Junior Management Science 10(3) (2025) 677-714

Junior Management Science

www.jums.academy
ISSN: 2942-1861

Mandatory ESG Disclosure and Firm Value – A Quantitative Analysis of the Effect of Directive 2014/95/EU on Firm Value

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Abstract

This work offers novel insights into how the introduction of the Non-Financial Reporting Directive in the European Union in 2014 affected firm value. Based on the theoretical discourse, it seems ex-ante unclear how this ESG disclosure directive is perceived by capital markets and affects firm value. Hence, this work aims to shed more light on the topic and add to the scant evidence literature offers. Specifically, the implications of the first-time mandate of ESG information disclosure are investigated using an instrumental variable and a difference-in-difference approach on a propensity score-matched sample of 708 firms based in the European Union and the U.S. Difference-in-difference results imply that firm's ESG performance, measured by Refinitiv's ESG scores, significantly increases after the adoption of the directive. Subsequent instrumental variables analysis suggests that the increased ESG performance resulting from the directive is associated with relatively weak, negative effects for Tobin's Q as the measure of firm value. In addition to confirming anticipatory effects for Tobin's Q as early as 2014, significant evidence reveals that firms (sectors) with higher ESG performance had a more negative market reaction than firms (sectors) with lower ex-ante ESG performance.

Keywords: disclosure regulation; firm value; mandatory ESG reporting; market reaction; non-financial reporting directive (NFRD)

1. Introduction

"The Social Responsibility of Business Is to Increase Its Profits" (Friedman, 1970)

Following this narrow neoclassical economic view that Milton Friedman voiced in an essay in the *New York Times*, managers should only engage in business activities that maximise shareholder value. Friedman labelled it "immoral" of managers to engage in Corporate Social responsibility (CSR) activities and that this should be considered "stealing" from shareholders (Freeman & Dmytriyev, 2017; Friedman, 1970; Kitzmueller & Shimshack, 2012). Pointedly depicting the last 50 years of political and economic discussion about this controversial paradigm, the New York Times published 22 responses from CEOs, economists, and Nobel laureates to the "Friedman´s doctrine" on the 50^{th} anniversary of Friedman´s essay. Most of the former opposed Friedman's views and pleaded for a more stakeholder-oriented behaviour in business (Sorkin, 2020). Part of this move from Shareholder- to Stakeholder-value-centrism is the increasing focus on externalities that are neglected within a narrow interpretation of Friedman's paradigm (Liang & Renneboog, 2020; Magill et al., 2015).

With the plethora of interwoven problems such as climate change, hunger, and migration that the world faces, stakeholder-centrism has been more significant than ever before, as from a societal perspective, internalising externalities and distributing rights and assets across generations can support approaching these problems (Christensen et al., 2018; Howarth & Norgaard, 1992; Magill et al., 2015). This is why, in the last decades, integrating ESG[1] criteria in investment decisions has become a new normal. As the PRI reported, by March 2022, 4,902 investors and service

[1] Environmental, Social, and Governance; see Chapter 2.1 for further definition on the terminology.

DOI: https://doi.org/10.5282/jums/v10i3pp677-714

providers representing US$121.3 trillion of assets under management committed to incorporating ESG factors into their investment decisions (Principles for Responsible Investment, 2022). Along with the over the years steadily increasing demand for investing sustainably, the resulting demand for information on companies' ESG performance is growing as well (Amel-Zadeh & Serafeim, 2017; Berg et al., 2022; Eccles et al., 2011). Therefore, a resulting question will not evolve around whether or not to engage in CSR activities but if disclosure of information on ESG prompts value creation (Liang & Renneboog, 2020).

Responding to the increased focus on ESG criteria in investment decisions and the resulting demand for information on ESG performance, an augmented number of companies voluntarily disclose this information. For example, from 2010 to 2022, the number of S&P 500 companies voluntarily publishing ESG reports grew from 20% to 96% (G&A, 2021, 2023). In the U.S., afar from financial, risk, and litigation disclosure requirements concerning public companies and environmental issues, as well as human capital management-related aspects from 2020 onwards, no mandatory requirements on disclosing ESG information have been laid out (Cifrino, 2023). In comparison, many jurisdictions, such as the European Union (EU), have already introduced mandatory reporting mandates (Ioannou & Serafeim, 2017).

In 2014, the EU adopted the first directive to foster sustainability-related information disclosure: The Non-Financial Reporting Directive (2014/95/EU; NFRD)[2], which came into force in 2017. The NFRD, transitioning ESG reporting in the EU from voluntary to mandatory, requires large companies with more than 500 employees and more than EUR€ 20,000,000 of total assets or revenues of more than EUR€ 40,000,000 to publish information related to environmental matters, social matters and treatment of employees, respect for human rights, anti-corruption and bribery, and diversity on company boards (European Commission, 2014a).

Despite a growing body of research agreeing that voluntary and mandatory ESG disclosure affects firm value, current literature neither theoretically nor empirically provides a clear answer to whether this effect is positive or negative.[3] Research in favour of a firm value-increasing effect argues that, e.g., elevated ESG performance would lead to positive valuation effects (Bajic & Yurtoglu, 2018; Fatemi et al., 2018; Flammer, 2015; Ioannou & Serafeim, 2017) while opposing literature brings forward, e.g., that the mandated disclosure could incur higher costs for companies that would need to distinguish themselves from competing firms (Grewal et al., 2019; Ioannou & Serafeim, 2017). Not only is literature regarding firm value implications of ESG disclosure mandates inconsistent in its findings, it also is relatively scant and more recent (Christensen et al., 2021; Hummel & Jobst, 2022; Mittelbach-Hörmanseder et al., 2021). To support closing this research gap, the present study aims to answer the research question of how the introduction of the NFRD affected firm value.

