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Non-financial disclosure regulation and environmental, social, and governance (ESG) performance: The case of EU and US firms.

This is the final peer-reviewed author's accepted manuscript (postprint) of the following publication:

Published Version:

Cicchiello, A.F., Marrazza, F., Perdichizzi, S. (2022). Non-financial disclosure regulation and environmental, social, and governance (ESG) performance: The case of EU and US firms. CORPORATE SOCIAL RESPONSIBILITY & ENVIRONMENTAL MANAGEMENT, 0, 1-15 [10.1002/csr.2408].

Availability:

This version is available at: <https://hdl.handle.net/11585/898170> since: 2022-10-29

Published:

DOI: <http://doi.org/10.1002/csr.2408>

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Does the ESG disclosure regulation contribute to the sustainable strategy of companies? The case of EU and US firms.

Abstract

The aim of this paper is to analyse the effect of non-financial reporting regulation on firms' Environmental, Social, and Governance (ESG) performance, commitment and effectiveness. Specifically, we explore the implications of the European Non-Financial Reporting Directive (NFRD) mandating disclosure on non-financial and diversity information by certain large companies. To identify the effect of the EU disclosure regulation on firms' ESG scores, we performed a differences-in-differences estimation using a sample of EU firms as the treated group and a sample of US firms as the control group in the period 2015-2020. Overall, our findings suggest that regulatory efforts to increase the transparency of the social and environmental impacts of firms' activities on society are effective at improving disclosure commitment and effectiveness. Hence, regulation supports the adoption of ESG strategies to the benefit of the whole society. The study provides a fresh comparison between regulating or not the ESG information market, drawing suggestions for future policy.

Keywords: Disclosure regulation; Sustainability reporting; ESG scores; Corporate Social Responsibility.

1. Introduction

The growing alertness and concern for climate-change-related shocks that threaten the stability of governments and businesses alike have led to a shift in institutional investors' focus on long-term value creation, placing Environmental, Social and Governance (ESG) factors at the centre of their investment decision-making process. Over the last few years, institutional investors have stepped up their efforts to assess companies' performance using ESG factors, addressing the challenges related to the lack of standardized and rigorous non-financial data at firm level for which adequate structures, reviews and controls are required (Ilhan *et al.*, 2021).

To meet the need for greater availability and robustness of ESG disclosures by firms, regulators across different jurisdictions have introduced new forms of regulations declined in different ways, encouraging companies to introduce ESG data into their annual reports. Some countries, for example, have imposed disclosure obligations on ESG related matters in traditional annual reports or in standalone ESG reports; others countries set voluntary standards to help organizations to measure, understand and communicate their exposure to ESG risks and opportunities. In some cases, there is no regulation at all and non-financial reporting efforts are limited to socially responsible companies or to those that try to comply with the stakeholders' pressures (Krueger *et al.*, 2021).

To date, there are still no universally agreed ESG reporting standards, and this prevents investors from effectively evaluating and comparing the ESG performance of companies and creates an opportunity for a lot more greenwashing (de Silva Lokuwaduge and De Silva, 2022).

The European Union (EU) has stepped forward towards sustainability reporting by enacting in 2014 the European Non-Financial Reporting Directive (Directive 2014/95/EU of October 22, 2014, hereafter, NFRD) amending Directive 2013/34/EU as regards *disclosure of non-financial and diversity information by certain large companies and groups* (European Union, 2014)¹. The NFRD has required all the listed firms, along with other non-listed but above certain levels of capital, sales and employees, to include into their financial reports also a sustainability statement. The disclosure obligation has also concerned companies operating in some specific industries such as, for example, the banking industry, the insurance industry and the energy industry.

The Directive established that the reports had to be entailed with information on the company's pledges and achievements on various issues about the Environmental, Social and Governance topics that are relevant or rather "material" for the activity of each company. Moreover, the NFRD has introduced for the very first time a standardization of how reports had to be drafted according to specific frameworks (e.g., the Global Reporting Initiative [GRI] Standards) not only to create a complete and comprehensive reporting process, but also to make the reports comparable and performance measurable on the basis of such qualitative data.

