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Effect of the European NFRD on Firm and ESG Performance

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Abstract

Title: Effect of the European NFRD on Firm and ESG Performance

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This thesis investigates the second-order consequences of the European Directive 2014/95, also known as the Non-Financial Reporting Directive (NFRD). The mandate came into force in 2017 and binds large European public firms to disclose non-financial information regarding their environmental, social, and corporate governance (ESG) performance. The study employs a difference-in-differences (DiD) research design to assess the impact the mandate had on affected public firms in the EU (treatment group) relative to a control group of unaffected US firms, matched based on a propensity score and the nearest-neighbor method. The analysis, based on data from 2011 to 2021, shows that the NFRD successfully increased sustainability performance of European firms in relation to American firms, especially in corporate governance and social concerns. However, this improvement was paid for by a decrease in profitability and firm performance in terms of ROE, ROA, and Tobin's Q. Surprisingly, firms with high pre-mandate ESG scores see a more significant decrease in market profitability proxies ROE and Tobin's Q while low pre-mandate scorers see a higher more severe decrease in ROA.

Keywords NFRD; Firm Performance; ESG Performance; disclosure regulation; European Union (EU); Directive 2014/95

Sumário

Título: Efeito da diretiva europeia sobre o desempenho das empresas e em matéria de ESG

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A tese investiga as consequências da segunda ordem da Diretiva Europeia 2014/95, também conhecida como Diretiva de Relatórios Não Financeiros (NFRD). O mandato entrou em vigor em 2017, tendo como objetivo obrigar as grandes empresas públicas europeias a divulgar as informações não financeiras relativas ao seu desempenho ambiental, social e de governação corporativa (ESG). O estudo emprega um design de pesquisa de diferenças em diferenças (DiD) para avaliar o impacto que o mandato causou às empresas públicas afetadas na UE (grupo de tratamento) em relação a um grupo de controle de empresas não afetadas dos EUA, combinados baseados numa pontuação de propensão e no método do vizinho mais próximo. A análise, com base nos dados de 2011 a 2021, revela que a NFRD aumentou com sucesso o desempenho de sustentabilidade das empresas europeias, relativamente às empresas americanas, com ênfase na governação corporativa e nas preocupações sociais. Porém, esta melhoria foi paga por uma diminuição da rentabilidade e do desempenho da empresa em termos do ROE, ROA e Q de Tobin. Surpreendentemente, as empresas com pontuações ESG pré-mandatórias elevadas observam uma diminuição mais significativa e mais elevada nas proxies de rentabilidade de mercado ROE e Tobin's. Q, enquanto os pontuadores pré-mandato baixos observam uma diminuição maior e mais acentuada no ROA.

Keywords NFRD; Desempenho da empresa; Desempenho ESG; Regulamento de divulgação; União Europeia (UE); Diretiva 2014/95

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List of Abbreviations

EU	European Union
NFRD	Non-Financial Reporting Directive
ESG	Environmental, Social, Governance
CSR	Corporate Social Responsibility
DiD	Difference-in-Differences
GRI	Global Reporting Initiative
ROA	Return on Assets
ROE	Return on Equity
SG&A	Selling, General, and Administrative Expenses
BM	Book-to-Market
PE	Price-Earnings-Ratio
FE	Fixed Effects
NASDAQ	Nasdaq Stock Market
NYSE	New York Stock Exchange

1. Introduction

The European Union (EU) made a significant move towards fostering a sustainable economy by introducing the Directive 2014/95/EU of the European Parliament and Council in 2014. This landmark directive, also known as Non-Financial Reporting Directive (NFRD), aims to establish a framework for businesses to disclose non-financial information regarding their environmental, social, and corporate governance (ESG) performance. Prior research suggests that the implementation of the directive indeed impacted the availability of sustainability information in companies that fell under its jurisdiction and hence positively influenced the credibility of the market by enhancing the transparency and reliability of non-financial disclosures, as proven by Ottenstein et al. (2021). Moreover, it led to increased Corporate Social Responsibility (CSR) activities within the firms concerned, which already materialized before the mandate was adopted, as shown by Fiechter et al. (2022).

In this thesis, I will add to the existing literature on the NFRD's effect on firm performance from an overall perspective and with the inclusion of (pre-mandate) ESG performance, as well as the impact of the disclosure shock on the individual ESG pillars across Europe. The outcome of the analysis will add to the insights that will help policymakers "find the most effective strategies for regulating corporate social and environmental responsibility" *and* its reporting practices. While mandates have proven to pose as effective policy tools for promoting sustainability, it is essential to ensure that imposed requirements do not negatively affect firms' profitability. The study employs a difference-in-differences (DiD) research design to assess the impact of the mandate on companies in the EU (treatment group) relative to a control group of unaffected US firms, matched based on a propensity score and the nearest-neighbor method. The data used for the analysis were taken from Refinitiv Eikon Datastream and were analyzed for both the pre-mandate period (2011-2017) and post-mandate period (2018-2021).

This thesis studies the impact of the NFRD on firm and ESG performance. First, an introduction to the NFRD is given in Section 2, while the subsequent section reviews existing literature and research on the impact of diverse international sustainability mandates, as well as the NFRD. Section 3 describes the methodology employed and presents the analyzed data and summary statistics. The study's findings are then presented before being summarized in the conclusion in Section 5. Finally, the study's limitations and potential future research are discussed.

2. The mandate

The EU took a step towards promoting a sustainable economy by introducing the Non-Financial Reporting Directive, henceforth referred to as NFRD, the mandate, or the directive. The mandate aims to increase transparency and improve the comparability of sustainable activities of public interest entities by requiring the publication of non-financial statements as part of annual reports. The reporting of CSR is an integral part of the NFRD. Matten and Moon (2008, p. 405) define CSR as the "communicated policies and practices of corporations that reflect business responsibility for some of the wider societal good." In turn, the NFRD is a crucial component of the Roadmap to a Resource Efficient Europe and Green Deal, which sets out the steps needed to render Europe's economy sustainable by the year 2050.

Companies falling under the directive are required to provide investor access to non-financial information about their impact on society in environmental, social, and governance aspects in order to improve stakeholder communication and "increase investor and consumer trust." Firstly, requirements in the environmental pillar include reporting about "health and safety, the use of renewable and/or non-renewable energy, greenhouse gas emissions, water use and air pollution." Secondly, the social criteria ask for information regarding "gender equality, working conditions, social dialogue, respect for trade union rights, health and safety at work." Thirdly, disclosure regarding governance includes, but is not limited to, actions taken on corruption and bribery, as well as human rights abuses (Directive, recital 6 and 7; European Commission, 2014).

The directive furthermore encourages basing the reporting on existing national, international, or union-based frameworks such as the OECD Guidelines for Multinational Enterprises and the Global Reporting Initiative (GRI) (Directive, recital 9, European Commission, 2014). Moreover, it aims to advance those existing standards to further improve transparency (Directive, recital 11; European Commission, 2014).

In order to reduce "the overall regulatory burden" for small and medium-sized enterprises (SMEs), only "large undertakings which are public-interest entities" fitting the following criteria are subject to the disclosure directive: (1) more than 500 employees on average, (2) balance sheet total, and (3) net turnover (Directive, recital 14, European Commission, 2014). The balance sheet total and net turnover thresholds are defined as 20€ million and 40€ million, respectively (European Commission, 2013).

3. Literature Review

3.1 Introduction to literature on CSR mandates

Prior literature on CSR mandates so far has focused on the effect the NFRD had on the quantity and scope as well as the quality of firms' non-financial reporting practices, or focuses on other regions' mandates and their effect in these regions. These kinds of analyses are termed first-order consequences by Gulenko (2018) and Ioannou and Serafeim (2019). They differentiate between first- and second-order consequences, with the first-order describing the direct impacts as a consequence of the mandate. The latter is regarded as a result of first-order consequences and concerns studies about real effects, including social externalities, such as changes in pollution levels, and changes in firm performance or firm value (Gulenko, 2018). Indeed, Gulenko showed a gap between the research conducted on first- and second-order consequences, with the majority of the work on the topic investigating first-order consequences up until 2018.

3.2 International Research on CSR mandates

At the international level, different CSR mandates and their respective consequences on social externalities at the second-order level have been analyzed in detail over the last decade. After the introduction of a carbon disclosure mandate in the UK, British firms experienced a significant decrease in emissions compared with firms in the rest of Europe (Downar et al., 2021). Mandatory disclosure of safety records in US-American mines of SEC-registered firms led to an improvement in labour conditions and a decrease in injuries while simultaneously affecting labour productivity (Christensen et al., 2017). Ioannou and Serafeim (2019) show evidence that both the quantity of disclosure and third-party assurance have increased in China, Denmark, Malaysia, and South Africa post mandates. Additionally, they found that with improved information access, firm valuations proxied by Tobin's Q increased (Ioannou & Serafeim, 2019). However, Tobin's Q decreased in India after introducing a CSR mandate requiring affected firms to invest 2% of their net profits in CSR (Manchiraju & Rajgopal, 2017).

In China, a CSR disclosure mandate that did not call for any modifications to firm behavior other than the reporting of non-financial information led to an increase in social externalities and a simultaneous decrease in firm profitability. Moreover, the authors found that results were driven by increased CSR spending and the shutdown of production facilities after the mandate (Chen et al., 2018).

This result is in line with the idea that even if companies are not forced by law to change their behavior, they adapt, as the increase in transparency is associated with increased stakeholder pressure. Indeed, the pressure by stakeholders materializes in their investment decisions when CSR directives come into force. Grewal et al. (2019) found that in three cases of mandate introductions, the scope of negative market reaction depended on the prior level of non-financial and ESG performance as well as disclosure degrees. Lower performance and disclosure, as well as a high quantity of material ESG issues, are associated with more negative reactions by investors. This is due to "investors anticipating proprietary and political cost" (Grewal et al., 2019). Hence, companies with strong pre-mandate reporting are expected to face lower costs due to weaker adaptation efforts. This finding is also consistent with Cheng et al.'s (2013) observation that firms benefit from easier access to financing when achieving high CSR performance and providing information, and thus, transparency. Moreover, it appears that these firms also benefit from lower cost of equity (Dhaliwal et al., 2011; El Ghoul et al., 2011).

3.3 European Research

In the European setting, few studies have been conducted on both the first- and second-order consequences of the NFRD. As a first-order consequence, the mandate was proven to have resulted in more availability of sustainability information and more credibility through external third parties in the companies concerned (Ottenstein et al., 2021). Breijer and Orij (2020) find that reporting practices differ after the introduction of the mandate, depending on whether the STOXX 600 European firm has already published ESG data voluntarily beforehand. Firms with prior voluntary reporting experience tend to use frameworks oriented towards a wide range of stakeholders, such as the GRI, and now also incorporate investor-oriented frameworks. In contrast, firms that previously refrained from voluntary reporting seem to focus primarily on frameworks oriented towards investors. However, they find those reports tend to include "boilerplate language" as a means of avoiding "poor non-financial performance, retaining proprietary information, or limiting implementation efforts" (Breijer & Orij, 2020).

Analysing both first- and second-order consequences, Fiechter et al. (2022) found evidence for an increased quantity of CSR activities in concerned firms that already materialized before the mandate was adopted. This change in firm behavior is more pronounced in firms with historically "*low levels of both CSR reporting and activities*", deemed as high-exposure firms. Moreover, they

find that the "*average EU firm*" experiences a decrease in firm profitability, proxied by Return on Assets (ROA) and Tobin's Q, compared with the American control group, which they link to increased Selling, General, and Administrative Expenses (SG&A) for CSR activities (Fiechter et al., 2022). At the same time, the mandate increased the ESG scores of concerned STOXX 600 European firms (Cicchiello et al., 2023) and concerned firms listed on the Warsaw Stock Exchange (Aluncha et al., 2023). Specifically, Aluncha et al. (2023) observed that the improvement in ESG performance is more pronounced in larger companies regarding the overall ESG score as well as the environmental and social pillars. However, the introduction of the mandate did not seem to significantly impact the governance pillar. Interestingly, the study also reveals that the improvement in ESG performance becomes more substantial in the years following the introduction of the NFRD, compared to the initial year (Aluchna et al., 2023).