The supranational and regulation-driven nature of this introduction across the EU presents an ideal setting to exploit the effect of mandatory ESG disclosure on firm value in a shock-based instrumental variables model (referred to as "IV" in the following) (Atanasov & Black, 2016; Christensen et al., 2017; La Torre et al., 2018; Leuz & Wysocki, 2015; Mittelbach-Hörmanseder et al., 2021). Specifically, the primary model comprises a two-staged least squares instrumental variables model (referred to as "2SLS" in the following) with a difference-in-difference Ordinary Least Squares (OLS) regression (referred to as "DID" in the following) in the first stage. In this first stage, the direct effect of the NFRD on the dependent variable ESG performance (measured as ESG score from Refinitiv) is predicted. In the second stage, the predicted values from the first stage are employed to predict the outcome of Tobin's Q. In addition to clustered standard errors and firm, year and sector-year fixed effects, various control variables such as size and leverage are included in the models. This model is run for the three subcomponent pillars of ESG as well. Furthermore, yearly effects are estimated in a two-staged DID model, and cross-sectional partitions are introduced based on sectoral affiliation and pre-directive ESG performance.

Five predictions are made to answer the research question of how the NFRD affected firm value. First, an on-average negative firm value reaction to the NFRD is hypothesised. Second, the reaction for prediction one will likely materialise differently depending on the topic concerned (Environmental, Social, or Governance). Third, this firm value reaction is likely more significant in the late post-period (2018-2019) than in the early post-period (2014-2017) of the directive. Fourth, in a cross-sectional partition, the effect of prediction one is likely to be more (less) significant for firms with lower (higher) pre-directive ESG performance. Fifth, entangled with prediction fours, sectoral affiliation is likely to be of relevance to firm value implications.

The statistically significant findings provide evidence that, on average, a firm's ESG performance increases after the adoption of the directive. Succeeding instrumental variables analysis utilising the predicted ESG performance from the first stage indicates that the positive and significant ESG performance is associated with negative effects for Tobin's Q as the measure of firm value. As yearly effects estimation indicates, this negative firm value outcome is most pronounced for the year of the directive's adoption, 2014, while it is 2015 for the ESG performance. Thus, demonstrating the existence of anticipatory effects after the adoption of the regulation. Additionally, the findings of this work corroborate the value-relevance of sector affiliation and pre-directive ESG performance of firms subject to the mandated disclosure. Statistically significant evidence brought forward in this work reveals that based on the sample, firms with

[2] Referred to as „NFRD", „the directive", or „the mandate" in the following.

[3] Despite the mixed literature, most of the empirical evidence implies a positive association between voluntary disclosure of ESG information and firm value. This indication needs to be treated, as mentioned, with carefulness due to the dual-selection problem (Christensen et al., 2021; Hummel & Jobst, 2022; Mittelbach-Hörmanseder et al., 2021).

higher ESG performance or those who belong to sectors with an on average high ESG rating had a more negative market reaction than firms with lower ex-ante ESG performance or those who belonged to lower ESG-rated sectors.

This work makes numerous research contributions. First, to the best of current knowledge, this study is the first to analyse the impact of the NFRD on firm value (proxied by Tobin's Q) in an instrumental variables setting, supported by results from difference-in-difference analyses. In addition, it is the first work that examines firm value consequences of the NFRD in a yearly effects model. As mentioned, this work expands limited research on the value implications of the NFRD and lends weight to the prevalent understanding that the NFRD had an overall negative effect on firm value (Fiechter et al., 2022; Grewal et al., 2019; Mittelbach-Hörmanseder et al., 2021). Besides, scholarship on the anticipatory effects of mandatory disclosure regulation (Fiechter et al., 2022; Grewal et al., 2019) as well as the relevance of sectoral affiliation (Cahan et al., 2016; Christensen et al., 2017; Eccles et al., 2012; Krueger, 2015a) and prior ESG performance (Fiechter et al., 2022; Grewal et al., 2019; Ioannou & Serafeim, 2017; Jackson et al., 2020; Mittelbach-Hörmanseder et al., 2021) is enriched by the insights generated in this work. As ESG disclosure regulation is a central topic of national and international interest, the findings of this work hold significance for regulators, policymakers, and firms alike.

The scope of this work is limited in various ways. This work mainly focuses on the overall effects of the NFRD on firm value and does not examine through which channels these effects materialise or why firms engage in the underlying ESG activities. Furthermore, it is pertinent to mention that this work analyses associations and not causal relationships and cannot be not entirely immune to the influence of flawed data (e.g., through greenwashing) provided by Refinitiv.

The remainder of this work is structured as follows. Chapter 2. provides background knowledge on mandatory ESG information disclosure and the theoretical concepts behind it and elucidates explicitly on the introduction of the NFRD in Europe. Chapter 3. offers a comprehensive overview of the literature related to mandatory ESG disclosure and its relationship with firm value. Based on the theoretical background and the literature review, the hypotheses 1. to 3. are developed in this chapter. Subsequently, Chapter 4. gives an overview of the sample construction and the main variables used in the empirical analysis. Chapter 5. follows with the research design to test the hypotheses to answer the research question. Results of the empirical analysis and robustness tests are reported in Chapter 6. This work concludes with Chapter 7. which summarises the findings and elaborates on the contributions, implications, and limitations and points out further research potential.

2. Background

2.1. Relevant Definitions

Since this work deals with the impact of the NFRD on firm value, clarifying the terminology related to the NFRD is indispensable to developing, analysing, and evaluating a thorough research agenda on the implications of such a policy intervention.

Terms such as "Sustainability", "Corporate Sustainability", "Corporate Citizenship", "Corporate Social Responsibility" (CSR), "non-financial", or "Environmental – Social – Governance" (ESG) pertaining to information, encompass terms that are related but different. The scientific literature still has not conclusively determined clear boundaries between the previous terms because of the ambiguity that is associated with the concepts (Christensen et al., 2021; Dhaliwal et al., 2011; Ioannou & Serafeim, 2017; Park et al., 2023; Sheehy & Farneti, 2021; Tarquinio & Posadas, 2020).