Although the main purpose of mandatory ESG disclosure regulation is to enhance the transparency, credibility and comparability of ESG information, it is unclear whether such regulation can actually improve company performance, both in financial and non-financial terms (Christensen, Hail, and Leuz, 2021). On the one hand, the transition of the ESG reporting from a voluntary to a mandatory regime could stimulate companies to become more socially responsible and pursue better ESG performance (Cupertino, Vitale, and Ruggiero, 2022). On the other hand, mandatory sustainability disclosure could prove detrimental to those upstanding companies that were already publishing sustainability reports as they should make greater efforts and perhaps incur higher costs to stand out from the rest of the companies in the post-settlement period (Quinn and Connolly, 2017).

The introduction of the European Non-Financial Reporting Directive has been the focus of increasing attention from practitioners and academics (Christensen, Hail, and Leuz, 2021). However, the question of whether and how this regulation may affect firms' sustainability performance remains unexplored. This study aims to fill this gap in the literature by investigating the effects of the EU

¹ The NFRD had to enter into force in EU countries by December 6, 2016. Companies within its scope had to report in accordance with its provisions for the first time in 2018 (covering financial year 2017).

disclosure regulation on firms' environmental, social, and governance (ESG) scores. Specifically, we empirically examine whether ESG disclosure regulation can represent an effective incentive tool for European firms to engage in sustainable practices and, consequently, increase their ESG performance. To this end, we performed a differences-in-differences (DID) estimation using a sample of EU firms within the scope of the Directive as the treated group and a sample of US firms as the control group in the period 2015-2020. First, we exclude the years before 2015 since we want to eliminate the turmoil of the European Sovereign debt crisis (2010-2014, see *Perdichizzi et al., 2022*). Second, since the NFRD went into effect in 2018, in order to have a balanced pre- and post-treatment period we have decided to end our investigation period in 2020.

We use US firms as control group because, unlike the EU, in the United States there are no mandatory ESG reporting requirements during our sample period. Despite being the first market to push for sustainable investing and being a very pioneer of the field - also given the volumes of wealth that are invested in this sector (*Zhang, Nakajima and Hamori, 2021*), the US lacks of ESG reporting and disclosure regulations. Only recently, in March 2021, Securities and Exchange Commission (SEC) Acting Chair Allison Lee has announced the urgent need to increase and improve the quantity and quality of non-financial disclosure and its intention to develop a *“comprehensive framework that produces consistent, comparable and reliable climate-related and ESG disclosures”*.

As discussed in detail below, the results provided in this paper reveal a significant positive relationship between regulation mandating ESG disclosure and ESG scores. EU firms within the scope of the ESG disclosure regulation are associated with higher ESG rating scores, confirming the effectiveness of the Non-Financial Reporting Directive. A range of robustness tests shows that our findings are consistent.

This paper contributes to the literature in several ways. First, it adds to the growing practitioner and academic literature on the introduction of the European Non-Financial Reporting Directive (e.g., *Breijer, and Orij, 2022*) by assessing, for the first time, its effects on firms' ESG scores. In fact, while a general objective of the NFRD is to enhance the transparency, credibility and comparability of ESG information, to date it is not clear whether mandatory non-financial information is related to the sustainability performance of firms. Therefore, this study complements this literature by highlighting the effectiveness of the Directive as an incentive mechanism for European companies to engage in sustainable practices and, consequently, to increase their ESG performance. Second, this study adds new insights to the current debate on voluntary versus mandatory reporting (see, for example, *Maaloul and Wegener, 2022*; among others) by comparing two of the most developed economies in the world (i.e., The United States and the European Union) that for different motives have addressed

the ESG disclosure issue with two very antithetic approaches: the former by letting third parties and firms free to choose, the latter by mandating disclosure with structured reporting standards. Finally, this study contributes to the strand of literature examining ESG performance (see, for example, Arvidsson and Dumay, 2022) by investigating the relationship between mandatory ESG disclosure and companies' ESG scores.

