that these results might be driven by a potential issue in the measure used as a proxy for ESG performance (i.e., Eikon's ESG Combined Score). One diverse approach that might be undertaken is developing a proprietary score or using a different one provided by other sources to test the strength of these findings.

Finally, looking at the eligible higher relevance of integrated reporting when compared

Table 11: **ESG Disclosure and Firm Value - EU-Only Sample**

This table presents results of estimating the following generalized difference-in-differences regression model:

$$Firm\ Value_{i,t} = \beta_0 + \beta_1(Treatment_i \times Law_t) + \beta' X_{i,t} + \mu_i + \delta_t + \epsilon_{i,t}$$

where $Firm\ Value_{i,t}$ is the firm value for firm i in period t; $Treatment_i$ equals 1 if firm i is part of the treatment group, and 0 otherwise; Law_t equals 1 if period t is 2014 or later, and 0 otherwise; $X_{i,t}$ is a vector of control variables; μ_i and δ_t are, respectively, firm and year fixed effects. Only European firms subject to the Directive 2014/95/EU are considered in this test. Bloomberg's ESG Disclosure Scores in 2013 were used to establish the treatment and control groups, both derived from the original set of 515 treatment companies. The treatment group is composed by firms with scores in the lowest quartile. The control group is composed by firms with above median scores that were matched to the treated companies according to their size, leverage, and profitability. The final sample consists of 135 treated firms and 135 control firms. The regression is estimated over the period of 2009-2019. Models (I) and (II) consider the approximate Tobin's Q (CHUNG; PRUITT, 1994) as the proxy for firm value. In models (III) and (IV), the Implied Cost of Capital (NG; REZAEE, 2015) is used as an alternative dependent variable. Models (I) and (III) do not consider control variables, while models (II) and (IV) do. Sample sizes are presented in firm-year observations. Robust standard errors are shown in parenthesis and are clustered at the firm level.

	Tobin's Q		Implied Cost of Capital	
	(I)	(II)	(III)	(IV)
$Law_t \times Treatment_i$	0.0861**	0.0921***	-0.0076***	-0.0070***
	(0.0394)	(0.0333)	(0.0022)	(0.0022)
$Size$		-0.0310		0.0044*
		(0.0339)		(0.0026)
$Leverage$		-0.0919		0.0324***
		(0.1420)		(0.0099)
ROA		3.4486***		0.1022***
		(0.3317)		(0.0233)
Observations	2727	2727	2727	2727
Firm FE?	Yes	Yes	Yes	Yes
Year FE?	Yes	Yes	Yes	Yes
Controls?	No	Yes	No	Yes
R^2	0.8159	0.8439	0.6445	0.6567
Adjusted R^2	0.7948	0.8258	0.6038	0.6170

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

to the stand-alone approach, Table 13 shows that the outcomes from the triple-differences approach for the EU-only sample of treated and control firms were significant and divergent from the results for the worldwide sample of control firms. As initially expected, firms that adopted the Integrated Reporting Framework from the IIRC yielded a positive incremental effect in their Q's in the order of 0.3658, significant at the 1% level, compared to the firms that did not adopt the integrated reporting approach. There was also a significant negative effect on the cost of capital, in the order of 2.5 percentage points, also significant at 1% level. Although these findings strongly support hypothesis H_4, it is worthy of note that the results when considering the worldwide control sample presented in Subsection 4.4 were not significant nor conclusive.

Table 12: **ESG Performance and Firm Value - EU-Only Sample**

This table presents results of estimating the following generalized triple difference regression model:

$$Firm\ Value_{i,t} = \beta_1(Law_t \times High\ ESG_i) + \beta_2(Law_t \times Treatment_i) + \\ + \beta_3(Law_t \times Treatment_i \times High\ ESG_i) + \beta' X_{i,t} + \mu_i + \delta_t + \epsilon_{i,t}$$