An example of this is the definition of a concept of non-financial information. As a shared agreement on this definition is missing, a definition of non-financial is still open to interpretation. Following a systematic literature review by Tarquinio and Posadas (2020), scholars mainly define this broad term with a residual definition, thus not explaining what non-financial information is but rather what it is not. Tarquinio and Posadas's (2020, p. 743) research highlights that non-financial information can also pertain to "intellectual capital information, strategy, business performance and risk." which may concern other areas than CSR, ESG, and sustainability. The authors conclude that the term non-financial, concerning disclosed information, forms a "genus", an umbrella term that can overlap and be synonymous with other information concepts such as ESG, CSR and Sustainability (Tarquinio & Posadas, 2020).

In a similar fashion, the terms CSR and ESG are interchangeably used as well. Both are the most predominant terms in the relevant literature, published by respected scholars in established journals consulted to create this research. (Christensen et al., 2021; Dhaliwal et al., 2011; Grewal et al., 2019; Ioannou & Serafeim, 2017; Liang & Renneboog, 2020; Mittelbach-Hörmanseder et al., 2021).

There are various definitions of CSR. Christensen et al. (2021, p. 1181) define CSR as "... corporate activities and policies that assess, manage, and govern a firm's responsibilities for and its impacts on society and the environment". CSR includes a wide range of activities that can be subsumed under the term "ESG". The acronym for "Environmental", "Social", and "Governance" is most commonly used in the capital markets environment, as the more clear division into three pillars makes it easier to distinguish, assign, and evaluate performance (Berg et al., 2022; Christensen et al., 2018; Harper Ho, 2016). For reasons of clarity and brevity, the terms ESG and CSR will be used interchangeably in the following work. Nevertheless, the term ESG will be used more frequently per its prior definition as the following work mainly examines non-financial disclosure in a capital markets environment. Moreover, in recent years, the term ESG

has gained increased traction in news and literature and will likely keep growing in importance (Christensen et al., 2018; Eccles et al., 2011; Pollman, 2021). A Google trends comparison (web search and news search) of the terms CSR and ESG can support this statement (*Appendix F;* Google Trends, 2023).

2.2. Non-financial Reporting in the European Union

With the supranational "Non-financial Reporting Directive" (NFRD; Council Directive 2014/95/EU), ESG disclosure was mandated by the EU for the first time. Driven by the goal to improve ESG disclosure of specific companies, on April 16, 2013, the European Commission proposed an amendment to the existing Accounting Directive (Directive 2013/34/EU). In the non-financial reporting realm, this directive set out requirements concerning policies, risks and outcomes linked to environmental and employee-related matters in annual financial statements (Allman & Won, 2022; Costa & Agostini, 2016). The NFRD was agreed on by the European Parliament and Council on February 26, 2014, and was adopted by the Parliament on April 15, 2014. Following Article 288 of the Treaty on the Functioning of the European Union, the member states were left to some degree of independence in the transposition of the directive into national law. The directive required the member states to adopt the directive into national law by the end of 2016. The first reporting year for companies to apply the directive was set to be the financial year starting on January 1, 2017, or during the calendar year 2017. Followingly, first-time reporting companies were mandated to publish the information in 2017 (Agliati, 2021; Allman & Won, 2022; European Commission, 2014a). All relevant events around the NFRD are tabulated in *Appendix C.*

The Directive 2014/95/EU (2014a) requires "large undertakings which are public-interest entities exceeding on their balance sheet dates the criterion of the average number of 500 employees during the financial year shall include in the management report a non-financial statement containing information to the extent necessary for an understanding of the undertaking's development, performance, position and impact of its activity, relating to, as a minimum, environmental, social and employee matters, respect for human rights, anti-corruption and bribery matters" (Article 19a (1); for further information on the scope of the directive, see Directive 2014/95/EU). With the included "double materiality" principle, companies are forced to disclose how ESG matters may affect the company's future and how the company affects society. Moreover, companies can decide not to implement policies pertaining to the matters mentioned in Article 19a (1). If they do so, companies "shall provide a clear and reasoned explanation for not doing so" (*ibidem*). This is referred to as the "comply-or-explain-approach". Not only do companies not need to follow a specific reporting guideline or framework for their disclosure, but they can – under specific requirements – publish a standalone ESG report (Article 1 (4)). The disclosures are to be checked in a binary manner by external auditors to determine whether they have been included. Even if there is no legally binding obligation to verify the contents of the disclosure, transposing countries can decide if they want the reported information to be verified by an external auditor (Article 1 (5); (6)).

A definition for "large undertakings that are public-interest entities" can be found in Article 2 of Directive 2013/34/EU (2013). Public interest entities include listed companies, credit institutions, insurance companies, and other companies "whose transferable securities are admitted to trading on a regulated market of any Member State" (Article 2 (1)). A company is a large undertaking if it fulfils two of the three requirements laid out in Article 3 (4): Balance sheet total of EUR€ 20,000,000, net turnover[4] of EUR€ 40,000,000, average number of employees during the financial year: 250 (European Commission, 2013).

Following the minimum thresholds, and with subsidiaries of other public interest entities exempted from the reporting mandate, the number of companies required to report under the NFRD sums to 1,956 (0.02% of all EU27 LLCs with 27% of total turnover of all EU LLCs and 86% market cap). Since member states are given the freedom to apply directive 2014/95/EU and 2013/354/EU to a broader set of firms in their national transposition, 13 states have introduced a wider definition of the minimum threshold, ramping up the number of mandated companies to around 11,500 (De Groen et al., 2020). Before the introduction of the NFRD, only around 2,500 larger undertakings disclosed ESG information regularly (European Commission, 2014b).

Since 2014, the EU has adopted five significant non-financial reporting legislations. The NFRD, the Capital Requirements Regulation II (CRR; Pillar 3 disclosure; publication on June 7, 2019), the Sustainable Finance Disclosure Regulation (SFDR; publication on December 9, 2019), the Taxonomy Regulation (publication on June 22, 2020), and the Corporate Sustainability Reporting Directive (CSRD; publication on December 16, 2022) (European Commission, 2019a, 2019b, 2020, 2022).