The remainder of the paper is organised as follows. In the next section, we review the relevant literature and develop our key research hypothesis. In Section 3, we present our methodology, followed by data and descriptive statistics in Section 4. Then, in Section 5, we show the baseline results, and some robustness tests. Section 6 concludes the paper.

2. Related Literature and Testable Hypothesis

Growing concern for global environmental issues among investors and society alike has made disclosure of non-financial information critical to assessing the long-term performance of companies in both developed and developing countries (Giron *et al.*, 2022). As a result, most of the world's largest companies have started reporting non-financial information in order to demonstrate their ethical standards and their commitment to environmental, social and governance issues (Pérez, 2015).

In recent years, the debate surrounding the relation between non-financial reporting and business performance has gained an increasing relevance in the literature, resulting in a great number of empirical studies with contrasting results (e.g., Friede, Brush *et al.*, 2015; Almeyda, 2019)². In line with stakeholder theory (Freeman and Miles, 2002), a majority of studies indicate a positive impact of environmental, social, and governance information on economic performance due to an increased stakeholder trust in the sustainable strategies of the company (e.g., Velte, 2017). Some studies, on the other hand, report negative or non-significant results and different causal impacts (e.g., Santis, Albuquerque, and Lizarelli, 2016). It is worth noticing how this relationship looks established years before the intervention by regulators. The doubts casted on the role played by the socially responsible behaviour of companies on the value creation process are related to a very explosive expansion of the Corporate Social Responsibility (CSR) and to the quality and verifiability of the supposed policies and actions undertaken by the companies and reported in their non-financial reports often drawn up in a very non-standardized and partial manner.

² For detailed literature review, see Fifka (2013); Ali, Frynas, and Mahmood (2017); Gupta and Das (2022).

Other studies on the link between CSR and corporate financial performance rely on signalling theory (Akerlof, 1970) and resource-based theory (Surroca *et al.*, 2010; Lourenço *et al.*, 2014). According to the signalling theory (Akerlof, 1970), companies voluntarily engage in ESG reporting to signal to financial markets their ability to mitigate risks and generate sustainable long-term financial returns. Positive information on corporate sustainability helps investor resolve uncertainty and reduce information asymmetry, influencing the share price response (Ramchander *et al.*, 2012). Conversely, companies that do not integrate the ESG information into their annual reporting or those with a negative ESG media coverage risk to be overlooked by investors or suffer from backlash due to the adverse signalling effects about their reputation (Wong and Zhang, 2022). Resource-based theory (Surroca *et al.*, 2010; Lourenço *et al.*, 2014) suggests that the availability of intangibles such as CSR information – which are very difficult to create, acquire or replicate - can generate sustainable competitive advantages, enhancing companies' ability to outperform against their competitors. A good CSR reputation can be considered as a valuable intangible asset able to improve firms' performance (Hussainey and Salama, 2010). In this context, ESG policies favourably affect this asset class easing an otherwise complicated process to improve reputation. In fact, common ESG-friendly practices (stakeholder engagement, for instance) have possibly the effect to make companies more ready to compete in the market as the engagement allows to recalibrate the strategy according to the needs, demands and aspirations of external stakeholders both up and downstream. In this way, companies inform the various agents of the value chain - from customers to suppliers - and other stakeholders about their ability to create wealth and their responsibility for the commitments undertaken. This can help them become more attractive and make ties with key stakeholders stronger and more durable.

A recent strand of the finance, accounting and economics literature focuses on the determinants and consequences of non-financial disclosure regulations enacted around the world in order to force firms to file public reports regarding their activities related to CSR, sustainability, and other environment, social, and governance issues (e.g., Chen, Hung, and Wang, 2018; Ioannou and Serafeim, 2019; Krueger *et al.*, 2021). The vision according to which mandatory reporting is the only way of improving the quality and comparability of non-financial information has been confirmed by several studies. In one of the very first studies on the subject, Crawford and Williams (2010) find evidence of a higher quality of non-financial information in countries (such as France) characterised by higher regulatory pressures than in more liberal countries (such as the US) where social reporting is mostly on a voluntary basis and regulatory pressures are relatively low. Krueger *et al.* (2021) highlight a significant positive effect of ESG regulations mandating disclosure on both the willingness of firms to publish ESG reports, as well as on information quality. In general, the authors support the idea that