where $Firm\ Value_{i,t}$ is the firm value for firm i in period t; $Treatment_i$ equals 1 if firm i is part of the treatment group, and 0 otherwise; Law_t equals 1 if period t is 2014 or later, and 0 otherwise; $High\ ESG_i$ equals 1 if the firm's i Combined ESG performance score from Refinitiv Eikon is above the median level in the year prior to the Directive 2014/95/EU enactment (i.e, 2013), and 0 otherwise; $X_{i,t}$ is a vector of control variables; μ_i and δ_t are, respectively, firm and year fixed effects. Only European firms subject to the Directive 2014/95/EU are considered in this test. Bloomberg's ESG Disclosure Scores in 2013 were used to establish the treatment and control groups, both derived from the original set of 515 treatment companies. The treatment group is composed by firms with scores in the lowest quartile. The control group is composed by firms with above median scores that were matched to the treated companies according to their size, leverage, and profitability. The final sample consists of 135 treated firms and 135 control firms. Models (I) and (II) consider the approximate Tobin's Q (CHUNG; PRUITT, 1994) as the proxy for firm value. In models (III) and (IV), the Implied Cost of Capital (NG; REZAEE, 2015) is used as an alternative dependent variable. Models (I) and (III) do not consider control variables, while models (II) and (IV) do. Sample sizes are presented in firm-year observations. Robust standard errors are shown in parenthesis and are clustered at the firm level.

	Tobin's Q		Implied Cost of Capital	
	(I)	(II)	(III)	(IV)
$Law_t \times High\ ESG_i$	-0.0165	0.0153	-0.0115**	-0.0106**
	(0.0892)	(0.0698)	(0.0048)	(0.0044)
$Law_t \times Treatment_i$	0.0296	0.0705	-0.0165***	-0.0147***
	(0.0902)	(0.0705)	(0.0050)	(0.0046)
$Law_t \times Treatment_i \times High\ ESG_i$	0.1079	0.0453	0.0110	0.0088
	(0.1283)	(0.1032)	(0.0068)	(0.0066)
$Size$		-0.0353		0.0052
		(0.0402)		(0.0032)
$Leverage$		-0.1060		0.0311***
		(0.1713)		(0.0113)
ROA		3.3064***		0.1066***
		(0.3933)		(0.0262)
Observations	1913	1913	1913	1913
Firm FE?	Yes	Yes	Yes	Yes
Year FE?	Yes	Yes	Yes	Yes
Controls?	No	Yes	No	Yes
R^2	0.8194	0.8471	0.6296	0.6432
Adjusted R^2	0.7988	0.8294	0.5873	0.6017

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

One possible explanation is that the treated European firms presented different levels of ex-ante ESG disclosure. In the main tests considering the worldwide control firms, all the European firms were considered in the treatment group, irrespective of their level of ESG disclosure. However, it is reasonable to assume that the European companies that already presented a remarkable degree of disclosure would be differently affected by the Directive 2014/95/EU than the firms lacking more transparent practices. This heterogeneity within the

Table 13: **Integrated Reporting and Firm Value - EU-Only Sample**

This table presents results of estimating the following generalized triple difference regression model:

$$Firm\ Value_{i,t} = \beta_1(Law_t \times IR_{i,t}) + \beta_2(Law_t \times Treatment_i) + \\ + \beta_3(Law_t \times Treatment_i \times IR_{i,t}) + \beta' X_{i,t} + \mu_i + \delta_t + \epsilon_{i,t}$$

where $Firm\ Value_{i,t}$ is the firm value for firm i in period t; $Treatment_i$ equals 1 if firm i is part of the treatment group, and 0 otherwise; Law_t equals 1 if period t is 2014 or later, and 0 otherwise; $IR_{i,t}$ equals 1 if the treated firm i starts disclosing ESG activities in year t according to the integrated reporting guidelines, and 0 otherwise; $X_{i,t}$ is a vector of control variables; μ_i and δ_t are, respectively, firm and year fixed effects. Only European firms subject to the Directive 2014/95/EU are considered in this test. Bloomberg's ESG Disclosure Scores in 2013 were used to establish the treatment and control groups, both derived from the original set of 515 treatment companies. The treatment group is composed by firms with scores in the lowest quartile. The control group is composed by firms with above median scores that were matched to the treated companies according to their size, leverage, and profitability. The final sample consists of 135 treated firms and 135 control firms. The regression is estimated over the period 2012-2014 (i.e, 2 years prior and 2 years after the Directive 2014/95/EU enactment). Models (I) and (II) consider the approximate Tobin's Q (CHUNG; PRUITT, 1994) as the proxy for firm value. In models (III) and (IV), the Implied Cost of Capital (NG; REZAEE, 2015) is used as an alternative dependent variable. Models (I) and (III) do not consider control variables, while models (II) and (IV) do. Sample sizes are presented in firm-year observations. Robust standard errors are shown in parenthesis and are clustered at the firm level.