2.3. Principles of Mandatory ESG Information Disclosure in the Context of Firm Value

Simultaneous with the rise in interest in ESG information, regulation grew and, hence, the scientific literature on mandating non-financial information. In a study, Fiandrino et al. (2022) found that from 2016 onwards, nearly 60% of scientific literature on non-financial information was published between 2019 and 2021. Moreover, scientific literature output in this field also grew in absolute numbers during that time. Despite this increase in literature on non-financial information regulation in the past years, the prevalent arm of research in corporate information disclosure and

[4] Net turnover is defined by Directive 2013/34/EU (2013) as "the amounts derived from the sale of products and the provision of services after deducting sales rebates and value added tax and other taxes directly linked to turnover" (Article 2 (5)).

its regulation still concentrates on *financial* reporting and disclosure regulation. Within academic research on financial and non-financial information disclosure, scholars differentiate between mandatory and voluntary disclosure (Krueger, 2015a; Leuz & Wysocki, 2015).

The difference between mandatory and voluntary ESG disclosure research exists in the partly divergent theoretical basis for both. Opposed to the scientific discourse on mandatory reporting, the discourse on voluntary reporting of ESG information entails looking at, e.g., adoption decisions of individual subjects or reporting-standard adherence. These adoption decisions need not be undertaken by firms in a mandatory setting, but the firm's underlying considerations will play a role in hypothesizing the effect of the NFRD on firm value. (Christensen et al., 2018, 2021; Mittelbach-Hörmanseder et al., 2021). Since this work deals with the link between the NFRD and firm value, only theoretical economic and socio-political concepts related to this regulation, needed to draw profound assumptions and later on assess the potential impact of the NFRD on firm value, will be discussed for reasons of clarity and briefness.

ESG disclosure can have many economic consequences; not all can be mentioned in this concise theoretical overview. In the presence of the NFRD, however, from a conceptual point of view, the theoretical discussion about mandatory ESG disclosure begins with the two opposing "shareholder expense view" and the "stakeholder maximization view" (Grewal et al., 2019; Leuz & Wysocki, 2008; Manchiraju & Rajgopal, 2017; Mittelbach-Hörmanseder et al., 2021). The discussion will be expanded by thoughts from a framework proposed by Leuz and Wysocki (2008), who approach disclosure and reporting regulation from a firm-specific (microeconomic) and market-wide (macro-economic) angle.

Taking up Friedman's (1970) shareholder expense view from the introduction of this work, it follows that CSR activities have a negative influence on firm value as a firm engages in CSR activities at the expense of shareholders (Mittelbach-Hörmanseder et al., 2021). Costs associated with this include direct costs and indirect costs. Direct costs resulting from a mandated ESG disclosure regime stem from complying with the NFRD (e.g. preparing the report or adapting internal processes). As Grewal et al. (2019) point out, these costs are relatively lower than others. An ex-ante assessment of the cost to comply with the NFRD resulted in an average administrative cost of EUR€ 82,000 per firm per year (De Groen et al., 2020). The political and proprietary costs are more significant for assessing the impact of the NFRD on firm value. Both form the indirect cost part. Proprietary costs refer to a potential decrease in the competitiveness of a firm subject to the mandate and thus influence its current and future attractiveness for investors. A firm will moreover carry costs if it decides to maintain its weak ESG performance and, e.g., pay for penalties or if it decides to improve its ESG performance (Chang et al., 2022; Christensen et al., 2021; Grewal et al., 2019). Political costs relate to current and priced-in future costs stemming from the politically induced pursuit of an investment, which is perceived as an investment carrying a negative net present value to shareholders. Actors asserting pressure can be the government, the regulator, or other interest groups, whether governmental or non-governmental. (Chang et al., 2022; Grewal et al., 2019; Healy & Palepu, 2001; Jensen & Meckling, 1978; Watts & Zimmerman, 1978).

In contrast to the cost that a firm is confronted with when disclosing ESG information, the stakeholder maximization view posits that benefits can come along with it as well, and firm value can be positively affected (Deng et al., 2013; Mittelbach-Hörmanseder et al., 2021). Analogue to the costs, the benefits can again be split into capital market effects and real effects, which concern the behaviour of the disclosing firm. Both effects are interconnected and relevant for the implications of the NFRD for firm value, as capital market effects are a tangible visualization of the expected real effects (e.g., benefits) for the disclosing firm (Leuz & Wysocki, 2015). From an investor point of view, the most significant benefit of mandatory disclosure of ESG information is the reduction of information asymmetries between a firm and potential investors as well as within a group of investors (Christensen et al., 2021; Verrecchia, 2001). First, mitigating the adverse selection problem leads to a lowered return threshold at which investors may be willing to invest in a firm (Amihud & Mendelson, 1986; Constantinides, 1986). Second, the information risk for an investor is lowered. The investor can have a more informed approach to valuing a firm, predicting a firm's future potential, and assessing a firm's risks, hence reducing the firm's cost of capital (Easley & O'Hara, 2004; Grewal et al., 2019; Krueger et al., 2021; Lambert et al., 2012). Third, monitoring effectiveness, e.g., observing environmental performance, is increased and, thus, corporate investment efficiency alike (Krueger et al., 2021; Lambert et al., 2007). Fourth, mandated ESG disclosure could advance the operational efficiency of a firm by forcing them to improve product quality, reduce energy consumption and waste and enhance the firm's reputation, brand value, or employee retention, among other reasons (Chang et al., 2022; Christensen et al., 2021; Grewal et al., 2019; Ioannou & Serafeim, 2017).

If only approached from a (net) benefit-to-the-firm view, following the full-disclosure-equilibrium, disclosure can be kept in a voluntary setting, and no need for regulatory intervention is given, as Leuz and Wysocki (2008) point out in detail. Conversely, considering the existence of firm-specific and market-wide costs and benefits, the overall equation may favour mandatory ESG disclosure even if firm-specific net benefits are negative, as higher market-wide net benefits can compensate for them. Moreover, even if market-wide, beneficial effects are significant, in most cases, these effects cannot be internalized by companies which would thus not disclose ESG information voluntarily. Hence, mandatory disclosure can help provide an optimal level of ESG disclosure (Christensen et al., 2021; Leuz & Wysocki, 2008).