obliging companies to publish ESG reports actually improves the information quality in the market while having also positive spill overs in real business situations. Chen, Hung, and Wang (2018), examine the impact of the CSR disclosure mandate enacted in China in 2008 on firm performance and social externalities. Using a difference-in-differences analysis, the authors reveal that firms under mandatory CSR reporting experience a decrease in profitability after the mandate but, at the same time, an increase in positive externalities. In a recent study, Mbanyele *et al.* (2022) investigate the effect of mandatory CSR disclosure regulations on firms' environmental innovation. According to the authors, firms in countries that have enforced mandatory CSR laws increase their green innovation output and quality compared to their counterparts in other countries that have not enforced CSR mandates. Finally, other studies have shown that the increased extent and quality of non-financial disclosure due to reporting obligations can have a positive impact on the market value of companies (Wang and Li, 2016; Ioannou and Serafeim, 2019).

Contrary to the aforementioned studies, another stream of literature questions the positive effects of mandatory ESG disclosure regulation by taking into account the key features of non-financial reporting and the potential burden placed on companies. As pointed out by Christensen, Hail, and Leuz (2021), unlike financial information, non-financial information is more complex, unstructured, and only partially quantifiable; this information is often industry-specific and covers a wider range of topics. These characteristics pose significant challenges to the measurement, comparability and standardization of non-financial information and, as a result, make it more difficult to predict the economic consequences of CSR reporting mandates than the effects of financial reporting standards. Furthermore, disclosure requirements are often designed taking into consideration not the interests of investors but those of other stakeholders; therefore, they can be extremely costly to businesses in terms of market value and liquidity.

Taking these arguments into consideration, previous studies have noted that the decision to impose mandatory disclosure of non-financial information may actually fail to achieve greater quality, reliability and comparability of disclosure as well as an improvement in performance. Tang and Demeritt (2018), for example, examine whether and how mandatory carbon reporting influences internal business processes and the performance of large UK-listed firms. Their findings do not suggest significant differences in emission reduction performance between companies that had voluntarily reported prior to the entry into force of the legal obligation and those that had disclosed their emissions only under a mandatory regime. Based on a sample of Italian listed companies, Agostini, Costa, and Korca (2022) analyse the impact of Directive 2014/95/EU on non-financial disclosure and its potential relationship with corporate financial performance. The authors reveal that, although the directive positively affects the quantity of information disclosed, the same effect does

not apply to the quality of non-financial information for which there are no significant changes in terms of completeness and tone of the disclosure. Furthermore, the quality of mandatory disclosure following the Directive by Italian listed companies does not show a significant relationship with corporate financial performance. Similarly, Breijer and Orij (2022) investigate the effect of the implementation of Directive 2014/95/EU on the comparability of non-financial information across listed European firms. According to the authors, the implementation of the Directive exacerbates information asymmetry for mandatory adopters (i.e., firms that choose to withhold disclosure until it becomes mandatory) that take advantage of the lack of specific standards and use boilerplate language to hide poor non-financial performance, retain proprietary information, or limit implementation efforts.

In light of the literature presented so far, it is clear that the transition from voluntary to mandatory disclosure leaves many open questions waiting for an answer (Darnall *et al.*, 2022). We contribute to this lively debate by investigating whether the move to mandated disclosure affects firms' CSR behaviour and, by extension, their performance. Hence, we present the following hypothesis:

H1: Mandatory ESG disclosure regulation positively influences the sustainability performance of European firms measured in terms of ESG scores.

The hypothesis is of a more peculiar kind as the analyses on regulation effects are quite a few both because only a minority of countries have actually passed legislation in such a direction and because of the recent history of this economic issue.