	Tobin's Q		Implied Cost of Capital	
	(I)	(II)	(III)	(IV)
$Law_t \times IR_{i,t}$	-0.0790	-0.0506	0.0040	0.0044
	(0.1000)	(0.0823)	(0.0040)	(0.0040)
$Law_t \times Treatment_i$	0.0706*	0.0803**	-0.0067***	-0.0061***
	(0.0404)	(0.0342)	(0.0023)	(0.0023)
$Law_t \times Treatment_i \times IR_{i,t}$	0.3796**	0.3658***	-0.0221***	-0.0250***
	(0.1742)	(0.1396)	(0.0055)	(0.0061)
$Size$		-0.0355		0.0047*
		(0.0338)		(0.0026)
$Leverage$		-0.0937		0.0325***
		(0.1411)		(0.0098)
ROA		3.4373***		0.1031***
		(0.3308)		(0.0232)
Observations	2727	2727	2727	2727
Firm FE?	Yes	Yes	Yes	Yes
Year FE?	Yes	Yes	Yes	Yes
Controls?	No	Yes	No	Yes
R^2	0.8166	0.8445	0.6455	0.6581
Adjusted R^2	0.7954	0.8263	0.6046	0.6182

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

treated group may have attenuated the actual effect of adopting the IR framework.

When the European firms were classified into treatment and control groups according to their ex-ante degree of ESG disclosure, the IR's value relevance for the less transparent firms became evident. Conjointly, results from Table 8 and Table 12 indicate that the integrated reporting is more efficient in enhancing ESG transparency when adopted by firms with low levels of ESG disclosure. Firms that already display highly transparent environmental, social,

and governance practices might not yield significant benefits from adopting an integrated report in place of a stand-alone one.

4.5.2 Non-Parametric DiD Regression

Another way to provide extra support to the models' validity is to run the non-parametric version of the DiD regressions. It consists of interacting dummy variables created for each year of the sample (which equals 1 if $year = t$ and 0 otherwise) with the treatment dummy, except for one that must be left out to serve as a reference for all of the other interactions. Typically, this is the first year of data. The procedure is a vital robustness check since it enables the researcher to observe any significant difference in the dependent variable between treated and control firms each year compared to the year previously defined as the model's baseline. Assuming that the variation in firm value and cost of equity capital was, in fact, due to the enhanced ESG transparency induced by the passage of the Directive 2014/95/EU, then no significant result should be identified in the pre-shock years.

Also, as pointed by Schiozer, Mourad, and Martins (2021, p.13), "the non-parametric regression is particularly useful when the timing of treatment is not a 'sharp' event [...] because it does not rely on a subjective judgment about the timing of treatment". That is the case in this study since Directive 2014/95/EU was enacted in 2014, but the legislation's enforcement only happened in 2017/18. It is possible that affected firms decided to comply with the regulation right after its enactment. However, it is more plausible to argue that companies adjusted their disclosure practices in different paces throughout the period between 2014 and 2017, considering the adjustments that had to be done in their internal activities and procedures.

For the sake of brevity, the non-parametric regression is presented only for the Equation 4, which assesses the Hypothesis H_2 since it is the main object of analysis in this study. Table 14 presents the results using both the worldwide and the EU-only control groups, and 2009 is the year of reference. All models were run with firm and year fixed effects and the original set of control variables.