4. Methodology

4.1 Research Design

Five years after the implementation of the mandate, this paper tests the effect on the concerned firms' profitability and their respective ESG performances in ten of the largest Eurozone countries. Following a difference-in-differences (DiD) design, European companies falling under the mandate (treatment group) are compared to their nearest neighbor-based matched American firms (control group) in the period before and after the mandate came into force (2011 – 2017 versus 2018 – 2021). The DiD allows us to "assess the causal effect of [the] event" on the affected group, in contrast to a group that was not affected by the same event (Lechner, 2011). Compared to the previously mentioned studies, as detailed in the previous chapter, this research differs due to a broader timeframe and broader inclusion of firms. Furthermore, the sample is not limited to one country or a specific European index but includes all the affected firms of the ten largest Eurozone countries for which the necessary data were available.

To allow for comparison at an international level and, hence, confirmation of research results in other regions, this paper follows the research design of Chen et al. (2018), who tested the impact of the mandatory CSR disclosure for firms of the two major Chinese stock exchanges in 2008. Moreover, it follows the research design of Fiechter et al. (2022) and Cicchiello et al. (2023), whose studies focused on the NFRD. The previously mentioned papers conducted difference-in-

differences design methods, analyzing the fundamentals of companies subject to the mandate compared to those not subjected in the period before and after the mandate.

4.2 Propensity-Score Matching

To ensure that the control group of American firms presents firm characteristics similar to those of the European treatment group affected by the CSR mandate, the approach of Chen et al. (2014), Downar et al. (2021), and Fiechter et al. (2022), as well as Cicchiello et al. (2023) was followed and a Propensity-scoring matching (PSM) was conducted for creating an appropriate control group.[1] A propensity score is defined as "the probability of receiving treatment conditional on covariates" (Dehejia and Wahba 2002, S. 153). Once the score is calculated based on the pre-mandate observations, the individual firms in the treatment group are matched to those with similar propensity scores in the control group. This leads to a balancing of the sample groups and a reduction in bias resulting from observed confounding factors (Dehajia & Wahba, 2002). Due to the research design of the DiD and the expectation of seeing a significant difference in firm performance after the mandate's introduction, the matching is based on the propensity score of the observations before 2018. More specifically, the matching is conducted by using the nearest-neighbor within the caliper option, which is the most common specification (Oakes & Johnson, 2006). It allows to improve the balance between the treated and control groups while keeping a larger sample size due to selection based on similarity (Dehajia & Wahba, 2002).

4.3 Hypotheses & Regressions

Due to adaptation costs, possibly increased CSR spending, as well as stakeholder pressure and expectations, firm profitability of affected firms can typically be assumed to decrease post-mandate (Grewal et al., 2019). Therefore, the first hypothesis is formulated as follows:

H1: Firms subject to the mandate see a decrease in profitability.

This effect is tested by performing the following regression on Return on Assets (ROA), Return on Equity (ROE), and Tobin's Q using dummy variables to indicate the time period before or after the

[1] Fiechter et al. (2022) and Cicchiello et al. (2023) test the impact of the EU mandate, and Chen et al. (2017) test the impact of the Chinese mandate 2008 using a PS-matched US-American control group, while Downar (2021) tests the UK carbon mandate 2013 against a PS-matched European control group. Fiechter et al. (2022) calculated the Propensity score using a probit regression, and Chen et al. (2017) used a logit regression.

mandate (Post), whether firms are affected (Treated), and their interaction (DiD). Additionally, the regression is controlled for company variables that influence firm profitability, namely Size, Leverage, NetSales, Liquidity, and Profitability. I also include firm- and year-, or industry-fixed effects. The coefficient of the interaction term β_3 measures the change in profitability of the treated group in comparison to the change in the control group after the mandate came into force.

$$ROA_{i,t}/ROE_{i,t}/TobinsQ_{i,t} = \beta_0 + \beta_1(Post) + \beta_2(Treated) + \beta_3(DiD) + \beta_j(Controls_{it}) + \varepsilon.$$[2]

The second hypothesis is an extension of the first regression with a control of whether the relative ESG performance of companies has an impact on firm performance. To test this, firms with comparably high ESG scores are indicated by the dummy variable "ESGmedian" which assumes the value 1 (0) when the firm is above (below) the yearly sample median.

H2: Firms with relatively high ESG scores see lower decrease in profitability.

$$ROA_{i,t}/ROE_{i,t}/TobinsQ_{i,t} = \beta_0 + \beta_1(Post) + \beta_2(Treatment\ firms) + \beta_3(DiD) + \beta_4(\text{ESGmedian}) + \beta_j(Controls_{it}) + \varepsilon$$

The third hypothesis is derived from prior research showing that low pre-mandate disclosure levels and CSR activities are associated with more negative market reactions to CSR mandates (Grewal et al., 2019) and higher adaption behavior (Fiechter et al., 2022). High-disclosure firms, moreover, benefit from comparably better access to financing (Cheng et al., 2013). To test if this holds true for pre-mandate ESG scores, the sample is therefore split into two subsets, one including firms achieving at least four quarters of ESG scores under (over) the median before the introduction of the mandate.

H3: Firms with lower pre-directive ESG scores see larger/more significant decreases in profitability.

$$ROA/ROE/TobinsQ = \beta_0 + \beta_1(Post) + \beta_2(Treatment\ firms) + \beta_3(DiD) + \beta_j(Controls_{it}) + \varepsilon$$

[2] Chen et al., (2018)

In the case of China, the CSR mandate led to an increase in social externalities, proven through a decrease in local wastewater and SO2 emissions in the cities most impacted by the mandate (Chen et al., 2018). Moreover, in the UK, emissions decreased following a carbon disclosure mandate (Downar et al., 2021), and in the US, labour conditions improved following a safety disclosure mandate (Christensen et al., 2017). As such effects could be a possible result of the NFRD in Europe and would be visible in the ESG scores, I regress the overall ESG score as well as its individual pillars to test for Social Externalities.

H4: ESG and its individual pillars' performances were positively impacted.

$$ESG_{i,t} = \beta_0 + \beta_1(Post) + \beta_2(Treatment\ firms) + \beta_3(DiD) + \beta_j(Controls_{it})$$

$$E_{i,t} = \beta_0 + \beta_1(Post) + \beta_2(Treatment\ firms) + \beta_3(DiD) + \beta_j(Controls_{it})$$

$$S_{i,t} = \beta_0 + \beta_1(Post) + \beta_2(Treatment\ firms) + \beta_3(DiD) + \beta_j(Controls_{it})$$

$$G_{i,t} = \beta_0 + \beta_1(Post) + \beta_2(Treatment\ firms) + \beta_3(DiD) + \beta_j(Controls_{it})$$

The Hausman specification test (1978) was performed in order to test whether random effects should be included in the study. Tested is the null hypothesis of no correlation between unique errors and the regressors in the model. With a P-Value of 0, this was rejected and fixed effects implemented. Due to these, however, the coefficients on β_2 of treated firms are omitted. Moreover, to counteract and correct existing endogeneity and heteroskedasticity, Robust Standard Errors are applied in all regressions as a precautionary measure to mitigate potential issues.

5. Data

5.1 Sample

The study employs a DiD research design to examine the impact of the mandate on European companies (treatment group) in comparison to a control group consisting of US firms matched based on nearest-neighbor criteria. The analysis was conducted on data collected from Refinitiv Eikon Datastream during the pre-mandate (2011 – 2017) and post-mandate (2018 – 2021) periods.

The initial treatment sample consists of all active public firms located in the ten economically strongest Eurozone countries based on GDP: Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, and Spain. The control sample consists of active listed firms on the two major US-American stock exchanges, Nasdaq Stock Market (NASDAQ) and New York Stock Exchange (NYSE), for which employee count data were available. American firms were chosen as the control set, as there were no market-wide mandates related to CSR disclosure implemented during the sample period in the United States (Ioannou & Serafeim, 2017; Christensen et al., 2021; Fiechter et al., 2022). Small European firms not subject to the mandate cannot serve as a suitable control group due to the limited availability of data (due to a low number of firms with an employee count below 500). Moreover, American firms present a more robust control group in this case, as comparing large firms to small firms would lead to an inadequate comparison due to differences in firm characteristics, resulting in differences in their reporting practices.

The initial sample consists of 2,833 distinct European firms, 1,648 and 2,972 distinct firms listed on the NYSE and NASDAQ, respectively. Then, all firms with an employee count of below 500 ($\leq$499)[3], as well as firms without ESG scores, were excluded. Moreover, firms with no observations in *ROE* and *ROA* before 2017 were excluded. Before the matching, the final sample was reduced to 877 unique firms in the treatment group and 1,519 distinct firms in the control group. Of these, 1,077 belonged to NYSE and 442 to NASDAQ. Before conducting the propensity score matching, all non-binary variables except for ROA, ROE, and Leverage were winsorized at the 99th percentile before calculating the final variables to mitigate the influence of outliers and exclude extreme values from the analysis.

5.2 Propensity Score Matching

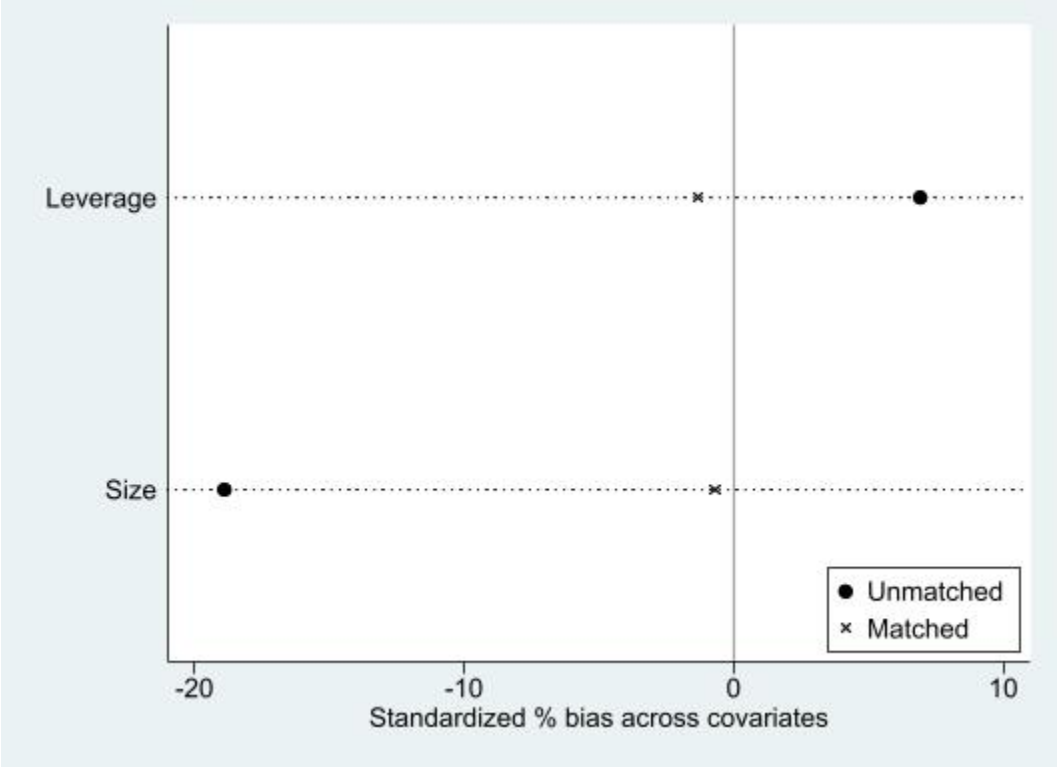
To ensure the comparability of the two sample groups and counteract the missing randomization of the control group, a propensity-score matching was performed. First, the propensity score is calculated using the pre-mandate covariates of lnTotalAssets (as a proxy for Size) and Debt-to-Equity (as a proxy for Leverage) following the matching approach of Cicchiello et al. (2023). Based on this score, the firms in the treated group were matched to the untreated group following the nearest-neighbor matching without replacement with a caliper of 0.03. The caliper aids in finding

[3] An employee count of bigger or equal to 500 is the condition for European firms to be affected by the mandate.

a fitting match in the range of +/-0.03 to increase the number of matched observations (Oakes & Johnson, 2006). The combination of Size and Leverage not only provided the most matched observations but also covered two crucial firm characteristics to compare firms in the EU versus the US. Indeed, these two variables impact the sustainable reporting practices of firms. Large firms tend to have lower information asymmetry (Baran & King, 2014) and to provide more non-financial information in the ESG context (Wong & Zhang, 2022). However, firms that finance themselves through debt focus less on investors and tend to report less ESG information; hence, they are likely to have lower ESG scores (Krueger et al., 2021).