As explained above, ESG reporting provides markets and the general public with information about a previously unexplored business reality. Regulation has potentially not only a signalling effect of the company value but also a “trigger effect” on the way in which the company is run both from an organizational and productive point of view. Indeed, most of the mandatory disclosure rules are aimed at aligning the interests of companies with those of their stakeholders and of the whole society to facilitate the necessary transition from a capitalist economy to a more sustainable economy in which large flows of capital are oriented towards investments that integrate ESG requirements into the decision-making process (Cicchello *et al.*, 2022b). Therefore, we expect stakeholder pressure associated with mandatory disclosure regulation to lead companies to act more socially responsible and engage in more CSR activities, thereby increasing their ESG performance.

3. Econometric Methodology

Our econometric setup is based on the difference-in-difference (DID) methodology used to identify changes in firms' ESG ratings after the implementation of the NFRD regulation. The DID methodology is commonly used in the financial literature (Rajan and Zingales, 1998; Dell'Ariccia *et al.*, 2008; Cicchiello *et al.*, 2022a) to evaluate the effects of regulatory policies.

The DID setup allows us to analyse time differences across two groups, and the DID estimator can account for omitted variables that affect both the treated and untreated groups. Moreover, including firm and time fixed effects in the regression allows us to identify the average treatment effect on the treated as we account for any time or firm confounding effects. We focus on the period from 2015 to 2020 and estimate the following equation:

$$ESG_{jt} = \beta_0 + \beta_1 Post * Treatment + \beta_2 Treatment_{jt} + \beta_3 Post_{jt} + \beta_i \sum Controls_{j,t-1} + \beta_4 Time + \beta_5 Firms + \epsilon_{jt} \quad (1)$$

where ESG_{jt} is the indicator of ESG rating for firm j at time t . $Treatment$ is a dummy variable equal to 1 for the European firms and 0 otherwise. $Post$ is a dummy variable equal to 1 for all the year following the NFRD (2018-2020). $Post * Treatment$ is the DID term that captures the effect of the treatment (normative) on ESG rating. The key coefficient is β_1 . If β_1 is positive (negative) on ESG rating, then we assume that the NFRD have contributed positively to the ESG rating. $Controls$ are a set of firm-level variables (ROA, Size, Leverage). $Time$ and $Firms$ represent the fixed effects included in the regression. ϵ_{jt} is the error term.

4. Data

4.1 Data

The dataset was collected from Thomson Reuters' DataStream, which has a reputation regarding sustainability data and has been extensively used in the literature. The original sample comprised the firms in the EUROPESTOXX600 (600 firms) and SP500 (505 firms) indexes. The initial sample consists of 1105 firms. The sample period covered is 2015 – 2020.

We apply several selection filters to the original dataset to remove outliers. First, we select all firms for which information on total assets is available for at least one of the sampled years. Second, we select all the firms whose information on ESG rating is available. Third, in the European sample, we select only firms whose headquarters are in the European Union and are affected by NFRD legislation (we exclude firms whose headquarters are in Switzerland and Russia). Those filters reduce our final sample by 866 firms, of which 429 belong to EUROSTOXX600 (treatment) and the other 437 to the SP500 (control). Moreover, all variables are winsorized at the 1% level to reduce the influence of

outliers. Finally, the sample size varies across regression specifications because not all variables are available for all firm-year observations.

4.2 Variables and Descriptive Statistics

Our main variable of interest is the ESG rating score retrieved from Thomson Reuters' Asset4 database. The ESG score measures the company's performance, commitment and effectiveness in the environmental (E), social (S) and governance (G) issues based on verifiable publicly-reported information. The total ESG score ranges from 0 to 100, with 100 representing the best ESG performance (see Refinitiv, 2021, for further details).