As mentioned, market-wide net benefits are not internalized by firms and, thus, play a minor role in assessing the effects of the NFRD on firm value. Nevertheless, they

were still mentioned as they are crucial in understanding the motivation for mandating ESG disclosure in the European Union. Assessing the aggregated effect of the NFRD on firm value implies the need to hypothesize whether the aggregated economic effect is positive or negative. The effect is the sum of the net benefit of every firm expected by the market. This individual net benefit can vary depending on various factors outlined in the previous chapter as well as existing pre-directive reporting on ESG, sector affiliation, and further (Grewal et al., 2019; Mittelbach-Hörmanseder et al., 2021). It has to be mentioned that a potential negative outcome in firm value does not necessarily imply that aggregated economic value has been destroyed. Moreso, embedded in an extended economic analysis, this work can be part of an overall analysis of the benefits of the NFRD for society.

2.4. Background on Mandatory ESG Information Disclosure

Decades of environmental and social activism preceded the world's first mandatory ESG reporting mandates. It was only in the 60's and 70's of the past century that companies were increasingly held accountable for their negative environmental and social impact. For example, in the 1960s, Vietnam War protestors demanded university endowment funds to step down from investments in the defence sector (Oreskes, 1985). The first attempts at voluntary social reporting were made in Europe by France and the Netherlands, swiftly followed by Austria, Switzerland, and Germany. In the 1980s – from a more religiously motivated impetus – ethical investment funds from the United Kingdom and the United States began basing investment decisions on a "negative screening" approach. This excluded companies from their investment universe that engaged in business labelled as "sinful", such as gambling, alcohol, and tobacco. In the 1990s, the trend for more ESG focus in investment decisions grew more substantially due to increased societal pressure following various environmental disasters and media coverage over the consequences of globalization (Ioannou & Serafeim, 2017; Kolk, 2003). As a result, the United Nations Environment Program (UNEP) and the Coalition for Environmentally Responsible Economies (CERES) jointly created the Global Reporting Initiative (GRI) in 1997, which provides the world's most widely used sustainability reporting standard covering each E, S, and G pillar (GRI, 2022).

Around the time of the Global Financial Crisis, investors and the public increasingly demanded reporting on ESG matters. Following these demands, a growing number of countries began mandating ESG information disclosure in the early 2000's. Countries such as France (2001), Australia (2003), Canada (2004), Malaysia (2007), Denmark (2008), China (2008), or South Africa (2010) all issued various mandatory ESG disclosure regulations around that time (Krueger et al., 2021). A landmark event in the century following was the Paris Agreement on Climate Change in 2015, as well as the adoption of the Sustainable Development Goals (SDGs) by the United Nations in the same year. Both events pointedly put climate change and sustainability into the spotlight of the world stage (Hummel & Jobst, 2022). As of 2020, the Carrots and Sticks[5] database listed 1,102 active, mandatory ESG policies in 84 countries worldwide (Van der Lugt et al., 2020).

In the context of ESG disclosure mandates, the United States (U.S.) remain a particular case. Until now, afar from financial, risk, and litigation disclosure requirements concerning public companies with environmental issues and human capital management-related aspects from 2020 onwards, no mandatory requirements on disclosing ESG information have been introduced (Cifrino, 2023). This is one reason why the U.S. represents a clean control group to assess the impact of the NFRD. According to the Governance and Accountability Institute (G&A), the number of S&P 500 companies voluntarily publishing ESG reports grew from 20% to 96% from 2010 to 2022 (G&A, 2021, 2023). In March 2022, the U.S. Securities and Exchange Commission proposed a novel mandate requiring registered foreign or domestic firms to include climate-related information, from GHG emissions to climate risks, in registration statements and reports such as the 10-K annual report (S&P Global, 2023). In April 2023, the SEC updated the status of the mandate, with most agenda points showing finalization dates between October 2023 and April 2024 (U.S. General Services Administration, 2023).

3. Literature Review and Hypotheses Development

3.1. Prior Research on the Relationship of Mandatory ESG Disclosure and Firm Value

After a short introduction to why the NFRD constitutes an ideal research setting for a paper on the association of ESG disclosure and firm value, an overview of the scientific evidence on mandatory ESG information disclosure and its effect on firm value is laid out. First, concerning non-European countries and second, concerning European countries. As mentioned, this work does not analyse the channels through which value is generated or destroyed by an ESG mandate and therefore, no literature review on studies analysing these drivers will be given. Moreover, following the classification into first- and second-order consequences, this review of the existing literature shall mainly focus on second-order NFRD effects pertaining to capital markets, especially firm value (measured as Tobin's Q).

As constituted by various scholars, the NFRD – due to its nature of being a discrete, external shock to governance in the EU causing an exogenous and random assignment of control and treatment groups – provides an optimal setting to improve the credibility of the potential association of firm value and the NFRD tested in this paper. In a voluntary setting, researching ESG disclosure falls prey to a dual-selection problem as it depends on voluntary ESG activities of companies and their choices in reporting about these (Christensen

[5] Carrots & Sticks is a joint project between KPMG, the GRI, UNEP, and the Centre for Corporate Governance in Africa from the University of Stellenbosch. It assesses the regulatory landscape of non-financial and sustainability reporting (Gibbons, 2020; Van der Lugt et al., 2020).

et al., 2021; Fiechter et al., 2022; Ioannou & Serafeim, 2017; Ottenstein et al., 2022). As Atanasov and Black (2016) point out, so-called "legal shocks" come from legal rules or changes in those – like the NFRD – and are the most convincing for research designs.