The performed matching decreased the standardized percentual bias across the two covariates to close to zero and, therefore, increased the comparability of the two groups (Figure 1). In particular, the bias in Size was significantly reduced from -21% to -1% and Leverage from 7.2% to -2.1%. Hence, the matching helped mitigate the shortcomings of using a non-randomized control group.

Figure 1: Propensity Score Distribution for Treated and Control Groups



Moreover, it led to a final sample size of 2,191 distinct firms after matching. The treated group consists of 817 distinct firms, while the control group consists of 1,077 and 442 distinct firms in the NYSE and NASDAQ sample, respectively. Appendix B presents the sample selection process

(Panel A) as well as the distribution per industry and country for the full sample and the PSM sample after matching (Panels B and C). While the percentage distribution between the countries changes slightly, the majority of the European pre-matching and matched sample consists of German, French, and Italian firms, representing 32.18%, 20.99%, and 13.21% of the matched European sample, respectively. While the same three industry groups already make up the majority of the two sample sets pre-matching, the matching further balances the percentage distribution of industry groups in the two regions. The industry group (10) Other represents 29.77% (32.79%) of the European (American) sample set, followed by (3) Manufacturing with 21.93% (15.94%) and finally (5) HiTech with 14.50% (14.06%).

5.3 Variables

5.3.1 Firm performance

In this analysis, firm performance is proxied by Return on Equity (ROE), Return on Assets (ROA), and Tobin's Q (TobinsQ). ROE is a measure of the firm's earning performance and is calculated by dividing Net Income by Total Assets. ROA measures operating profitability independent of leverage and is the ratio of Net Income over the Average Shareholder's Equity (Chen et al., 2018). Tobin's Q is a market-based performance metric calculated by dividing the market value of assets divided by the book value of assets (Fiechter et al., 2022).

5.3.2 ESG performance

The firms' sustainable performance is tested by regressing the control variables on the overall ESG Score (ESG), and the individual pillars: environmental (E), social (S), and corporate governance (G). The ESG Score is a weighted average of the three individual pillars. The environmental pillar is concerned with topics such as emissions and the use of resources and includes environmental risks and opportunities and their related impact on society and the environment. The social pillar quantifies how the firm impacts society by taking into consideration Human Rights and how firms treat their workforce (e.g., Diversity Opportunity, Health, and Safety). The last pillar, corporate governance, takes into account systems and processes regarding a firm's integration of vision and strategy, but also management and the board of directors, as well as shareholder rights and CSR. The scores are given in the range of zero to 100, where 100 is the best (Refinitiv, 2022).

5.3.3 Control Variables

The following explains which variables were chosen based on the analysis and the theoretical background for the control set to cover relevant firm characteristics.

As a firm's size and leverage impact both profitability and ESG scores, the two variables are included as controls (Baran & King, 2014; Krueger et al., 2021; Wong & Zhang, 2022). Size is proxied for by the natural logarithm of Total Assets, while Leverage is proxied by Debt-to-Equity, which is the ratio of Total Liabilities over Total Assets (Capon et al., 1990; Chen et al., 2018; Fiechter et al., 2022; Cicchiello et al., 2023). Furthermore, Net Sales is included as a proxy for sales performance, representing a constituent component of ROA according to the DuPont method (Bauman, 2014) and, moreover, is positively related to ESG disclosure (Lys et al., 2015). Liquidity impacts the dependent variables as it represents the ability of firms to (re)pay short-term debts and their ability to invest in profitable projects, including ESG opportunities, and is proxied by dividing Working Capital over Total Assets (Capon et al., 1990; Pattitoni et al., 2014). Furthermore, Profitability is proxied for by the Price-to-Earnings ratio (PE) (Share Price divided by Earnings per Share), which has a U-shaped relation to return on equity (Ohlson & Gao, 2006). Moreover, the Book-to-Market ratio (BM) (Book value of equity divided by the market value of equity) is used as a proxy for profitability in terms of market value (Fama & French, 1992). Following Chen et al. (2018), firm- and year-, as well as industry-fixed effects are included in the regressions as further controls.

Table 1 Panel A below documents the summary statistics of the variables and Appendix A shows the variable description. Appendix C and D show summary statistics of the European and U.S.-American samples, respectively, before and after the mandate. Additionally, Appendix E shows the correlation of the profitability and sustainability variables in their controls.

Table 1: Summary Statistics

Panel A. Summary Statistics

Variable	Obs	Mean	Std.	Min	Max
treated	82,956	0.39	0.49	0.00	1.00
post	82,956	0.36	0.48	0.00	1.00
did	82,956	0.14	0.35	0.00	1.00
Employees	77,856	24824.59	49813.92	542.00	312373.00
ROE	77,867	10.10	577.20	-65333.33	31560.00
ROA	80,197	4.54	84.18	-4652.08	10450.35
TobinsQ	74,209	0.00	0.02	0.00	2.55
ESG*	57,119	51.03	20.28	10.40	89.73
E*	57,223	43.62	29.80	0.00	95.46
S*	57,062	53.77	22.71	9.15	95.27
G*	57,051	53.08	22.19	6.34	93.62
ESGmedian	57,119	0.50	0.50	0.00	1.00
Leverage	81,676	110.93	2829.29	-108024.70	223758.50
Size	81,470	15.11	2.04	0.00	22.58
NetSales*	81,437	9067228.00	20300000.00	19446.00	130000000.00
Liquidity	70,040	0.15	1.03	-123.96	1.00
PE	61,558	2253.34	15858.01	0.00	2030600.00
BM	74,493	769.72	3338.81	-145270.30	112330.40

Variables marked with a * were winsorized at a 99% level.

6. Findings

6.1 Firm profitability

In this section, I show how the NFRD impacts firm performance proxied by ROE, ROA, and TobinsQ. The regressions include firm- and year-fixed or industry-fixed effects, and controls for relevant firm characteristics, namely Size, Leverage, NetSales, Liquidity, and PE or BM. Owed to adaptation costs and possibly increased CSR spending due to stakeholder pressure and expectations, the profitability of affected firms is expected to decrease post-mandate.

Indeed, the results in Table 2 (Panel A) show that while all three profitability proxies were significantly higher in the post-period than in the pre-period (coefficients on Post), the coefficients on DiD were all negative. The coefficient of DiD explains the Difference-in-Differences, comparing the impact the mandate had on the European firms after its introduction in comparison to the American non-affected firms. The negative coefficients on the dummy, hence, indicate that

the NFRD negatively impacted firm performance in affected European firms compared to their control group. The reduction is the most statistically significant in ROA, with a reduction of -1.159 (-1.162) at the 1% significance level when controlling for firm and year (industry) fixed effects.

For robustness purposes, the control variable for profitability, namely PE, is replaced by BM in the regression results of Panel B. The coefficients on Post and DiD have reverse signs, showing an increase in profitability in the post-mandate period but a decrease in profitability for treated firms compared to the control group post-mandate. More specifically, ROE significantly decreases at a 10% level, ROA at a 5% level, but TobinsQ decreases insignificantly in European firms compared to their matched American unaffected firms.

As a second robustness check, the regression is performed while excluding all firms with negative ROE or ROA observations. Thus, only financially healthy firms that are likely to survive long-term and can invest in sustainable opportunities are included in the now smaller sample. The results in Panel C show a significant positive coefficient for Post, indicating that in the period after the mandate, the overall level of firm performance increased. Again, the coefficients of DiD were negative. Contrary to the first robustness check, however, the decrease is no longer statistically significant in ROE but in TobinsQ. The decrease in ROA remains statistically significant at a 1% level.

While the significance of ROE and TobinsQ varies in the three Panels, ROA significantly decreases at a 1% level in affected firms subsequent to the mandate compared to the unaffected firms. Hence, while the magnitude of the statistical significance of the disclosure shock ranges, these results suggest that the mandate negatively affected the factors underlying ROE, ROA, and TobinsQ, leading to a reduction in firm performance in both internal and market proxies. Therefore, these findings indicate that firms that mandatorily report non-financial information according to the NFRD suffer from a significant loss in profitability compared to their voluntarily reporting or non-reporting control group after the mandate's introduction. These findings are in line with those of Chen et al. (2018), who also found a reduction in both ROA and ROE in China, and with Fiechter et al. (2022), who found a reduction in ROA and TobinsQ in Europe as a result of a non-financial disclosure shock.

Table 2: Difference-in-Differences on Firm Performance

Panel A. Firm performance

VARIABLES	(1) ROE	(2) ROE	(3) ROA	(4) ROA	(5) TobinsQ	(6) TobinsQ
Post	**83.74****	**55.42***	**1.153****	**0.607****	**0.00101*****	**0.000300*****
	(41.67)	(30.20)	(0.579)	(0.271)	(0.000185)	(7.37e-05)
DiD	**-46.97***	**-47.00***	**-1.159*****	**-1.162*****	**-0.000107****	**-0.000107****
	(27.20)	(27.16)	(0.285)	(0.285)	(4.68e-05)	(4.61e-05)
Size	-50.53**	-38.03**	-0.931	-1.131**	-0.000595**	-0.000399
	(20.25)	(15.04)	(0.628)	(0.552)	(0.000292)	(0.000255)
Leverage	0.0800	0.0801	4.58e-05	4.48e-05	3.67e-09	3.23e-09
	(0.0580)	(0.0581)	(5.04e-05)	(5.17e-05)	(7.45e-09)	(7.55e-09)
NetSales	3.40e-06	3.23e-06	5.56e-08**	6.66e-08***	0	0
	(2.75e-06)	(2.70e-06)	(2.30e-08)	(2.34e-08)	(0)	(0)
Liquidity	149.8	143.1	11.52***	11.53***	0.000206	0.000190
	(143.3)	(141.7)	(2.237)	(2.226)	(0.000400)	(0.000406)
PE	-8.46e-05	-8.87e-05	-1.05e-05**	-1.01e-05**	6.13e-10*	8.61e-10**
	(7.64e-05)	(7.58e-05)	(4.19e-06)	(3.98e-06)	(3.53e-10)	(3.88e-10)
Constant	689.2***	517.2***	19.44**	21.44**	0.00966**	0.00709*
	(265.2)	(198.4)	(9.329)	(8.323)	(0.00430)	(0.00381)
Firm Fixed Effect	Yes	No	Yes	No	Yes	No
Year Fixed Effect	Yes	No	Yes	No	Yes	No
Industry Fixed Effect	No	Yes	No	Yes	No	Yes
Observations	50,982	50,982	51,959	51,959	51,960	51,960
Adjusted R-squared	0.009	0.008	0.039	0.026	0.049	0.019
Number of firms	1,723	1,723	1,729	1,729	1,727	1,727

Table 2

(continued)

Panel B. Firm performance - Robustness Check with BM as Profitability Proxy

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	ROE	ROE	ROA	ROA	TobinsQ	TobinsQ
Post	51.33	**44.05***	15.85	6.755	**0.00172****	**0.000593***
	(33.52)	(25.57)	(15.22)	(6.457)	(0.000844)	(0.000356)
DiD	**-43.32***	**-42.97***	**-1.876****	**-1.683****	-5.78e-05	-4.35e-05
	(23.32)	(22.91)	(0.856)	(0.682)	(6.11e-05)	(5.82e-05)
Size	-13.81	-11.33	-22.29	-19.37	-0.00210	-0.00184
	(16.44)	(12.81)	(23.87)	(20.85)	(0.00141)	(0.00127)
Leverage	0.00331	0.00323	7.36e-05	5.42e-05	2.70e-09	2.19e-09
	(0.00324)	(0.00323)	(6.55e-05)	(4.75e-05)	(4.02e-09)	(3.75e-09)
NetSales	2.54e-06	2.53e-06	5.98e-07	5.77e-07	0	0
	(2.33e-06)	(2.29e-06)	(5.53e-07)	(5.22e-07)	(0)	(0)
Liquidity	165.0	161.4	30.09***	29.94***	-0.00162***	-0.00163***
	(113.0)	(111.2)	(1.113)	(0.968)	(4.22e-05)	(3.54e-05)
BM	-0.00158	-0.00148	-0.000158	-0.000244	1.16e-08	3.38e-09
	(0.00114)	(0.00123)	(0.000275)	(0.000227)	(2.52e-08)	(2.54e-08)
Constant	158.8	121.3	321.2	282.5	0.0317	0.0284
	(218.8)	(173.4)	(342.9)	(303.8)	(0.0202)	(0.0185)
Firm FE	Yes	No	Yes	No	Yes	No
Year FE	Yes	No	Yes	No	Yes	No
Industry FE	No	Yes	No	Yes	No	Yes
Observations	62,079	62,079	63,771	63,771	63,850	63,850
Adjusted R-squared	0.002	0.002	0.087	0.086	0.238	0.231
Number of firms	1,811	1,811	1,813	1,813	1,813	1,813