We include a comprehensive set of control variables in our regression to mitigate the potential omitted variable bias. Specifically, we account for firm profitability to avoid a potential bias since profitable firms maybe have the opportunity to invest more in ESG activities and thus have a positive impact on ESG rating scores (Kreuger *et al.*, 2021). This is proxied by the ratio of net income to total assets (ROA). We also control for the firm size, proxied by the natural logarithm of total assets (Size), since larger firms tend to disclose more ESG-related information (Baran and Dolly King, 2012 and 2014). Finally, we account for firms' leverage (calculated as total debt to common equity - Leverage). Leverage firms are riskier and are focused on a short-term investment (Fama and French, 2002). Also, they tend less to disclose ESG practises and activities and thus negatively impact ESG rating scores (Krueger *et al.*, 2021).

Table I shows the summary statistics. The ESG rating score averages 62.5, in line with previous studies (Hussainey and Salama, 2010). The proxied of firm profitability (ROA) is equal to 0.07, the Leverage is equal to 1.1, and the firm Size (the natural logarithm of total assets) mean is 16.857 (EUR 21.856 million).

[INSERT TABLE I]

4.3 Identification

In line with the parallel trend assumptions, the trend of the variable of interest should follow the same path over time in both the treatment and control groups before the "shock". Figure 1 shows that the main dependent variable (ESG Scores) displays similar trends in both groups from 2014 to 2017 (pre-treatment period), alleviating the concerns that the parallel trends assumption is violated.

[INSERT FIGURE 1]

5. Results

5.1 Baseline analysis

Table II shows the main results for equation 1. In column 1, the Post dummy is always positive, evidencing that, on average, the ESG rating increased after 2017. The variable of interest, “Post*Treatment”, is positive and statistically significant (p-value < 0.01). These results suggest that NFRD regulation is generally associated with higher ESG rating scores. Our findings are also economically significant. The coefficient on Treatment*Post of 0,7373 suggests that on average, over the post-NFRD, there has been an increase in firm ESG rating of 1.02 due to NFRD regulations.³ These findings are in line with the theory about firms’ ESG awareness and asymmetric information (Lourenço *et al.*, 2014; Ioannou and Serafeim, 2019).

Considering our control variables, firms with a higher level of profitability (ROA) and larger experienced higher ESG rating scores, in line with previous research (Kreuger *et al.*, 2021; Baran and Dolly King, 2012 and 2014). In contrast, a firm with high Leverage has lower ESG rating scores. In column 2, we replicate the baseline regression, including time-fixed effects; our main findings are reiterated.

[INSERT TABLE II]

5.2 Propensity score matching

Our previous estimates could be biased since firms could be different in terms of pre-shock characteristics such as size or other unobservable. This could affect the ESG rating scores and render our previous estimates biased. Therefore, we use propensity score techniques to match firms on two pre-NFRD shock outcome variables: firm size and leverage. Then, we implement and estimate a probit model during the pre-TLTRO shock (2015-2017) as follows:

$$\text{Treatment}_{it} = \beta_0 + \beta_1 \text{Size}_{it} + \beta_2 \text{Leverage}_{it} + \epsilon_{it} \quad (2)$$

We compute the propensity scores using the estimates obtained from equation 2. The matching produces a sample of comparable firms in terms of Size and Leverage. Control for firm size is important since larger firms tend to disclose more ESG-related information (Baran and Dolly King, 2012 and 2014). We also impose the condition that the propensity score must lie within a .001 range of the bank’s propensity score. Using a 1:1 matching strategy, the matched samples are similar in size and leverage. In column 5 of Table II, we show the regression using the firm fixed effect, while in column 6, we use both firm and time fixed effects. The results with the matched sample estimates

³ We calculated the economic magnitude as the multiplication of the DID coefficient, the mean value of Treatment, and the number of years after the implementation of the NFRD.

reiterate the previous ones (Columns 3-4 of Table II). These results reinforce our previous findings and confirm our *Hypothesis 1*.

5.3 Placebo Test

Finally, we revisit the parallel trends assumption using placebo tests. The intuition behind the placebo test is that the main results can only be observed when the NFRD shock is in force but cannot be observed at any previous point in time and space. First, we randomly assign firms to a randomized placebo treatment (Treatment Placebo). This step indirectly allocates the binding of the European Non-Financial Reporting Directive (NFRD) randomly across the countries. Second, we randomly assign the temporal treatment during the pre-treatment period (Post Placebo). Third, we interact the placebo treatment (Treatment Placebo) and the temporal placebo pre-treatment period (Treatment Placebo*Post Placebo). These random placebo treatments do not change the economic condition across countries, and the interactions with the placebo treatment remain insignificant (Columns 5-6 of Table). This test mitigates concerns about anticipation effects.