Overall, the literature on the disclosure of ESG information differs between voluntary and mandatory disclosure. Within the literature on mandatory disclosure, a further differentiation can be drawn between first- and second-order consequences. First-order or direct consequences refer to effects like reporting quantity or quality attributable to a change in the regulatory environment. Second-order or indirect consequences include effects on the firm itself, investors and lenders, or society at large (Gulenko, 2018; Ottenstein et al., 2022). It is perhaps striking that even though the EU emphasizes its high expectations on second-order consequences in a memo released around the time of the mandate of the NFRD, most scientific publications have been conducted in the field of voluntary disclosure at that time. Only after the construction of the NFRD more publications on mandatory disclosure were released (Christensen et al., 2018; European Commission, 2014b; Gulenko, 2018).

Empirical evidence agrees that voluntary and mandatory ESG disclosure affects firm value. However, current literature does not clearly answer whether this effect is positive or negative[6]. Not only is literature regarding firm value implications of ESG disclosure mandates inconsistent in its findings, but it also is relatively scant and more recent since this type of disclosure became more common relatively recently compared to voluntary reporting (Christensen et al., 2021; Hummel & Jobst, 2022; Mittelbach-Hörmanseder et al., 2021).

A literature review dealing with the firm value implications of ESG disclosure mandates in countries outside the EU also shows mixed results. Four of the five mentioned relatively recent publications report a positive and only one a negative association of mandated ESG reporting with firm value.[7]

In the research for this work, one of the most cited contributions was produced by Ioannis Ioannou and George Serafeim in 2017. Their study explores the implications of ESG disclosure regulations in China, Denmark, Malaysia, and South Africa from just before 2011 utilizing a propensity score matched, two-staged differences-in-differences and IV setting. They find that treated companies significantly augmented ESG disclosure after the introduction of a disclosure mandate. This resulting increase, they conclude, is associated with increases in firm value, measured by Tobin's Q. Ioannou and Serafeim point out that it is challenging to separate the reporting effects from the effects of possible changes in the underlying ESG or other firm activities around the directive (Ioannou & Serafeim, 2017).

Approaching worldwide ESG disclosure mandates from a Mergers & Acquisitions (M&A) angle, T. Li et al. (2023) employ a difference-in-difference approach with a global M&A and divestiture data set spanning the years 2000 to 2020. They find that acquisitions following mandated ESG disclosure increase companies' ESG performance and may create long-term firm value. Using Tobin's Q as a proxy for firm value, their findings indicate a positive and statistically significant impact of acquisitions following ESG disclosure mandates on firm value after the adoption year of the respective mandate. In contrast, T. Li et al. (2023) state that when weak-ESG assets are divested following a mandate, divesting firms only experience a short-term improvement in their ESG scores, which does not translate into a higher firm valuation (T. Li et al., 2023).

In a similar vein, two studies examine Integrated Reporting in South Africa – a subset country of Ioannou and Serafeim's work – and find a positive relationship between mandated ESG disclosure and firm value. Lee and Yeo (2016) further conclude that following the mandated disclosure of Integrated Reporting through the King III Report on Corporate Governance in 2010, results of an on average positive relationship suggest that the benefits of the mandate exceed its costs. In a similar study, Barth et al. (2017) analyse – among other things covered – how firm value (measured by Tobin's Q) is positively associated with the quality of companies' Integrated Reporting after its introduction. Barth et al. (2017) judge their work's findings to be consistent with the results drawn out by Lee and Yeo (2016).

Moving from the African to the Asian continent, Chen et al. (2018) exploit an ESG disclosure mandate introduced on certain stock exchanges in China in 2008. Using a difference-in-difference design with a sample of 3,120 firm-year observations, they find that mandatory ESG disclosure is negatively associated with firm value and investment. Chen et al. conclude that their findings indicate that mandatory CSR disclosure changes firm behaviour and produces positive externalities, thus leading to costs for shareholders (Chen et al., 2018).

Similar results are reported by Manchiraju and Rajgopal (2017), who study Clause 135 of the Companies Act introduced in India in 2013, requiring companies above a certain threshold to spend 2% of their average net profits of the prior three years on ESG activities. Like the NFRD, Clause 135 is constructed in a "comply-or-explain" approach. Importantly, this law and the study concern the value implications of ESG *activities* and follow a mandate on ESG spending and *not* reporting. Utilizing an event study approach combined with a regression discontinuity design, Manchiraju and Rajgopal calculate a 4.1% drop in the stock price of companies subject to the mandate after the introduction of the legislation. Interestingly, they state that the mandate does not negatively affect companies that spend more on advertising. Measured by Tobin's Q, the long-term firm value is negatively influenced by the ESG mandate. The same mandate is exploited by Bha-

[6] Despite the mixed literature, most of the empirical evidence imply a positive association between voluntary disclosure of ESG information and firm value. This indication needs to be treated, as mentioned, with carefulness due to the dual-selection problem (Christensen et al., 2021; Hummel & Jobst, 2022; Mittelbach-Hörmanseder et al., 2021).

[7] The three papers concerning India are excluded as Clause 135 targets ESG spending instead of reporting.

gawan and Mukhopadhyay (2019), who apply a difference-in-difference setting combined with matching to evaluate the impact of Clause 135 on Tobin's Q as a measure of firm value. Contrasting the findings of Manchiraju and Rajgopal, Bhagawan and Mukhopadhyay find a positive and statistically significant impact on firm value. A third study harnessing Clause 135, published by Jadiyappa et al. (2021), results in a positive association of firm value (Tobin's Q) with increased ESG spending as well.

In the United Kingdom (UK), every firm was made to report comprehensive data on their GHG emissions in their annual reports by "The Companies Act 2006 (Strategic Report and Directors' Report) Regulations 2013", passed in July 2013. Krueger (2015a) leverages this mandate to investigate the effect of mandated greenhouse gas emissions disclosure on firm value (measured by Tobin's Q). Krueger not only uncovers that companies more significantly affected by the regulation were more strongly positively affected in valuation but also finds that an increase in valuation was most significant for larger firms and firms from carbon-intensive industries such as oil and gas. Compared to other works that do not, Krueger analyses the channels through which carbon disclosure affected firm value and indicates that capital market effects have more influence on value than real effects. According to his research, the mandate, on average, increased market liquidity and lowered information asymmetries (Krueger, 2015a).