Table 2

(continued)

Panel C. Firm performance - Robustness Check excluding firms with negative ROE and ROA

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	ROE	ROE	ROA	ROA	TobinsQ	TobinsQ
Post	**54.86****	**38.52***	**2.433*****	**1.372*****	**0.000957*****	**0.000292*****
	(24.19)	(21.78)	(0.395)	(0.180)	(0.000104)	(4.38e-05)
DiD	-28.71	-28.86	**-1.375*****	**-1.379*****	**-0.000125****	**-0.000133*****
	(19.63)	(19.51)	(0.286)	(0.287)	(4.96e-05)	(4.90e-05)
Size	-51.70**	-41.89**	-1.758***	-1.586***	-0.000441***	-0.000216
	(21.07)	(16.74)	(0.409)	(0.365)	(0.000157)	(0.000131)
Leverage	0.100	0.100	3.78e-05	3.76e-05	3.98e-09	3.57e-09
	(0.0965)	(0.0963)	(5.17e-05)	(5.24e-05)	(8.24e-09)	(8.35e-09)
NetSales	3.85e-06	3.74e-06	5.02e-08***	5.28e-08***	0	0
	(3.33e-06)	(3.30e-06)	(1.54e-08)	(1.54e-08)	(0)	(0)
Liquidity	-4.748	-11.34	9.246***	9.282***	0.000384	0.000378
	(48.60)	(46.64)	(2.452)	(2.429)	(0.000270)	(0.000276)
PE	-0.000159	-0.000164	-1.30e-05***	-1.22e-05***	3.41e-10	6.56e-10
	(0.000143)	(0.000142)	(2.93e-06)	(2.86e-06)	(4.42e-10)	(5.16e-10)
Constant	735.9***	605.3***	32.43***	29.55***	0.00744***	0.00441**
	(282.0)	(221.2)	(6.226)	(5.626)	(0.00230)	(0.00196)
Firm FE	Yes	No	Yes	No	Yes	No
Year FE	Yes	No	Yes	No	Yes	No
Industry FE	No	Yes	No	Yes	No	Yes
Observations	46,959	46,959	47,853	47,853	47,857	47,857
Adjusted R-squared	0.020	0.020	0.038	0.030	0.047	0.014
Number of firms	1,679	1,679	1,688	1,688	1,688	1,688

Table 2 depicts the Diff-in-Diff results regarding the impact of the NFRD on firm performance proxied by ROA, ROE, and TobinsQ in the sample period Q1 2011 to Q4 2021. Control variables Size, Leverage, NetSales, Liquidity, PE, and an additional ESGMedian Dummy are included. Firm-, Year-, and Industry-Fixed effects are included. In Panel B, PE is replaced by BM. Robust standard errors (in parentheses) and adjusted R-squared are provided. The symbols ***, **, * denote significance at the 1%, 5%, and 10% level respectively.

6.2 Controlling with ESG median dummy

The following section analyzes whether the relative yearly ESG performance of companies has an impact on firm performance in the context of the directive's introduction. Therefore, an ESG dummy indicating whether the firm achieved an ESG score above (below) the yearly median was additionally included in the prior run regression.

Table 3 presents the results of the regression including the ESG level control. Panel A reports again a significant positive trend in the dependent variables ROE, ROA, and TobinsQ in the period following the mandate. Interestingly, the coefficients of DiD on ROE are no longer significant, while the reduction without the ESG Dummy control was significant at a 10% level in Table 3 (Panels A and B). In Panel C of Table 2, run on firms with only positive firm performance, the results on ROE are similar to the ones found in Table 3 for all firms but including the ESGMedian. Columns 3 and 4 show that the decrease in ROA remains significant at a 1% level, while the significance in TobinsQ increased from 5% to 1%. Notably, this effect is less negative when controlling for firm- and year-fixed effects compared with industry-fixed effects. This suggests that the mandate's impact on firm performance is driven by industry-specific factors. One possible explanation could be how ESG materiality varies between industries as different sectors and industries impact the individual pillars in different magnitudes. Additionally, the results suggest that the mandate had a significantly negative impact on two of the three firm performance proxies in the treated group. European firms see a decrease of -1.161% (-1.146%) in ROA and a decrease of -0.00207 (-0.000163) in TobinsQ when testing for firm and year (industry) fixed effects compared to their not mandatorily disclosing matched US firms, which is statistically significant at the 1% level.

Panel B shows the robustness check using BM as a proxy for profitability. Contrarily to the other findings, the coefficients of Post are insignificantly negative for ROA. The coefficient on Post for ROE is insignificantly positive and for TobinsQ significantly positive at a 1% level. DiD is negative at different significance levels for the three proxies, from 10% for ROE, 5% for ROA. and 1% for TobinsQ, confirming the results of Panel A.

Panel C shows the regression performed on the reduced sample of firms with only positive ROA and ROE observations. Similar to Panel A, the coefficients on DiD are all negative and range in a similar magnitude but are only significant for ROA and TobinsQ at a level of (still) 1%. These results support the findings of the initial sample.

The ESGmedian dummy itself has statistically insignificant negative effects on ROE and ROA, and when regressing on Tobin's Q, the coefficient is statistically insignificant and negative for firm- and year-fixed effects, but insignificantly positive for industry-fixed effects. Notably, the coefficient of ROE, while controlling for firm- and year-fixed effects in the robustness check, is

statistically negative (Panel B, column 2). While insignificant, this could indicate the possibility that high ESG scores having a negative impact on the proxies. However, while the coefficients are mainly insignificantly negative on ESGmedian, including the dummy variable impacted the model and the coefficients for Post and DiD and improved the adjusted R-square, indicating that ESG performance has an impact on firm performance.

Collectively, the findings in Table 3 confirm the results in Table 2, indicating that firm performance in European firms was negatively affected by the introduction of the NFRD compared to unaffected firms in the US. It is worth noting that the reaction on the two market variables is ambiguous: TobinsQ was significantly reduced at a 1% level in all tests, and ROE was only significantly negatively impacted in one of three panels. This could indicate that the market reacted negatively to the disclosure shock, leading to a decrease in perceived market value over the actual decrease in earnings potential (ROE). Operating performance proxied by ROA was significantly reduced in European firms relative to their American counterparts. This could be due to the costs associated with the reporting processes or an increase in SG&C for CSR activities, as found by Fiechter et al. (2022).

Table 3: Difference-in-Differences on Firm Performance including median ESG

Panel A. Firm performance – ESGmedian

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	ROE	ROE	ROA	ROA	TobinsQ	TobinsQ
post	**79.87****	42.64	**1.664****	**0.745****	**0.00125*****	**0.000364*****
	(39.67)	(26.10)	(0.729)	(0.315)	(0.000286)	(0.000103)
DiD	-40.44	-36.99	**-1.161*****	**-1.146*****	**-0.000207*****	**-0.000163*****
	(25.28)	(23.14)	(0.299)	(0.294)	(5.03e-05)	(4.84e-05)
ESGmedian	-13.15	-6.610	-0.201	-0.222	-3.51e-05	4.39e-05
	(10.12)	(6.970)	(0.240)	(0.244)	(3.59e-05)	(4.59e-05)
Size	-59.44**	-46.14**	-1.839**	-1.908**	-0.00103**	-0.000823*
	(27.07)	(20.74)	(0.930)	(0.836)	(0.000493)	(0.000440)
Leverage	0.0884	0.0884	5.12e-05	4.79e-05	3.43e-09	3.15e-09
	(0.0724)	(0.0725)	(5.54e-05)	(5.61e-05)	(7.78e-09)	(7.90e-09)
NetSales	3.54e-06	3.43e-06	8.22e-08***	9.21e-08***	0	0
	(3.06e-06)	(3.00e-06)	(2.25e-08)	(2.26e-08)	(0)	(0)
Liquidity	-0.0626	-13.79	9.110***	9.060***	-0.000146	-0.000234
	(69.81)	(68.34)	(2.176)	(2.165)	(0.000678)	(0.000695)
PE	-9.12e-05	-9.35e-05	-1.21e-05**	-1.18e-05**	2.73e-10	4.95e-10
	(7.77e-05)	(7.69e-05)	(5.53e-06)	(5.37e-06)	(3.43e-10)	(3.53e-10)
Constant	872.8**	687.9**	34.08**	34.43***	0.0167**	0.0139**
	(383.3)	(291.5)	(14.15)	(12.86)	(0.00752)	(0.00678)
Firm FE	Yes	No	Yes	No	Yes	No
Year FE	Yes	No	Yes	No	Yes	No
Industry FE	No	Yes	No	Yes	No	Yes
Observations	37,814	37,814	38,646	38,646	38,641	38,641
Adjusted R-squared	0.022	0.021	0.046	0.026	0.075	0.044
Number of firms	1,660	1,660	1,669	1,669	1,668	1,668

Table 3

(continued)

Panel B. Firm performance ESGmedian - Robustness Check with BM as Profitability Proxy

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	ROE	ROE	ROA	ROA	TobinsQ	TobinsQ
post	45.73	34.50	-0.0534	-0.133	**0.00116*** **	**0.000357*** **
	(31.08)	(21.08)	(0.990)	(0.476)	(0.000314)	(0.000126)
DiD	**-33.69***	**-32.94***	**-0.792****	**-0.856****	**-0.000207*** **	**-0.000164*** **
	(20.18)	(18.63)	(0.403)	(0.390)	(5.39e-05)	(4.96e-05)
ESGmedian	-13.31	-11.38*	-0.279	-0.436	-7.03e-05	7.87e-06
	(9.069)	(6.618)	(0.268)	(0.267)	(5.41e-05)	(4.07e-05)
Size	-22.91	-19.57	1.303	1.024	-0.00105*	-0.000923*
	(20.75)	(16.56)	(1.162)	(1.075)	(0.000573)	(0.000533)
Leverage	0.00256	0.00253	-4.38e-06	-3.60e-06	9.92e-10	6.28e-10
	(0.00300)	(0.00299)	(1.17e-05)	(1.19e-05)	(1.76e-09)	(1.75e-09)
NetSales	2.92e-06	2.94e-06	4.88e-08*	6.28e-08**	0	0*
	(2.58e-06)	(2.53e-06)	(2.85e-08)	(2.85e-08)	(0)	(0)
Liquidity	30.30	24.98	12.24***	12.40***	0.000174	0.000106
	(49.94)	(50.12)	(2.598)	(2.595)	(0.000793)	(0.000815)
BM	-0.00173**	-0.00185**	-0.000185*	-0.000205*	-6.37e-09	-1.16e-08
	(0.000858)	(0.000839)	(0.000104)	(0.000113)	(1.27e-08)	(1.36e-08)
Constant	326.5	278.8	-15.45	-12.45	0.0169*	0.0152*
	(292.7)	(237.0)	(17.42)	(16.27)	(0.00868)	(0.00817)
Firm FE	Yes	No	Yes	No	Yes	No
Year FE	Yes	No	Yes	No	Yes	No
Industry FE	No	Yes	No	Yes	No	Yes
Observations	45,449	45,449	46,780	46,780	46,815	46,815
Adjusted R-squared	0.003	0.002	0.038	0.019	0.062	0.044
Number of firms	1,772	1,772	1,780	1,780	1,780	1,780

Table 3

(continued)

Panel C. Firm performance ESG median - Robustness Check excluding firms with negative ROE and ROA