Table 14: **ESG Disclosure and Firm Value - Non-Parametric DiD Regression**

This table presents results of estimating the non-parametric version of the following generalized difference-in-differences regression model:

$$Firm\ Value_{i,t} = \beta_0 + \beta_1(Treatment_i \times Law_t) + \beta' X_{i,t} + \mu_i + \delta_t + \epsilon_{i,t}$$

where $Firm\ Value_{i,t}$ is the firm value for firm i in period t; $Treatment_i$ equals 1 if firm i is part of the treatment group, and 0 otherwise; $X_{i,t}$ is a vector of control variables; μ_i and δ_t are, respectively, firm and year fixed effects. The variable Law_t was replaced by time dummies created for each year in the sample and equals 1 if $Year = t$, and 0 otherwise. The regression is estimated over the period of 2009-2019. The year of reference is 2009 - the first year of data. Models (I) and (II) are run considering the main sample with the worldwide control firms. Models (III) and (IV) consider the alternative sample of EU-only firms. The approximate Tobin's Q is used as the proxy for firm value, following Chung and Pruitt (1994). The Implied Cost of Capital is also used as an alternative dependent variable, following Ng and Rezaee (2015). Control variables are considered in all models. Sample sizes are presented in firm-year observations. Robust standard errors are shown in parenthesis and are clustered at the firm level.

	Control Group: World		Control Group: EU-Only	
	Tobins Q	ICC	Tobins Q	ICC
	(I)	(II)	(III)	(IV)
$Year_{2010} \times Treatment_i$	-0.0507^{**}	0.0015	0.0647	-0.0011
	(0.0205)	(0.0017)	(0.0437)	(0.0035)
$Year_{2011} \times Treatment_i$	-0.0647^{**}	0.0037	0.1314^{**}	-0.0071
	(0.0257)	(0.0023)	(0.0596)	(0.0045)
$Year_{2012} \times Treatment_i$	0.0081	-0.0017	0.0906	-0.0054
	(0.0259)	(0.0021)	(0.0599)	(0.0041)
$Year_{2013} \times Treatment_i$	0.0769^{***}	-0.0071^{***}	0.1333^{**}	-0.0064
	(0.0278)	(0.0022)	(0.0602)	(0.0042)
$Year_{2014} \times Treatment_i$	0.0662^{**}	-0.0063^{**}	0.1637^{***}	-0.0085^{*}
	(0.0314)	(0.0025)	(0.0626)	(0.0045)
$Year_{2015} \times Treatment_i$	0.0969^{***}	-0.0088^{***}	0.1429^{**}	-0.0085^{*}
	(0.0335)	(0.0026)	(0.0642)	(0.0047)
$Year_{2016} \times Treatment_i$	0.0406	-0.0075^{***}	0.1880^{***}	-0.0098^{**}
	(0.0327)	(0.0026)	(0.0621)	(0.0045)
$Year_{2017} \times Treatment_i$	0.0804^{**}	-0.0068^{***}	0.2040^{***}	-0.0119^{***}
	(0.0354)	(0.0026)	(0.0657)	(0.0045)
$Year_{2018} \times Treatment_i$	-0.0218	-0.0013	0.1868^{***}	-0.0146^{***}
	(0.0362)	(0.0029)	(0.0677)	(0.0052)
$Year_{2019} \times Treatment_i$	0.0162	-0.0077^{**}	0.2398^{***}	-0.0175^{***}
	(0.0389)	(0.0030)	(0.0736)	(0.0053)
Size	-0.0697^{***}	0.0071^{***}	-0.0322	0.0047^{*}
	(0.0225)	(0.0017)	(0.0338)	(0.0026)
Leverage	0.2865^{***}	0.0183^{***}	-0.0816	0.0316^{***}
	(0.0925)	(0.0052)	(0.1406)	(0.0098)
ROA	3.3936^{***}	0.1236^{***}	3.4659^{***}	0.1007^{***}
	(0.2047)	(0.0135)	(0.3317)	(0.0233)
Observations	9287	9287	2727	2727
Firm FE?	Yes	Yes	Yes	Yes