Focussing on literature concerning the NFRD in Europe, in contrast to the studies relating to non-European countries/worldwide settings, the three studies mentioned show negative results regarding the equity market perception of mandatory ESG disclosure. Next to the study of Ioannou and Serafeim (2017), Grewal et al. (2019) was one of the studies most cited in the literature consulted for this work. In their study, Grewal, Riedl, and Serafeim assessed the stock returns of affected companies around significant events leading up to the entry into force of the NFRD. They found evidence that the NFRD, on average, leads to a negative market reaction. This negative reaction was more strongly pronounced for firms with lower pre-directive ESG performance and -disclosure levels. Grewal et al. (2019) conclude that investors evaluate the NFRD to be, on average, costly to firms and especially to those with weak pre-directive ESG performance and disclosure levels, as they would be forced to disclose additional ESG information. According to the study, this negative reaction is linked to proprietary and political costs.

Fiechter et al. (2022) inspect real effects following the introduction of the NFRD and document that affected companies increased their ESG activities and that they started doing so before the NFRD came into force in 2017. These effects were more pronounced for companies with lower pre-directive levels of ESG reporting and activities (high exposure[8]). For the measures of total ESG activities and the social score measure, Fiechter et al. (2022) outline increases for high-exposure firms as early as 2014. The authors conclude that the treatment effects are economically meaningful, with an increase in ESG for the mentioned high-exposure firms of 1.3% (2014), 2.4% (2015), 3.8% (2016), 3.8% (2017), and 6.8% (2018), relative to the base year 2013. No significant treatment effect for the environmental score measure was discovered on average. The authors hypothesize three potential explanations for the pre-directive increase in ESG activity and reporting: Internal development and efficiency increases from preparations for the mandate, increased public attention around the NFRD (see also Christensen et al., 2017; Grewal et al., 2019), and anticipation of potential adverse stakeholder reactions following mandated disclosure (including anticipation of potential stricter regulation see also Leuz and Wysocki (2015) and Manchiraju and Rajgopal (2017)). Besides, in concert with the results of Grewal et al., Fiechter et al. state a negative effect of the directive on Tobin's Q for EU companies, which is more distinct for high-exposure firms than low-exposure firms. However, that difference is statistically insignificant. Finally, as Fiechter et al. point out, the negative effect of the NFRD on Tobin's Q is concentrated in high-exposure firms with comparatively lower increases in ESG activities following the NFRD (Fiechter et al., 2022).

In line with the findings of Fiechter et al. (2022), Mittelbach-Hörmanseder et al. (2021) indicate a negative association of share prices of STOXX Europe 600 noted companies with mandatory ESG reporting following the introduction of the NFRD. They use textual analysis with a self-constructed topic-specific disclosure measure for the period between 2008 and 2016, which indicates an either positive or statistically insignificant relationship between ESG disclosure and share prices for the pre-announcement period (Mittelbach-Hörmanseder et al., 2021). For example, Rossi and Harjoto (2020) report a positive correlation of Tobin's Q following two Italian Legislative Decrees 231/2001 and 254/2016. The problem with this work lies in, first, the small number of companies in the sample (N=156) and even more so second, in the entanglement of mandatory (Decree 254/2016) and voluntary (Decree 231/2001) disclosure which, as learned from extant literature, delivers divided results. Thus, this work will not consider Rossi and Harjoto's results.

In a nutshell, it seems ex-ante unclear how mandatory ESG disclosure may impact capital markets and, in particular, firm value based on the current theoretical discourse. Resultingly, this work aims to shed more light on the topic and add to the scant evidence literature offers. It has to be noted that the empirical analysis conducted in this work does not cover the channels of value creation (such as the increased level of disclosure or the changes in firm behaviour).

[8] According to Fiechter et al. (2022), exposure firms are firms with low levels of pre-directive ESG performance (activities) and disclosure (reporting). Fiechter et al. measure *reporting* with a self-constructed variable consisting of various ASSET4 categories. *Activities* are measured using the Social and Environmental score provided by ASSET4 (Fiechter et al., 2022).

3.2. Hypotheses Development

In light of the theoretical foundation and the current state of scientific literature, the need to further empirically evaluate the effect of the NFRD on firm value arises. First, the absolute effect of the NFRD on firm value for the population of subject firms is hypothesized. Afterwards, cross-sectional effects depending on specific firm characteristics potentially leading to varying investor reactions are predicted. In total, five central predictions are made.

Taking up the theoretical perspectives unfolded in Chapter 2.3 again, it became clear that mandatory disclosure regulation seeks to increase firms' ESG information transparency by enforcing the disclosure of both positive and negative information, which otherwise may not be released (Ioannou & Serafeim, 2017; Verrecchia, 2001). Following Christensen et al. (2021) and Fatemi et al. (2018), it can be concluded that the magnitude of the capital market reaction to the passage of the NFRD in 2014 – in form of an adaption of firm value – fundamentally relies, first, on the net benefit to the firm on an aggregate level (as valued by capital markets), and second, on the level at which companies withhold material ESG information prior to the announcement of the NFRD.

Literature regarding mandatory financial disclosure and voluntary ESG disclosure that finds a positive association with firm value typically suffers from the dual-selection problem, which is less prevalent in the mandatory context (Christensen et al., 2021; Hummel & Jobst, 2022). In contrast to the voluntary setting, the implications of mandatory ESG disclosure for firm value are ex-ante unclear. To hypothesize the aggregate effect of the mandated disclosure in the European Union, costs and benefits to the affected firms, pre-directive disclosure levels, market valuation of information, and flaws in the construction of the mandate need to be evaluated from a capital market perspective.