6. Conclusions

The number of companies that have developed governance processes to measure, analyse, drive and communicate sustainability efforts has dramatically increased in the last years. While these trends are partly due to the voluntary actions of individual companies, in many cases they could be the result of regulations that impose disclosure requirements. The transition of ESG reporting from a voluntary to a mandatory regime has sparked a lively debate regarding its potential effects on firms' information disclosure as well as firms' performance, both in financial and non-financial terms (Christensen, Hail, and Leuz, 2021).

In light of the above, this study aims to contribute to the academic debate on Directive 2014/95/EU by investigating for the first time the role mandatory non-financial disclosure can play in enhancing the sustainability performance of European firms. More precisely, we test whether the entry into force of the EU disclosure regulation affects firms' CSR behaviour and, by extension, their ESG scores. By performing a differences-in-differences estimation with a sample of EU firms as the treated group and a sample of US firms as the control group in the period 2015-2020, we find that firms are sensitive to changes induced by the ESG disclosure regulation. Our findings highlight a significant increase in the ESG scores of European firms within the scope of the disclosure regulation. This result could be attributed to the increased external pressure from stakeholders following the enactment of the Non-Financial Reporting Directive mandating the disclosure of non-financial and diversity information.

This paper provides clear policy implications. First, through its findings, this study confirms the need for a mandatory disclosure regime on ESG issues and its ability to promote corporate sustainability practices across all sectors. Second, this study supports the willingness of regulators to implement a widespread CSR reporting mandate by providing evidence of the positive effect disclosure regulation can have on firms' ESG scores. This study also provide relevant implications for stakeholders and investors, highlighting the fact that firms under mandatory non-financial reporting do achieve better ESG performance.

The findings of the present study indicate interesting and significant results regarding the effects of regulation mandating ESG disclosure in the EU on ESG Scores. Going forward, future studies could take into consideration the evolutionary process of Directive 2014/95/EU to verify whether these results continue to hold.

Tables and Figures

Figure 1: This figure shows the average of ESG rating among treated firms (blue line) and non-treated firms (red line) from 2015 to 2017.