Table 14: Non-Parametric DiD Regressions (H_2) - *continued*

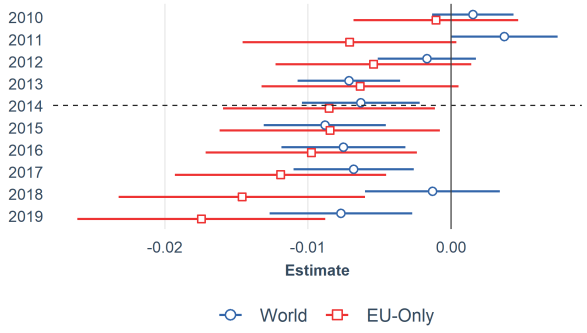
	Control Group: World		Control Group: EU-Only	
	Tobins Q	ICC	Tobins Q	ICC
	(I)	(II)	(III)	(IV)
Year FE?	Yes	Yes	Yes	Yes
Controls?	Yes	Yes	Yes	Yes
R^2	0.8402	0.6200	0.8448	0.6594
Adjusted R^2	0.8227	0.5783	0.8261	0.6186

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

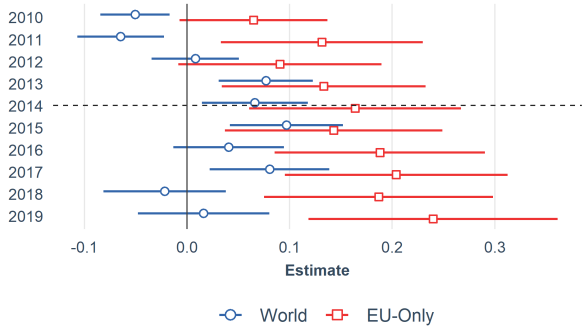
Results were more consistent when analyzing the Implied Cost of Capital (ICC) as the dependent variable. Figure 3a depicts the models (II) and (IV) coefficients with the respective confidence intervals for easier visualization of the outcomes.

Figure 3: **Treatment Effect on the Dependent Variables Over Time.** This figure presents the coefficients from the non-parametric DiD regressions, run as robustness checks. Figure (a) presents the coefficients when the ICC is used as the dependent variable. Figure (b) reports the coefficients when the approximate Tobin's Q is used as the dependent variable. The horizontal line in both charts represent the time of treatment (i.e., the Directive 2014/95/EU enactment in 2014). All coefficients are displayed along with their 90% confidence intervals.

(a) Treatment Effect on ICC



(b) Treatment Effect on Tobin's Q



In model (IV) - which considered the European control firms, no significant pre-treatment coefficient was obtained, supporting the parallel trends assumption. From 2014 (i.e., year of the Directive enactment) onward, the results are increasingly more relevant and significant, supporting that firms responded gradually to the regulation. The effect was similar when considering the worldwide samples as the control group, except in 2018 when the coefficient was not significant (model II). That should not be a cause of concern, though, since it is expected that some noise is present in the non-parametric DiD, given the number of individual parameters that need to be estimated (SCHIOZER; MOURAD; MARTINS, 2021). At the same time, it

must be highlighted that in 2013 the coefficient was significantly negative - thus, before the shock.

Meanwhile, Tobin's Qs outcomes were more erratic, as shown in Figure 3b. In model (I), which considered the worldwide group of firms as control, some coefficients were statistically different from zero in the pre-shock period, such as 2010, 2011, and 2013. More noteworthy is that in 2010 and 2011, the coefficients were negative, indicating that treated companies faced a significant decrease in value compared to the control firms, taking 2009 as reference. These results raise concerns about potential unobserved variables driving the outcomes, such as variations in macro aspects discussed earlier in this section.

On the other hand, in model (III), it is possible to notice a more consistent pattern, with significantly positive coefficients from 2014 onward and no negative terms. These are promising pieces of evidence since the model considered only European firms in its sample - what should mitigate the concerns about the results from model (I) being driven by macro unobservables. However, even in model (III), there also are pre-shock significant coefficients, namely in 2011 and 2013. Altogether, the evidence presented by the analysis of the non-parametric version of the DiD supports previous findings that the increased transparency on ESG matters had a significantly positive (negative) impact on firm value (cost of capital). Yet, it was not possible to categorically reject the concerns raised about possible omitted variables or the possible violation of the parallel trends assumption in the main specifications.