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	ROE	ROE	ROA	ROA	TobinsQ	TobinsQ
post	**93.78****	**47.90***	**3.226*****	**1.492*****	**0.00115*****	**0.000337*****
	(45.23)	(26.99)	(0.457)	(0.196)	(0.000151)	(5.42e-05)
DiD	-42.23	-38.86	**-1.418*****	**-1.384*****	**-0.000205*****	**-0.000172*****
	(26.29)	(24.16)	(0.247)	(0.249)	(5.10e-05)	(5.10e-05)
ESGmedian	-8.503	-0.777	-0.275	-0.199	-5.37e-05	1.84e-05
	(9.689)	(6.573)	(0.208)	(0.211)	(4.05e-05)	(3.90e-05)
Size	-75.45**	-56.37**	-2.678***	-2.286***	-0.000784***	-0.000552**
	(32.49)	(24.54)	(0.507)	(0.472)	(0.000253)	(0.000218)
Leverage	0.186	0.186	5.29e-05	5.30e-05	3.73e-09	3.41e-09
	(0.163)	(0.163)	(5.83e-05)	(5.89e-05)	(8.73e-09)	(8.86e-09)
NetSales	3.96e-06	3.83e-06	6.69e-08***	6.79e-08***	0*	0
	(3.64e-06)	(3.59e-06)	(1.60e-08)	(1.63e-08)	(0)	(0)
Liquidity	-12.81	-28.20	6.617***	6.727***	0.000105	3.91e-05
	(84.35)	(80.33)	(1.791)	(1.786)	(0.000429)	(0.000441)
PE	-0.000171	-0.000173	-1.29e-05***	-1.20e-05***	-0	2.39e-10
	(0.000154)	(0.000153)	(2.67e-06)	(2.64e-06)	(3.93e-10)	(4.57e-10)
Constant	1,102**	834.6**	47.77***	41.69***	0.0130***	0.00978***
	(458.9)	(342.3)	(7.760)	(7.296)	(0.00386)	(0.00337)
Firm FE	Yes	No	Yes	No	Yes	No
Year FE	Yes	No	Yes	No	Yes	No
Industry FE	No	Yes	No	Yes	No	Yes
Observations	34,783	34,783	35,559	35,559	35,556	35,556
Adjusted R-squared	0.039	0.038	0.056	0.040	0.065	0.030
Number of firms	1,577	1,577	1,589	1,589	1,589	1,589

Table 3 depicts the Diff-in-Diff results regarding the impact of the NFRD on firm performance proxied by ROA, ROE, and TobinsQ in the sample period Q1 2011 to Q4 2021 depending on their yearly ESG performance. Control variables Size, Leverage, NetSales, Liquidity, PE, and an additional ESGMedian Dummy are included. Firm-, Year-, and Industry-Fixed effects are included. Robust standard errors (in parentheses) and adjusted R-squared are provided. The symbols ***, **, * denote significance at the 1%, 5%, and 10% level respectively.

6.3 Firms with lower pre-directive ESG scores see higher decrease in profitability

Having documented that ESG has an effect on the model, the following section examines whether the pre-mandate ESG score has any influence on how firm performance post-mandate is impacted. To do so, the sample is divided into ESG subsets based on whether firms achieved scores better than the median for at least four quarters in the period before the implementation of the NFRD. Table 4 (Panel A) presents the regression results for the low pre-mandate ESG score subset and Panel B for the high pre-mandate ESG score subset, including firms with four quarters of observations lower than the respective year's median (Panel A), and firms with no observations below the median (Panel B). Then, I tightened the restrictions/definition for firms with bad pre-mandate ESG performance by increasing the number of years below median to three years (Panels C and D) and five years (Panels E and F). Thus, the low sample includes firms with repeatedly bad ESG-performance relative to their peers and excludes outlier firms that only had one year of bad performance. Vice versa, the high-ranking sample includes only firms with no or few bad performance scores.

6.3.1 Four quarters of sub-median ESG performance

Panels A and B below depict the performance of firms with four quarters of low versus high pre-mandate ESG performance. In both Panels, the coefficients on Post indicate that firm performance proxies are increased after the mandate's introduction. However, while the increase is statistically significant for strong-performance firms in ROE, ROA, and TobinsQ, only the latter is statistically significant for weak-performance firms. These results suggest that firms with higher ESG scores have stronger firm performance in the second half of the sample period.

The effect of the NFRD on firms with low and high ESG performance differs between the three profitability proxies. While the coefficients of DiD for ROE are negative in both panels, they are only statistically significant for firms with good ESG performance (Panel B, Columns 1 and 2). This indicates that firms with higher ESG scores did not profit from their prior sustainable performance in comparison to the American control group. However, in the case of ROA, coefficients of DiD are all statistically significant at the 1% level but differ in magnitude. Firms scoring below the median experience a decrease of -1.394 and -1.404 in ROA (Panel A) compared to a decrease of -0.887 and -0.874 (Panel B) in the more sustainable firms after the mandate's introduction compared to the control group. Hence, firms with lower pre-directive ESG scores see

a stronger decrease and are at a disadvantage relative to high-scoring firms in the case of ROA relative to their matched controls.

On the other hand, the coefficients for TobinsQ are negative for both pre-mandate ESG Levels, with a stronger significance but lower magnitude for the previously higher-scoring firms. The results indicate that affected firms experience a decrease in TobinsQ after the mandate compared to non-affected firms independent of their pre-mandate ESG score.

Panels A and B suggest that European firms falling under the jurisdiction of NFRD experience a decrease in profitability relative to the unaffected American firms subsequent to the disclosure shock, independent of a one-year lower than median ESG performance. Firms with lower pre-directive ESG scores thus see a smaller decrease in ROE and TobinsQ but not ROA. This indicates that prior strong ESG performance has not clearly helped to remedy deterioration in profitability. In fact, it only helped against deterioration in operating profitability, but not profitability according to market-based proxies.

6.3.2 12 quarters of sub-median ESG performance

Panels C and D in Appendix F examine how firms that performed relatively worse in at least three non-consecutive years pre-mandate reporting were impacted by the disclosure shock compared to their matched control group. The results show that high-scoring firms see a significant improvement in performance in the post-period, while the improvement for low-ESG firms is only significant in Tobin's Q. The decrease in profitability of treated firms post-mandate compared to the control group is statistically negatively significant in poorly performing firms for ROA but significantly negative in all three proxies for strongly performing groups. Nevertheless, the effect is again smaller in magnitude and significance for ROA in better-performing firms than in those with weak performance. The Panels confirm that all affected firms independent of ESG score see a decrease in profitability, while they suggest that firms with strong performance see a larger decrease relative to the unaffected firms.

6.3.3 20 quarters of sub-median ESG performance

In Panels E and F in Appendix G, the definition of being classified as a firm with strong performance is even more restricted to at least 20 quarters, i.e., five years below versus above the median ESG score in the years prior to the mandate. These results confirm the findings of the previous analyses. Again, European firms with low pre-mandate ESG scores only see a significant

decrease in ROA, whereas European firms with high pre-mandate ESG scores experience a significant decrease in all three proxies compared to their American control group. As in the prior control of three bad-performing years, the economic and statistical significance is higher in the weak-performance firms than in the strongly performing subset in the five-year control.

6.3.4 Conclusion of sub-median ESG performance

The results of the main analyses and the robustness checks, with increasing years of relatively bad performance, indicate that firm performance is impacted differently by the introduction of mandatory non-financial disclosure reporting, depending on the firms' prior ESG performance. However, contradicting the expectation that firms with better pre-mandate ESG scores should see a less negative impact, those firms actually experienced a more significant decrease in firm performance.

Firms with strong performance see a definite decrease in ROE, ROA, and TobinsQ compared to their control group, while weak firms only experience a definitive decrease in ROA. However, this decrease in ROA is economically and statistically stronger throughout the Panels for firms with low pre-mandate ESG scores. This could be due to increased operating expenses (SG&A) connected to less know-how, missing reporting infrastructure, and the need to build up reporting teams or costs connected to improve the criteria to be reported on (Fiechter et al., 2022).

While the internal operating performance decreased more strongly for firms with worse pre-mandate ESG scores, the market proxies ROE and TobinsQ see a higher and statistically stronger decrease in firms with good pre-mandate ESG scores. This could be due to the fact that investors do not care about historical ESG performance or that those previously relatively weak firms now achieve high scores.

While Grewal et al. (2019) found more negative reactions by investors for firms with lower pre-directive ESG performance and disclosure, this cannot be seen in the market-based firm profitability proxies ROE and TobinsQ. A possible explanation for this could be that firms with relatively good pre-mandate ESG performance might have been overvalued and, simultaneously, prior weakly performing firms improved their sustainable activities and scores. Consequently, the market might have revalued and, in turn, down valued those firms, explaining the greater decrease in firms with high pre-mandate scores. Overall, pre-directive ESG scores seem to negatively impact

profitability in firms that have to mandatorily disclose non-financial information compared to unaffected firms that do not, or voluntarily, report on them.

Table 4: Pre-mandate ESG performance on firm performance

Panel A. Firm performance - pre-mandate *low* ESG score - 4 quarters

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	ROE	ROE	ROA	ROA	TobinsQ	TobinsQ
post	73.27	37.78	0.486	0.480	**0.00127*** **	**0.000364*** **
	(71.51)	(44.65)	(1.025)	(0.466)	(0.000382)	(0.000139)
DiD	-30.24	-30.00	**-1.394*** **	**-1.404*** **	-0.000114	**-0.000114***
	(38.67)	(38.19)	(0.446)	(0.445)	(7.07e-05)	(6.91e-05)
Size	-31.65	-18.80*	-0.363	-0.674	-0.000837*	-0.000579
	(23.15)	(11.10)	(1.025)	(0.872)	(0.000499)	(0.000420)
Leverage	0.0460	0.0463	7.16e-05	8.50e-05	1.49e-08	1.48e-08
	(0.0494)	(0.0495)	(0.000131)	(0.000135)	(2.11e-08)	(2.12e-08)
NetSales	9.37e-07	6.36e-07	-7.88e-09	3.78e-09	0	0
	(1.10e-06)	(8.38e-07)	(7.25e-08)	(7.35e-08)	(0)	(0)
Liquidity	233.7	232.6	12.74***	12.84***	-0.000132	-7.67e-05
	(211.0)	(210.6)	(3.399)	(3.394)	(0.000626)	(0.000624)
PE	-0.000110	-7.95e-05	-1.71e-05	-1.47e-05	2.10e-09	3.05e-09*
	(0.000120)	(9.66e-05)	(1.27e-05)	(1.25e-05)	(1.49e-09)	(1.72e-09)
Constant	383.1	211.0*	10.61	13.68	0.0124*	0.00924
	(263.3)	(109.6)	(14.24)	(12.36)	(0.00687)	(0.00591)
Firm Fixed Effect	Yes	No	Yes	No	Yes	No
Year Fixed Effect	Yes	No	Yes	No	Yes	No
Industry Fixed Effect	No	Yes	No	Yes	No	Yes
Observations	27,152	27,152	27,626	27,626	27,623	27,623
Adjusted R-squared	0.004	0.002	0.034	0.024	0.050	0.023
Number of firms	1,045	1,045	1,050	1,050	1,048	1,048

Table 4

(continued)

Panel B. Firm performance - pre-mandate *high* ESG score - 4 quarters

VARIABLES	(1) ROE	(2) ROE	(3) ROA	(4) ROA	(5) TobinsQ	(6) TobinsQ
post	**84.77****	**70.43***	**1.659*****	**0.701****	**0.000775*****	**0.000232*****
	(38.16)	(38.28)	(0.598)	(0.278)	(7.37e-05)	(4.36e-05)
DiD	**-61.78***	**-61.34***	**-0.887*****	**-0.874*****	**-0.000105***	**-0.000101***
	(35.25)	(34.64)	(0.314)	(0.315)	(6.07e-05)	(6.04e-05)
Size	-71.68**	-60.92**	-1.504***	-1.668***	-0.000278***	-0.000124
	(35.74)	(29.09)	(0.567)	(0.491)	(7.94e-05)	(7.82e-05)
Leverage	0.110	0.110	2.84e-05	2.10e-05	-2.22e-09	-2.72e-09
	(0.103)	(0.103)	(3.34e-05)	(3.28e-05)	(3.73e-09)	(4.15e-09)
NetSales	3.91e-06	3.77e-06	7.27e-08***	8.45e-08***	0	0
	(3.51e-06)	(3.39e-06)	(1.85e-08)	(1.86e-08)	(0)	(0)
Liquidity	12.83	0.811	9.580***	9.338***	0.000747***	0.000644**
	(115.6)	(108.9)	(1.707)	(1.686)	(0.000270)	(0.000277)
PE	-8.03e-05	-8.59e-05	-9.34e-06**	-9.28e-06**	3.20e-10	4.54e-10
	(8.25e-05)	(8.19e-05)	(3.77e-06)	(3.69e-06)	(4.44e-10)	(4.71e-10)
Constant	1,079**	925.2**	29.73***	31.53***	0.00530***	0.00313**
	(521.4)	(420.0)	(8.879)	(7.810)	(0.00125)	(0.00124)
Firm Fixed Effect	Yes	No	Yes	No	Yes	No
Year Fixed Effect	Yes	No	Yes	No	Yes	No
Industry Fixed Effect	No	Yes	No	Yes	No	Yes
Observations	23,830	23,830	24,333	24,333	24,337	24,337
Adjusted R-squared	0.025	0.024	0.061	0.035	0.086	0.026
Number of firms	678	678	679	679	679	679

Table 4 depicts the Diff-in-Diff results regarding the impact of the NFRD on firm performance in the subsets of low and high pre-mandate ESG-performance in the sample period Q1 2011 to Q4 2021. Control variables Size, Leverage, NetSales, Liquidity, PE are included. Firm-, Year-, and Industry-Fixed effects are included. In Panel B, PE is replaced by BM. Robust standard errors (in parentheses) and adjusted R-squared are provided. The symbols ***, **, * denote significance at the 1%, 5%, and 10% level respectively.