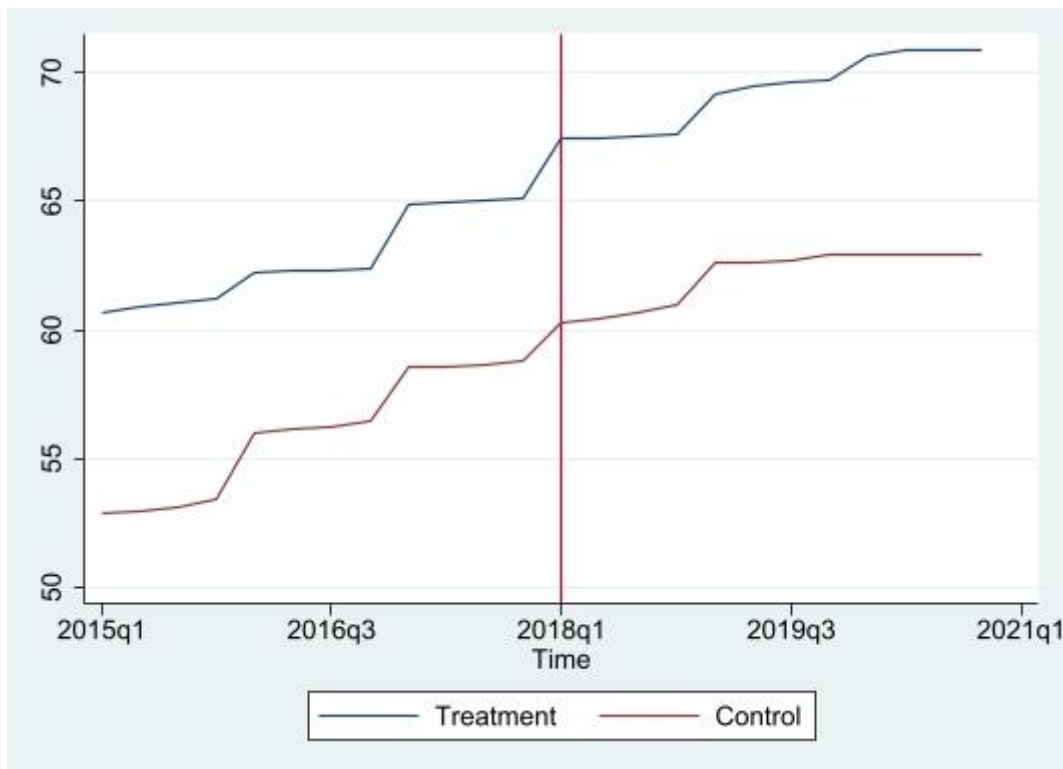


Table I: Summary Statistics for the Full Sample (2015-2020). Table I reports the summary statistics of the variables for the full sample. All variables are expressed in real terms. Sources: yearly firm-specific and firm-specific data, are respectively.

Variables	Obs	Mean	SD	p25	p75
ESG	19918	62,738	17,274	51,970	75,920
Treatment	19918	0,495	0,500	0,000	1,000
Size	19918	16,866	1,613	15,765	17,838
ROA	19918	0,067	0,065	0,028	0,096
Leverage	19918	1,116	1,271	0,384	1,321

Table II: Effects of NFRD on ESG rating scores. Table II reports estimates from a difference-in-difference regression model where the impact of NFRD on ESG rating scores is analysed. Treatment is a dummy variable equal to 1 if the firm is located in EU, 0 otherwise. Post is a dummy equal to 1 in 2018-2020. In columns 1-2 we estimate the baseline model of equation 1. Columns 3-4 replicates the tests from columns 1-2 but uses a propensity score matched sample on pre-NFRD firms as described in Section 5.2, Equation 2. In columns 5-6, we present placebo test. Models include firms and time fixed effects. The estimation period is 2015-2020. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Variables	(1) ESG	(2) ESG	(3) ESG	(4) ESG	(5) ESG	(6) ESG
Post*Treatment	0.7373*** (4.4933)	0.6880*** (4.3056)	0.7635*** (4.6177)	0.7193*** (4.4704)		
Post	4.4432*** (35.4658)		4.5074*** (36.0360)			
Post Placebo*Treatment Placebo					-0.0597 (-0.3582)	0.0142 (0.0877)
Post Placebo					-4.7875** (-2.4139)	
Size	5.6088*** (28.4171)	3.6717*** (17.9365)	5.3548*** (26.9331)	3.3616*** (16.2907)	5.5700*** (28.2235)	3.6350*** (17.7611)
ROA	3.8782*** (3.3490)	3.6665*** (3.2181)	3.8099*** (3.2870)	3.7126*** (3.2565)	3.3594*** (2.9138)	3.1761*** (2.8003)
Leverage	-0.6341*** (-7.6655)	-0.7204*** (-8.9064)	-0.6683*** (-7.9427)	-0.7598*** (-9.2444)	-0.6351*** (-7.6732)	-0.7208*** (-8.9068)
Constant	-33.8288*** (-10.1993)	-3.6683 (-1.0704)	-29.4327*** (-8.8386)	1.5544 (0.4515)	-28.3281*** (-8.4268)	5.5817 (1.5902)
Observations	19,918	19,918	19,540	19,540	19,918	19,918
R-squared	0.252	0.292	0.252	0.293	0.251	0.291
Number of firms	866	866	860	860	866	866
PSM	NO	NO	YES	YES	NO	NO
Firms FE	YES	YES	YES	YES	YES	YES
Quarter FE	NO	YES	NO	YES	NO	YES

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