4.5.3 Alternative Shock Period

The main shock period used throughout the study is 2014 - the year in which Directive 2014/95/EU was enacted. The reasoning behind it is that firms may have adapted themselves to the regulation from the moment of its enactment - irrespective of the year of effective enforcement of the law. It implies that firms and the market as a whole were able to process the new information about the mandatory disclosure setting from day one of the Directive approval.

However, companies were obligated to report their ESG activities from the year 2017 onward. In practice, it means that the reports were mandatory for the firms impacted by the Directive starting in 2018 (reflecting the 2017 fiscal year). It is possible that most companies

had already adapted their disclosure practices by then, and, in turn, the market had also already absorbed a good part of the effects of the legislation. At the same time, it is also plausible that a new impact on firm value and cost of capital could be observed in 2018 if the firms could not fully comply with the regulation by the end of 2017. Table 15 presents the outcomes for Equation 4 considering the 2017 fiscal year as an alternative shock period. Both control groups (i.e., worldwide and European firms) were considered.

Table 15: **ESG Disclosure and Firm Value - Alternative Shock Period**

This table presents results of estimating the following generalized difference-in-differences regression model, using 2017 as an alternative shock period:

$$Firm\ Value_{i,t} = \beta_0 + \beta_1(Treatment_i \times Law_t) + \beta' X_{i,t} + \mu_i + \delta_t + \epsilon_{i,t}$$

where $Firm\ Value_{i,t}$ is the firm value for firm i in period t; $Treatment_i$ equals 1 if firm i is part of the treatment group, and 0 otherwise; Law_t equals 1 if period t is 2017 or later, and 0 otherwise; $X_{i,t}$ is a vector of control variables; μ_i and δ_t are, respectively, firm and year fixed effects. The regression is estimated over the period of 2009-2019. Models (I) and (II) are run considering the main sample with the worldwide control firms. Models (III) and (IV) consider the alternative sample of EU-only firms. The approximate Tobin's Q is used as the proxy for firm value, following Chung and Pruitt (1994). The Implied Cost of Capital is also used as an alternative dependent variable, following Ng and Rezaee (2015). Control variables are considered in all models. Sample sizes are presented in firm-year observations. Robust standard errors are shown in parenthesis and are clustered at the firm level.

	Control Group: World		Control Group: EU-Only	
	Tobins Q	ICC	Tobins Q	ICC
	(I)	(II)	(III)	(IV)
$Year_{2017} \times Treatment_i$	0.0018	-0.0015	0.0844**	-0.0080***
	(0.0206)	(0.0014)	(0.0351)	(0.0023)
$Size$	-0.0738***	0.0075***	-0.0311	0.0046*
	(0.0224)	(0.0017)	(0.0339)	(0.0026)
$Leverage$	0.2730***	0.0193***	-0.1113	0.0336***
	(0.0927)	(0.0052)	(0.1431)	(0.0099)
ROA	3.3710***	0.1255***	3.4481***	0.1017***
	(0.2051)	(0.0134)	(0.3325)	(0.0235)
Observations	9287	9287	2727	2727
Firm FE?	Yes	Yes	Yes	Yes
Year FE?	Yes	Yes	Yes	Yes
Controls?	Yes	Yes	Yes	Yes
R^2	0.8383	0.6150	0.8434	0.6570
Adjusted R^2	0.8208	0.5733	0.8253	0.6173

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

As it can be seen, the term of interest (i.e., the interaction between the time and treatment dummies) presented contrasting results at first. Models (I) and (II) were not significant, while model (III) displayed a significant positive effect and model (IV) displayed a significant negative effect. It must be noted, however, that the signal of the terms in models (I) and (II) coincide with

the signal in models (III) and (IV), respectively.

The reasoning for the statistically insignificant terms may reside in the characteristics inherent to each of the samples. Models (III) and (IV) considered the EU-only sample in which the treatment group was composed by the firms that presented the lowest level of ESG disclosure in the pre-shock period. It is reasonable to argue that these companies would need more time and effort to comply with the regulation requirements than the firms with ex-ante better disclosure practices that served as the control group. Therefore, when the Directive was enforced in 2017/18, part of the treated firms could have failed to adequately start disclosing their ESG activities earlier, prompting them to change their disclosure level sharply. At the same time, the control firms were allegedly more able and had more resources to satisfy the disclosure requisites and might have adapted their procedures in previous years.