6.4 ESG and its individual pillar's performances were positively impacted

Having documented the effects of the mandatory disclosure shock on firm performance, the following section examines its effect on ESG performance. Table 5 shows how the mandate impacted the overall ESG score and its individual pillars. The results show that the ESG score and each individual pillar significantly improved at the 1% significance level in the post-mandate period. This trend might be due to the general rise in the topic of sustainability over the years and the increased focus and improvement of scores by firms. The effect on Post is more prominent when controlling for firm- and year-fixed effects than on industry-fixed effects, indicating that firm-specific factors drive the effect and heterogeneity exists within industries with regard to ESG, which is explained by ESG materiality. Overall, the scores on the individual pillars increased in the period after the mandate's introduction. The environmental pillar saw the strongest increase and the corporate governance pillar saw the lowest increase.

The coefficients of DiD indicate that the mandate significantly impacted the diverse ESG pillars of European firms, as well as the overall ESG score to different degrees and directions, compared to the matched American firms. The overall ESG score of the treated firms was positively affected by the mandate, but only the inclusion of industry-fixed effects yielded a significant change (at the 5% level). Interestingly, the environmental score decreased by -3.87% (-3.076%) after the mandate's introduction compared to the American control group, when controlling for firm- and year- (industry-) fixed effects at the 1% significance level. The social score showed only a significant increase when controlling for industry fixed effects at a 1% level, with a coefficient of 2.270%. Likewise, the governance score increases significantly at the 1% level by 4.425% (5.046%) when controlling for firm and year (industry) fixed effects.

In order to test the robustness of the results in Panels A, Panel B, and C show the same regression with the difference of using BM instead of PE as a profitability proxy in Panel B, and the initial regression performed on a smaller sample including only firms without any negative ROE or ROA observations. The results support the findings of Panel A. Across all Panels, the effects are more pronounced when controlling for industry-fixed effects for ESG, S, and G, and inversely less pronounced for the same control for the environmental score. Of the three pillars, the governance score had the highest increase compared with the unaffected control group.

Interestingly, while the coefficient on Post was the smallest in magnitude for the governance score, the magnitude of the coefficient on DiD is the greatest. This underscores that the G-score increased in affected European firms compared to unaffected American firms after the mandate's introduction.

The results suggest that while the mandate did indeed impact the individual ESG pillars, it did not, unlike expected, yield only positive results compared to the American control group. The American control group fared better in terms of environmental concerns after the mandate's introduction compared to the treated European group. However, both the social and the governance scores increased post-mandate relative to the control group, and the overall European score was likely balanced out by the contrasting changes in the individual pillars. This could be due to companies focusing on the latter two pillars, which might have been previously neglected and/or not reported on. Having reporting guidelines could have led firms to focus on and improve specific criteria. Hence, firms reporting necessary information improved their scores, but knowing which criteria are relevant for scoring might have decreased the barriers to achieving higher scores.

As scores are measured against the industry, industry benchmarks and thresholds might have increased over the years, making it harder to achieve high scores in the environmental pillar, which has long been the most important consideration. Next to that, environmental scores could have decreased due to tighter controls and firms being more cautious in order to prevent greenwashing. Moreover, while the mandate did not lead to an increase or improvement on the environmental pillar, it did not exclude the possibility that it led to positive social externalities that were not reflected in the score.

The introduction of the NFRD did lead to a significantly better sustainable performance in terms of ESG score of European firms compared to American firms in total, mainly driven by improvements in governance and social and despite the relative deterioration of environmental concerns.

Table 5: Difference-in-Differences on ESG Performance

Panel A. ESG Performance

VARIABLES	(1) ESG	(2) ESG	(3) E	(4) E	(5) S	(6) S	(7) G	(8) G
post	**19.25*** **	**7.734*** **	**21.03*** **	**9.617*** **	**20.51*** **	**8.032*** **	**15.28*** **	**5.104*** **
	(0.782)	(0.402)	(1.053)	(0.569)	(0.950)	(0.482)	(1.173)	(0.571)
DiD	0.512	**1.348** **	**-3.870*** **	**-3.076*** **	1.251	**2.270*** **	**4.425*** **	**5.046*** **
	(0.664)	(0.655)	(0.912)	(0.909)	(0.859)	(0.852)	(0.898)	(0.883)
Size	3.833***	8.235***	5.450***	9.777***	3.871***	8.707***	2.221**	6.071***
	(0.543)	(0.565)	(0.755)	(0.760)	(0.680)	(0.656)	(0.900)	(0.879)
Leverage	-1.78e-05	-2.48e-05	-4.39e-05	-5.10e-05	4.88e-05	3.64e-05	-6.89e-05	-6.80e-05
	(4.73e-05)	(4.63e-05)	(5.77e-05)	(5.42e-05)	(5.13e-05)	(5.18e-05)	(7.35e-05)	(7.24e-05)
NetSales	-2.44e-09	-4.51e-08	1.26e-08	-3.22e-08	-1.46e-08	-6.14e-08*	2.84e-10	-3.49e-08
	(3.20e-08)	(3.05e-08)	(4.94e-08)	(4.61e-08)	(3.80e-08)	(3.66e-08)	(3.63e-08)	(3.70e-08)
Liquidity	2.897	1.559	3.382	1.868	2.889	0.718	2.118	2.092
	(1.802)	(1.944)	(2.586)	(2.669)	(2.252)	(2.398)	(2.580)	(2.691)
PE	-1.95e-06	-1.43e-07	-8.87e-06	-7.47e-06	-1.54e-06	1.68e-07	4.40e-06	6.68e-06
	(2.19e-06)	(2.74e-06)	(7.51e-06)	(7.80e-06)	(2.92e-06)	(3.41e-06)	(5.05e-06)	(4.57e-06)
Constant	-16.21**	-79.29***	-49.04***	-110.3***	-15.58	-83.98***	13.41	-43.76***
	(8.217)	(8.677)	(11.45)	(11.63)	(10.27)	(10.06)	(13.73)	(13.53)
Firm FE	Yes	No	Yes	No	Yes	No	Yes	No
Year FE	Yes	No	Yes	No	Yes	No	Yes	No
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes
Observations	38,659	38,659	38,659	38,659	38,659	38,659	38,659	38,659
Adjusted R-squared	0.434	0.340	0.326	0.270	0.370	0.285	0.167	0.119
Number of firms	1,669	1,669	1,669	1,669	1,669	1,669	1,669	1,669

Panel B. ESG Performance - BM as Profitability Proxy

VARIABLES	(1) ESG	(2) ESG	(3) E	(4) E	(5) S	(6) S	(7) G	(8) G
post	**20.05*** **	**8.426*** **	**21.85*** **	**10.07*** **	**21.12*** **	**8.838*** **	**16.52*** **	**5.962*** **
	(0.723)	(0.385)	(0.988)	(0.547)	(0.864)	(0.461)	(1.067)	(0.531)
DiD	0.396	**1.417** **	**-3.949*** **	**-2.978*** **	1.071	**2.310*** **	**4.504*** **	**5.284*** **
	(0.643)	(0.635)	(0.887)	(0.878)	(0.829)	(0.827)	(0.854)	(0.840)
Size	3.428***	6.813***	4.358***	7.736***	3.348***	6.957***	2.317***	5.434***
	(0.469)	(0.488)	(0.654)	(0.664)	(0.594)	(0.593)	(0.728)	(0.714)
Leverage	-1.51e-05	-2.94e-05	-2.76e-05	-4.12e-05**	1.59e-05	-2.43e-06	-4.38e-05	-5.35e-05
	(2.20e-05)	(2.02e-05)	(2.04e-05)	(1.74e-05)	(1.75e-05)	(1.64e-05)	(3.55e-05)	(3.43e-05)
NetSales	2.00e-08	-1.74e-08	5.71e-08	1.79e-08	1.49e-08	-2.45e-08	-8.47e-09	-4.25e-08
	(2.92e-08)	(2.74e-08)	(4.44e-08)	(4.13e-08)	(3.52e-08)	(3.40e-08)	(3.43e-08)	(3.48e-08)
Liquidity	1.928	0.520	1.328	-0.245	1.894	-0.262	1.567	1.329
	(1.577)	(1.667)	(2.164)	(2.225)	(2.005)	(2.091)	(2.185)	(2.255)
BM	2.33e-05	-1.75e-05	1.90e-05	-1.37e-05	7.10e-05	2.20e-05	-3.89e-05	-7.52e-05
	(4.71e-05)	(4.96e-05)	(7.88e-05)	(7.37e-05)	(5.50e-05)	(5.49e-05)	(7.66e-05)	(8.52e-05)
Constant	-11.54	-58.11***	-34.29***	-80.08***	-8.885	-57.75***	10.55	-34.29***
	(7.065)	(7.430)	(9.856)	(10.10)	(8.941)	(9.042)	(11.01)	(10.90)
Firm FE	Yes	No	Yes	No	Yes	No	Yes	No
Year FE	Yes	No	Yes	No	Yes	No	Yes	No
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes
Observations	46,815	46,815	46,815	46,815	46,815	46,815	46,815	46,815
Adjusted R-squared	0.436	0.329	0.314	0.249	0.369	0.276	0.188	0.130
Number of firms	1,780	1,780	1,780	1,780	1,780	1,780	1,780	1,780

Panel C. ESG Performance - Robustness Check excluding firms with negative ROE and ROA

VARIABLES	(1) ESG	(2) ESG	(3) E	(4) E	(5) S	(6) S	(7) G	(8) G
post	**18.74*** **	**6.622*** **	**21.12*** **	**9.381*** **	**20.12*** **	**6.995*** **	**13.37*** **	**2.949*** **
	(1.165)	(0.539)	(1.566)	(0.761)	(1.401)	(0.648)	(1.791)	(0.794)
DiD	1.078	**1.862** **	**-4.417*** **	**-3.654*** **	1.711	**2.637** **	**5.731*** **	**6.307*** **
	(0.923)	(0.911)	(1.219)	(1.214)	(1.207)	(1.196)	(1.283)	(1.276)
Size	5.408***	11.48***	7.408***	13.35***	5.967***	12.72***	3.384**	8.350***
	(0.862)	(0.820)	(1.123)	(1.012)	(1.106)	(0.961)	(1.547)	(1.396)
Leverage	-0.000105	-9.47e-05	-0.000193	-0.000184	-4.33e-05	-4.69e-05	-0.000139	-0.000107
	(0.000100)	(0.000102)	(0.000127)	(0.000126)	(9.85e-05)	(9.85e-05)	(0.000153)	(0.000159)
NetSales	-1.35e-07**	-1.43e-07***	-2.12e-07***	-2.23e-07***	-1.61e-07**	-1.68e-07**	-3.13e-08	-3.65e-08
	(5.44e-08)	(5.03e-08)	(5.85e-08)	(5.45e-08)	(7.20e-08)	(6.87e-08)	(6.74e-08)	(6.63e-08)
Liquidity	4.433	4.061	3.099	2.547	4.367	3.277	5.006	5.868
	(2.758)	(3.039)	(3.721)	(3.943)	(3.540)	(3.824)	(3.753)	(3.899)
PE	-3.64e-06	-4.98e-07	2.95e-06	4.78e-06	-4.08e-06	-2.20e-06	-1.23e-05*	-6.39e-06
	(4.45e-06)	(6.08e-06)	(6.65e-06)	(6.56e-06)	(6.95e-06)	(8.72e-06)	(6.31e-06)	(7.87e-06)
Constant	-38.73***	-128.7***	-76.09***	-163.6***	-46.48***	-145.5***	-3.201	-78.82***
	(13.02)	(12.60)	(16.95)	(15.54)	(16.62)	(14.67)	(23.70)	(21.63)
Firm FE	Yes	No	Yes	No	Yes	No	Yes	No
Year FE	Yes	No	Yes	No	Yes	No	Yes	No
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes
Observations	21,275	21,275	21,275	21,275	21,275	21,275	21,275	21,275
Adjusted R-squared	0.463	0.387	0.379	0.333	0.405	0.341	0.163	0.119
Number of firms	761	761	761	761	761	761	761	761

Table 5 depicts the Diff-in-Diff results regarding the impact of the NFRD on ESG performance and its individual pillars in the sample period Q1 2011 to Q4 2021. Control variables Size, Leverage, NetSales, Liquidity, PE are included. Firm-, Year-, and Industry-Fixed effects are included. In Panel B, PE is replaced by BM. Robust standard errors (in parentheses) and adjusted R-squared are provided. The symbols ***, **, * denote significance at the 1%, 5%, and 10% level respectively.