Meanwhile, models (I) and (II) were run using the European-worldwide matched sample. They considered all the European firms in the sample as the treatment group, irrespective of the ex-ante levels of ESG disclosure of each firm. In terms of their disclosure level, the presence of the "high performer" among treated firms might have attenuated the impact on the firm value and the cost of capital when considered the alternative shock period if they adjusted their practices in earlier years.

All things considered, results are convincing as evidence supporting the hypothesis that environmental, social, and governance practices matter for firm value and cost of capital.

5 Conclusion

Although a substantial number of studies in the past years have investigated the link between CSR and ESG practices and firm value, there is still a lack of agreement about the value relevance of ESG initiatives. Part of the results' heterogeneity might be explained by the constant challenges empirical researchers in the field face to effectively address potential endogeneity issues. It is often hard to disentangle the actual effect from the effect of possible omitted variables and properly claim causality between variables.

Under the European setting in which the disclosure of environmental, social, and governance practices was made mandatory for large public-interest companies, this study tackles the empirical challenge by using a quasi-natural experiment design and matching techniques that appropriately achieve causal inference. The difference-in-differences models were run considering two propensity-score-matched sets of control firms and were robust to alternative tests.

The results contribute to the literature in different ways. First, they show that governmental intervention effectively increases the overall level of ESG disclosure by the impacted firms. This finding is particularly relevant since a good part of the regulation of the same kind has a "comply or explain" rule, which might undermine the effects expected by the governments. By confirming that this type of legislation is effective, other countries might as well study initiatives akin.

Second, results show that this governmental demand is not value-destroying for the firms. In fact, on average, firms affected by the Directive 2014/95/EU presented a significant increase in their value, measured by Tobin's Q, compared to firms in both control groups. Also, their cost of capital, measured by the Implied Cost of Capital, presented a significant reduction.

Third, while some previous studies already analyzed this relationship and achieved similar results, most of them are not robust to endogeneity concerns. The shock-based designs used in this study provide a valuable scenario to infer causality more consistently.

Altogether, the evidence derived from this study suggests a relationship between ESG and firm financial performance, in which ESG practices positively (negatively) impact the firm value (cost of capital).

At the same time, some limitations must be underscored. First, this work's results are bound to the data quality from third-party providers, such as Bloomberg and Refinitiv Eikon. Although their methodologies are generally robust and countless academic studies use them, there is a relevant discussion about how these scores are computed and why scores from different providers are usually low correlated among themselves (PAGANO; SINCLAIR; YANG, 2018; BERG; KÖLBEL; RIGOBON, 2019; DIMSON; MARSH; STAUNTON, 2020). Future work may address this point in a more precise manner.

Second, some of the robustness tests presented mixed results, divergent from the expected. It was more evident when the set of worldwide firms was used as controls. Even though treatment and control groups were propensity score matched according to relevant observable variables, other relevant omitted variables (such as macroeconomic variation) may not have been entirely or adequately addressed. On the other hand, results when considering only the European firms were far more consistent. They also followed the previous findings on the ESG-firm value link in terms of significance, magnitude, and sign. Notwithstanding the need for a more profound investigation about possible confounders, as a whole, the findings are good indicators of the existence of a causal relationship between ESG and firm value.

More importantly, this study's findings have meaningful, practical implications for different audiences interested in the value-relevance of ESG practices, such as governments, regulators and policy-makers, companies, investors, and practitioners. Regarding the governments and regulatory authorities, more effort may be undertaken to create, develop and improve the legislation since the evidence suggests that mandatory disclosure regulations are effective. Companies may be interested because the findings point to a relevant environmental, social, and governance effect on firm value and cost of capital. Firms might incorporate the ESG into their strategy and ensure that their initiatives are properly communicated to the whole stakeholder network. On the other side, investors can incorporate ESG criteria in their company valuation methods, evaluating firm performance in terms of sustainability and stakeholder management. Overall, this study makes relevant progress towards consolidating the research on the ESG-firm financial performance link, advancing the understanding of the causal relationship between the variables, and providing opportune avenues for future research.

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