7. Conclusion

This thesis examined the impact of the NFRD on firm and ESG performance of European firms relative to unaffected American firms since its enforcement in 2017.

First, overall firm profitability increased from the pre- to the post-period. However, when compared to American firms, European firms affected by the NFRD saw a decrease in ROA, ROE, and TobinsQ. Second, when adding a binary variable indicating above-median ESG performance into the regression, both ROA and Tobin's Q statistically decline subsequent to the mandate in European firms compared to American firms. On the other hand, ROE seems to be relatively less negatively affected in firms with high ESG scores than in those with low ESG scores. Third, when subdividing the sample depending on their pre-mandate performance of below versus over the yearly median for one, three, or five years, both groups, independent of pre-mandate ESG performance, experienced a decrease in profitability. Surprisingly, firms with high pre-mandate ESG scores show a larger decrease in the market profitability proxies ROE and Tobin's Q, whereas those with low pre-mandate scores show a more significant decrease in ROA. This is probably due to higher adoption costs in the reporting processes, reflected in higher SG&A expenses, and the related deterioration in operating profitability (Fiechter et al., 2022). Contrary to Grewal et al. (2019), who found stronger negative market reactions in returns as a result of the NFRD in low-performing firms, the performed analyses show that strong, mandated firms experienced a stronger decline in the market profitability proxies, ROE and Tobin's Q, compared to their American controls. Hence, the mandatory disclosure of non-financial information negatively impacted firm performance in European firms compared to the matched American firms. Moreover, high pre-mandate ESG scores do not seem to positively impact firm performance after the mandate's implementation, with the exception of a relatively less negative decrease in operating profitability.

Finally, the NFRD successfully increased the sustainability performance of European firms relative to American firms, especially in terms of corporate governance and social concerns. However, the average European firm achieved lower scores in the environmental pillar than the unaffected American firms subsequent to the mandate's introduction.

In conclusion, the improvement in investor communication and sustainable activities in social and corporate governance concerns was paid for by a relative decrease in profitability and firm performance as measured by ROE, ROA, and Tobin's Q. Hence, governments debating whether to

introduce a sustainable disclosure mandate need to decide whether the accompanying decrease in relative profitability is bearable for their local firms and if such a mandate is thus an effective policy tool for promoting local sustainability.

8. Limitations and Future Research

This study acknowledges several limitations that may affect the generalizability and robustness of the findings. Firstly, the analysis is based on the assumption that all large firms subject to the reporting requirements of the directive comply with it. However, some companies may not fully adhere to the reporting obligations, potentially introducing a bias into the results. Moreover, American firms can voluntarily publish non-financial reports and can follow the same voluntary standards, such as the OECD or GRI Reporting Guidelines. Secondly, due to a lack of data, the sample included no control for age. More mature firms tend to have more financial resources to use for reporting or have more experience in reporting practices and, therefore, could see a lower decrease in profitability. Additionally, while the nearest-neighbor matching improved the comparability of the two groups, the matching itself was only based on two variables, namely size and leverage.

Future research could include studying which underlying factors of ROE and ROA were the drivers of the statistically significant changes since the introduction of the mandate. While the study examined the overall impact on firm and ESG performance, it would be interesting to find the drivers of these changes, that is, if the change in performance was connected with sales revenue, operating expenses, non-operating income and expenses, and CSR spending for firm performance subsequent to the disclosure and adaption shock. Moreover, research could be conducted to determine which criteria of the individual ESG pillars were the most affected and which positive social externalities resulted from the improvement in the social and corporate governance pillars. Another interesting aspect would be to examine which criteria of the environmental score led to a relative decrease in the environmental score of European firms. Further analysis could be conducted on the impact of pre-mandate disclosure according to different existing CSR reporting frameworks, such as the GRI and OECD guidelines. It is possible that firms adhering to those benefitted frameworks pre-mandate had fewer adoption costs and were less negatively affected by the mandate's introduction.

Appendices

Appendix A: Variable Description

Variable	Description	Source
Employees	Represent the number of both full and part time employees of the company, excluding seasonal and emergency employees (Refinitiv, 2022).	Worldscope
Return on Assets ($ROA_{i,t}$)	Measure of firm's operating profitability independent of leverage. Is the ratio of Net Income over Average Shareholder's Equity (Chen et al., 2018).	Datastream
Return On Equity Total % ($ROE_{i,t}$)	Measure of firm's earning performance, calculated by dividing Net Income by Total Assets (Chen et al., 2018).	Datastream
Tobins's Q ($TobinsQ_{i,t}$)	Market Value of Assets divided by the book value of assets (Fiechter et al., 2022).	Worldscope
ESG Score ($ESG_{i,t}$)	Refinitiv's ESG Score is an overall company score based on the self-reported information in the environmental, social and corporate governance pillars (Refinitv, 2022).	Datastream
Environment Pillar Score ($E_{i,t}$)	Refinitiv's Environment Pillar Score is the weighted average relative rating of a company based on the reported environmental information and the resulting three environmental category scores (Refinitv, 2022).	Datastream
Governance Pillar Score ($G_{i,t}$)	Refinitiv's Social Pillar Score is the weighted average relative rating of a company based on the reported social information and the resulting four social category scores (Refinitv, 2022).	Datastream
Social Pillar Score ($S_{i,t}$)	Refinitiv's Governance Pillar Score is the weighted average relative rating of a company based on the reported governance information and the resulting three governance category scores (Refinitv, 2022).	Datastream
Leverage ($Leverage_{i,t}$)	Ratio of Total Liabilities to Total Assets (Chen et. al, 2018).	Worldscope
Size ($Size_{i,t}$)	Natural logarithm of Total Assets (Fiechter et al, 2022).	Worldscope
Net Sales ($NetSales_{i,t}$)	Net Sales represent gross sales and other operating revenue less discounts, returns and allowances (Refinitv, 2022).	Worldscope
Liquidity ($Liquidity_{i,t}$)	Ratio of Working Capital over Total Assets (Capon et al., 1990)	Worldscope
Price-to-Earnings ($PE_{i,t}$)	Ratio of Share Price divided by Earnings per Share (Ohlson & Gao, 2006).	Datastream
Book-to-Market ($BM_{i,t}$)	Ratio of Book Value of Equity divided by the Market Value of Equity (Fama & French, 1992).	Datastream
Post	Dummy variable indicating the period before (0) and after (1) the mandate's introduction in 2017.	
Treated	Dummy variable indicating whether the firm is affected (1) or unaffected by the NFRD.	
DiD	Dummy variable that equals 1 if the firm is affected by the NFRD and the observation is of the period after the mandate and equals 0 in all other cases.	
ESGmedian	Dummy variable that equals 1 if the firm achieved an ESG score over the yearly ESG median, and 0 if it is below.	

Appendix B: Sample Description

Panel A. Sample selection

Selection criteria	**EU sample**		**NYSE sample**		**NASDAQ sample**	
	firm-years	distinct firms	firm-years	distinct firms	firm-years	distinct firms
Start: EU 10 & U.S. firms (2011-2021 with data available)	127,485	2,833	71638	1648	137856	2872
Less observations of firms:						
without number of employees <499	-34,944	-198	-9,547	-83	-43262	-222
without TRESGS data	-54,946	-1753	-13,284	-458	-76,127	-2197
without ROE and ROA before 2017	-213	-5	-1026	-30	-357	-11
Final sample before matching:	37,383	877	47,781	1,077	18,110	442
Final sample after matching:	**34,276**	**817**	**40,745**	**1,004**	**14,456**	**370**

Panel B. Sample distribution per industry

	Pre-Matching Sample				**Matched Sample**			
	EU firms		U.S. firms		EU firms		U.S. firms	
	Firm-years	%	Firm-years	%	Firm-years	%	Firm-years	%
(1) Consumer Non-Durables	2,489	6.66%	3,462	5.25%	2,322	6.77%	3,012	5.46%
(2) Consumer Durables	2,052	5.49%	1,871	2.84%	1,796	5.24%	1,505	2.73%
(3) Manufacturing	7,939	21.24%	10,102	15.33%	7,516	21.93%	8,797	15.94%
(4) Energy	698	1.87%	2,288	3.47%	653	1.91%	1,982	3.59%
(5) HiTech	5,805	15.53%	10,693	16.23%	4,971	14.50%	7,764	14.06%
(6) Telcommunications	1,239	3.31%	1,518	2.30%	1,229	3.59%	1,375	2.49%
(7) Telephone and Television Transmission	2,884	7.71%	7,420	11.26%	2,508	7.32%	6,310	11.43%
(8) Shops	1,938	5.18%	4,827	7.33%	1,824	5.32%	3,899	7.06%
(9) Health	1,357	3.63%	2,772	4.21%	1,253	3.66%	2,455	4.45%
(10) Other	10,982	29.38%	20,938	31.78%	10,204	29.77%	18,102	32.79%
Total	37,383	100%	65,891	100%	34,276	100 %	55,201	100 %

Appendix C: Summary Statistics of the Treatment Group in the pre- and post-period

Panel A. Summary Statistics - Treatment Group: Pre

Variable	Obs	Mean	Std.	Min	Max
ROE	20,219	9.24	31.99	-1,011.76	512.62
ROA	20,292	4.72	8.53	-120.97	334.85
TobinsQ	17,745	0.00	0.05	0.00	2.55
ESG*	9,880	58.42	18.84	10.40	89.73
E*	9,880	61.62	25.16	0.00	95.46
S*	9,880	62.36	22.08	9.15	95.27
G*	9,880	50.56	22.23	6.34	93.62
ESGmedian	9,880	0.70	0.46	0.00	1.00
Leverage	20,879	140.62	3,393.63	-87737.18	223758.50
Size	20,879	14.82	2.17	1.95	22.58
NetSales*	20,852	8211279.00	18500000.00	19,446.00	130000000.00
Liquidity	18,321	0.14	0.18	-0.93	0.99
PE	14,819	1,297.09	6,272.47	0.00	328860.00
BM	17,771	956.56	3,793.62	-145270.30	90,671.29

Panel B. Summary Statistics - Treatment Group: Post

Variable	Obs	Mean	Std.	Min	Max
ROE	11,240	7.70	36.43	-2,006.63	308.42
ROA	11,293	4.14	6.71	-68.17	80.13
TobinsQ	11,201	0.00	0.00	0.00	0.01
ESG*	9,777	59.91	19.08	10.40	89.73
E*	9,777	56.48	25.56	0.00	95.46
S*	9,777	65.23	20.89	9.15	95.27
G*	9,777	55.02	22.40	6.34	93.62
ESGmedian	9,777	0.64	0.48	0.00	1.00
Leverage	11,378	111.40	312.45	-13,128.57	3,510.39
Size	11,378	15.05	2.08	9.69	22.49
NetSales*	11,382	8,127,150.00	17,800,000.00	19,446.00	130,000,000.00
Liquidity	10,028	0.13	0.18	-1.75	0.87
PE	9,476	1,151.37	5,976.80	0.17	319,954.20
BM	11,450	843.28	5,032.78	-141,542.30	67,287.23

Variables marked with a * were winsorized at a 99% level.

Appendix D: Summary Statistics of the Control Group in the pre- and post-period

Panel A. Summary Statistics - Control Group: Pre

Variable	Obs	Mean	Std.	Min	Max
ROE	29,891	1.92	832.05	-65,333.33	10,400.00
ROA	31,212	4.57	134.42	-4,652.08	10,450.35
TobinsQ	28,384	0.00	0.01	0.00	0.47
ESG*	20,803	44.77	19.57	10.40	89.73
E*	20,823	35.22	28.42	0.00	95.46
S*	20,808	46.44	21.19	9.15	95.27
G*	20,789	51.25	22.46	6.34	93.62
ESGmedian	20,803	0.41	0.49	0.00	1.00
Leverage	32,175	117.69	3,360.51	-108,024.70	218,359.00
Size	32,129	15.10	2.01	0.00	21.67
NetSales*	32,123	9,201,125.00	20,800,000.00	19,446.00	130,000,000.00
Liquidity	27,099	0.16	1.64	-123.96	1.00
PE	24,084	2,944.69	21,526.81	0.01	2,030,600.00
BM	28,372	656.59	2,116.62	-10,046.29	75,468.27

Panel B. Summary Statistics - Control Group: Post

Variable	Obs	Mean	Std.	Min	Max
ROE	16,517	27.58	561.42	-2,117.54	31,560.00
ROA	17,400	4.52	11.57	-144.50	161.45
TobinsQ	16,879	0.00	0.00	0.00	0.08
ESG*	16,659	49.24	19.43	10.40	89.73
E*	16,743	35.94	29.01	0.00	95.46
S*	16,597	51.11	21.63	9.15	95.27
G*	16,605	55.73	21.31	6.34	93.62
ESGmedian	16,659	0.42	0.49	0.00	1.00
Leverage	17,244	62.06	1,682.99	-50,578.26	56,139.29
Size	17,084	15.50	1.82	8.48	22.04
NetSales*	17,080	10,500,000.00	22,700,000.00	19,446.00	130,000,000.00
Liquidity	14,592	0.16	0.19	-0.93	0.97
PE	13,179	2,857.51	15,960.98	0.15	906,410.00
BM	16,900	713.35	3,042.98	-13,380.48	112,330.40

Variables marked with a * were winsorized at a 99% level.

Appendix E: Correlation Matrix of Dependent and Independent Variables

Panel F. Correlation Variables – Firm Performance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) ROE	1								
(2) ROA	0.0564	1							
(3) TobinsQ	0.0243	0.4323	1						
(4) Leverage	0.0787	-0.0071	-0.0302	1					
(5) Size	0.0119	-0.0738	-0.1557	0.0624	1				
(6) NetSales	0.0188	-0.0149	-0.095	0.0161	0.6434	1			
(7) Liquidity	-0.0073	0.2147	0.2104	-0.0694	-0.4082	-0.2152	1		
(8) PE	-0.0001	0.0057	0.0474	-0.0045	0.0345	0.0601	0.007	1	
(9) BM	-0.0064	-0.0915	-0.1241	0.0012	0.0232	-0.0015	-0.0144	-0.0111	1

Panel G. Correlation Variables – ESG Performance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) ESG*	1									
(2) E*	0.876	1								
(3) S*	0.9049	0.7723	1							
(4) G*	0.6424	0.3571	0.3697	1						
(5) Leverage	-0.0024	0.0053	0.0005	-0.0138	1					
(6) Size	0.536	0.5541	0.4656	0.3027	0.0208	1				
(7) NetSales	0.3561	0.3542	0.3115	0.2102	0.0008	0.672	1			
(8) Liquidity	-0.2467	-0.2488	-0.2202	-0.1229	-0.009	-0.3809	-0.202	1		
(9) PE	0.006	-0.0037	0.0017	0.0209	0.0009	0.0224	0.0554	0.0191	1	
(10) BM	0.0011	0.015	-0.0036	-0.0145	0.0061	0.0328	0.0031	-0.008	-0.0086	1

Appendix F: Robustness Check of Firm Performance with low/high pre-mandate ESG score of 12 quarters

Panel C. Firm performance - pre-mandate *low* ESG score - 12 quarters

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	ROE	ROE	ROA	ROA	TobinsQ	TobinsQ
post	62.79	31.91	1.073	0.618	**0.00119*** **	**0.000338*** **
	(56.11)	(35.07)	(0.881)	(0.387)	(0.000310)	(0.000111)
DiD	-26.45	-26.63	**-1.437*** **	**-1.443*** **	-8.53e-05	-9.47e-05
	(30.38)	(30.39)	(0.394)	(0.393)	(6.66e-05)	(6.47e-05)
Size	-28.10	-17.08**	-0.616	-0.839	-0.000718*	-0.000471
	(17.96)	(8.483)	(0.863)	(0.734)	(0.000421)	(0.000354)
Leverage	0.0473	0.0475	4.71e-05	4.92e-05	5.94e-09	5.64e-09
	(0.0485)	(0.0486)	(6.13e-05)	(6.38e-05)	(9.47e-09)	(9.57e-09)
NetSales	1.01e-06	8.14e-07	5.30e-08	6.56e-08	0	0
	(7.89e-07)	(6.32e-07)	(6.94e-08)	(7.16e-08)	(0)	(0)
Liquidity	205.8	204.8	12.53***	12.60***	0.000173	0.000208
	(182.3)	(181.9)	(3.007)	(3.005)	(0.000542)	(0.000545)
PE	-8.85e-05	-7.27e-05	-2.08e-05**	-1.95e-05**	1.02e-09	1.61e-09
	(8.07e-05)	(6.70e-05)	(9.33e-06)	(9.58e-06)	(1.02e-09)	(1.22e-09)
Constant	350.1*	199.9**	14.01	16.19	0.0109*	0.00781
	(205.5)	(86.11)	(12.19)	(10.57)	(0.00588)	(0.00506)
Firm Fixed Effect	Yes	No	Yes	No	Yes	No
Year Fixed Effect	Yes	No	Yes	No	Yes	No
Industry Fixed Effect	No	Yes	No	Yes	No	Yes
Observations	33,260	33,260	33,824	33,824	33,817	33,817
Adjusted R-squared	0.004	0.002	0.035	0.025	0.049	0.019
Number of firms	1,247	1,247	1,253	1,253	1,251	1,251

Appendix F

(continued)

Panel D. Firm performance - pre-mandate *high* ESG score - 12 quarters

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	ROE	ROE	ROA	ROA	TobinsQ	TobinsQ
post	**107.7****	**95.56***	**1.192***	**0.572***	**0.000747*****	**0.000230*****
	(51.64)	(53.50)	(0.614)	(0.326)	(8.08e-05)	(5.03e-05)
DiD	**-83.11***	**-82.10***	**-0.686****	**-0.667***	**-0.000122***	**-0.000114***
	(50.03)	(48.78)	(0.344)	(0.344)	(6.35e-05)	(6.30e-05)
Size	-95.10*	-82.76**	-1.753**	-1.994***	-0.000363***	-0.000224***
	(49.36)	(40.94)	(0.730)	(0.648)	(7.37e-05)	(7.28e-05)
Leverage	0.110	0.110	5.03e-05	3.38e-05	-6.04e-09	-6.83e-09
	(0.105)	(0.105)	(6.81e-05)	(7.38e-05)	(8.40e-09)	(9.55e-09)
NetSales	4.47e-06	4.30e-06	6.54e-08***	7.71e-08***	0	0
	(4.09e-06)	(3.94e-06)	(1.98e-08)	(1.97e-08)	(0)	(0)
Liquidity	-1.923	-19.81	8.745***	8.600***	0.000277	0.000172
	(162.7)	(150.9)	(1.700)	(1.677)	(0.000246)	(0.000247)
PE	-8.03e-05	-8.85e-05	-7.31e-06***	-7.23e-06***	4.63e-10	6.08e-10
	(9.57e-05)	(9.48e-05)	(2.67e-06)	(2.45e-06)	(3.94e-10)	(4.14e-10)
Constant	1,461**	1,283**	34.61***	37.45***	0.00679***	0.00479***
	(738.1)	(607.5)	(11.63)	(10.46)	(0.00119)	(0.00119)
Firm Fixed Effect	Yes	No	Yes	No	Yes	No
Year Fixed Effect	Yes	No	Yes	No	Yes	No
Industry Fixed Effect	No	Yes	No	Yes	No	Yes
Observations	17,722	17,722	18,135	18,135	18,143	18,143
Adjusted R-squared	0.025	0.024	0.064	0.037	0.086	0.026
Number of firms	476	476	476	476	476	476

Appendix G: Robustness Check of Firm Performance with low/high pre-mandate ESG score of 20 quarters

Panel E. Firm performance - pre-mandate *low* ESG score - 20 quarters

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	ROE	ROE	ROA	ROA	TobinsQ	TobinsQ
post	57.58	28.92	1.042	0.540	**0.00116*** **	**0.000315*** **
	(52.05)	(32.21)	(0.840)	(0.366)	(0.000297)	(0.000107)
DiD	-24.37	-24.57	**-1.338*** **	**-1.346*** **	-7.98e-05	-8.50e-05
	(28.34)	(28.33)	(0.375)	(0.374)	(6.29e-05)	(6.14e-05)
Size	-26.20	-16.17**	-0.672	-0.911	-0.000680*	-0.000438
	(16.67)	(7.778)	(0.823)	(0.695)	(0.000399)	(0.000335)
Leverage	0.0466	0.0468	4.48e-05	4.71e-05	5.66e-09	5.45e-09
	(0.0481)	(0.0482)	(6.09e-05)	(6.32e-05)	(9.45e-09)	(9.56e-09)
NetSales	8.28e-07	6.61e-07	5.47e-08	6.55e-08	0	0
	(6.30e-07)	(4.92e-07)	(5.53e-08)	(5.65e-08)	(0)	(0)
Liquidity	193.8	192.7	12.54***	12.58***	0.000215	0.000249
	(172.7)	(172.2)	(2.874)	(2.869)	(0.000521)	(0.000524)
PE	-3.63e-05	-3.02e-05	-1.00e-05*	-9.86e-06**	8.31e-10**	1.16e-09***
	(2.75e-05)	(2.03e-05)	(5.19e-06)	(4.97e-06)	(3.69e-10)	(4.22e-10)
Constant	330.8*	193.5**	14.88	17.39*	0.0105*	0.00742
	(192.1)	(80.19)	(11.69)	(10.07)	(0.00562)	(0.00481)
Firm Fixed Effect	Yes	No	Yes	No	Yes	No
Year Fixed Effect	Yes	No	Yes	No	Yes	No
Industry Fixed Effect	No	Yes	No	Yes	No	Yes
Observations	35,764	35,764	36,352	36,352	36,345	36,345
Adjusted R-squared	0.004	0.002	0.037	0.025	0.047	0.018
Number of firms	1,316	1,316	1,322	1,322	1,320	1,320

Appendix G

(continued)

Panel F. Firm performance - pre-mandate *high* ESG score - 20 quarters

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	ROE	ROE	ROA	ROA	TobinsQ	TobinsQ
post	**122.1****	**113.4***	**1.152***	**0.683***	**0.000749*****	**0.000264*****
	(57.52)	(63.18)	(0.648)	(0.348)	(8.39e-05)	(5.00e-05)
DiD	**-99.60***	**-99.09***	**-0.777****	**-0.756****	**-0.000149****	**-0.000146****
	(59.56)	(58.48)	(0.367)	(0.368)	(6.56e-05)	(6.57e-05)
Size	-102.7*	-89.90**	-1.621**	-1.856**	-0.000385***	-0.000254***
	(54.39)	(45.34)	(0.817)	(0.747)	(7.25e-05)	(7.33e-05)
Leverage	0.111	0.111	5.71e-05	3.99e-05	-5.72e-09	-6.18e-09
	(0.106)	(0.106)	(6.80e-05)	(7.37e-05)	(8.48e-09)	(9.65e-09)
NetSales	4.92e-06	4.72e-06	6.14e-08***	7.32e-08***	0**	0*
	(4.54e-06)	(4.36e-06)	(2.15e-08)	(2.14e-08)	(0)	(0)
Liquidity	9.552	-13.37	8.296***	8.202***	0.000155	3.12e-05
	(196.3)	(179.5)	(1.828)	(1.808)	(0.000270)	(0.000270)
PE	-0.000202	-0.000228	-1.15e-05**	-1.06e-05**	-2.34e-10	-1.44e-10
	(0.000262)	(0.000259)	(4.63e-06)	(4.77e-06)	(6.10e-10)	(6.77e-10)
Constant	1,580*	1,395**	32.76**	35.37***	0.00712***	0.00524***
	(819.7)	(677.9)	(13.14)	(12.14)	(0.00118)	(0.00120)
Firm Fixed Effect	Yes	No	Yes	No	Yes	No
Year Fixed Effect	Yes	No	Yes	No	Yes	No
Industry Fixed Effect	No	Yes	No	Yes	No	Yes
Observations	15,218	15,218	15,607	15,607	15,615	15,615
Adjusted R-squared	0.027	0.026	0.060	0.032	0.110	0.038
Number of firms	407	407	407	407	407	407

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