On the benefit side, literature suggests that more and better ESG information can benefit capital markets through a lowered return threshold at which investors may be willing to invest in a firm, lower information risk (resulting in e.g., improved performance prediction), investor investment efficiency, greater liquidity, and lower cost of capital (Amihud & Mendelson, 1986; Chang et al., 2022; Christensen et al., 2021; Constantinides, 1986; Easley & O'Hara, 2004; Grewal et al., 2019; Krueger et al., 2021; Lambert et al., 2007, 2012). Moreover, the more and better disclosure of ESG information can change firm behaviour or mitigate externalities. It can incentivize firms to adapt behaviour and thus become more efficient. Firms may ramp up their carbon emission reduction efforts, improve employee retention and engagement, increase efficiencies in their supply chain or buyer/supplier relationship or improve overall safety and quality measures (Darendeli et al., 2022; Ioannou & Serafeim, 2017; La Porta et al., 2000; Wang, 2023). For example, Konar and Cohen (1997) and Schlenker and Scorse (2017) found that a rise in information availability increases operation efficiency and environmental performance. Cutler et al. (2004) show evidence that this increased information availability can improve surgery results. As Eccles et al. (2014) and Ioannou and Serafeim (2017) point out, the positive effects can derive either from the regulation itself or since the market views the mandated disclosure regulation (here: the NFRD) as a strong signal of a government's commitment to sustainability, the role of ESG information for society, and potential (more severe) regulation in the future. Indeed, during the time of the introduction of the NFRD, the Paris Agreement, an international treaty on climate change, was adopted by 196 countries at the United Nations Climate Change Conference (COP21) in Paris on December 12, 2015. This landmark event showcased the severeness of climate change and government commitment to sustainability – and thus also ESG information disclosure – since, for the first time, a binding agreement unifies all nations to combat climate change and its effects (UNFCCC, n.d.). All of the benefits mentioned may be viewed positively by investors and thus increase firm value.

Nevertheless, research suggests that markets do not efficiently price ESG information and its benefits. Choi et al. (2020) suggest that investors underreact to climate change risks following the observation that stocks of carbon-intensive firms underperform firms with low carbon emissions in abnormally warm weather. Additionally, they discover that in contrast to institutional investors, retail investors sell carbon-intensive firms in such weather. In a similar vein, Stroebel and Wurgler (2021) and Krueger et al. (2020) find that a significant majority of financial economists judge financial markets to underestimate climate risk and that institutional investors believe that equity valuations do not entirely reflect climate risk. Combining these relatively recent insights with the steep increase in interest in sustainability and ESG information and their incorporation in investment decisions in the last years is outlined in Chapter 2.3 and the introduction, it becomes evident that the mispricing of ESG information must have been even more pronounced during the time of the NFRD passage. At that time, the standalone benefits resulting from the passage of the NFRD in 2014 may have been viewed as significantly less value-enhancing than they were actually.

Contrasting the benefits, investors may anticipate various sources of cost. As mentioned earlier, these can be split into direct and indirect costs. Direct costs resulting from a mandated CSR disclosure regime stem from complying with the NFRD through implementation efforts or operating costs. As Grewal et al. (2019) and De Groen et al. (2020) point out, these costs are relatively lower than others. More significant for the value relevance of the NFRD are political and proprietary costs. Together, these form the indirect cost part. Political costs relate to current and priced-in future costs stemming from the politically induced pursuit of an investment, which is perceived as an investment carrying a negative net present value to shareholders. These can include costs for expanding and adjusting ESG activities to enhance ESG performance (Christensen et al., 2021). Proprietary costs refer to a potential decrease in the competitiveness of a firm subject to the mandate and thus influence its current and future attractiveness for investors. A firm will moreover carry costs

if it decides to maintain its weak ESG performance and, e.g., pay for penalties or if it decides to improve its ESG performance (Chang et al., 2022; Grewal et al., 2019; Healy & Palepu, 2001; Jensen & Meckling, 1978; Watts & Zimmerman, 1978). Furthermore, the mandated ESG disclosure in the EU could have levelled the playing field and thus prevented firms with good ESG performance from setting themselves apart from poor-performing firms. To highlight this, good performers would have needed to increase their efforts, resulting in higher costs (Ioannou & Serafeim, 2017; Mittelbach-Hörmanseder et al., 2021).

Based on the assumption that mandatory ESG disclosure reduces information asymmetry, next to the net benefits to firms subject to the NFRD, a prediction for the aggregate effect of the NFRD on firm value necessitates an evaluation of the extent to which firms withheld material ESG information before the passage of the mandate. If, prior to the mandate, most firms affected had disclosed a non-financial report with material ESG information, few new information would enter the market and produce a negligible aggregate market reaction in firm value.

Since in a voluntary setting that existed up until the passage of the first mandatory disclosure setting in the EU in 2014, following the assumption that firms behave rationally and make optimal decisions, one can follow that all firms where net benefits existed prior to the regulation, these firms would have already published ESG information voluntarily. Since with the NFRD, firms that until then would have not reported would now need to report even under negative net benefits. The negative net benefits would be negatively valued by capital markets and imply a negative firm value association with the NFRD. The reduced dual-selection problem often brought up to explain the relationship between ESG disclosure and firm value in a voluntary setting could be a viable explanation (Christensen et al., 2018; Mittelbach-Hörmanseder et al., 2021).

As pointed out, firms that did not report until the passage of the NFRD are likely to have a negative net benefit from reporting ESG information since they assume that the reporting consequences will incur higher costs than benefits for the firm. Hence, if the firm reports ESG information for the first time under the NFRD, it is likely that more negative than positive ESG news will be released into the market. Evidence suggests that markets respond in the same direction as the news or in "quite a few cases" (Christensen et al., 2021, p. 1199) asymmetrically. Flammer (2013) and Crifo et al. (2015) suggest that investors put more weight on negative ESG news. Like Flammer and Crifo et al., Krueger (2015b) similarly concludes that investors respond negatively to bad ESG information and have a weakly negative reaction to good information.

A mechanism reducing the market reaction's magnitude in either direction, often pointed out to be weakening the NFRD, may be the comply-or-explain approach (see Chapter 2.2) that the NFRD uses. This leaves companies the chance to omit material information that is potentially value-destroying. In addition to the potentially weaker market reaction resulting from the comply-or-explain approach, the generally vague definition of what and how to report on ESG matters in the directive[9] leaves companies with more room for cherry-picking, greenwashing, and publishing irrelevant information. In addition, the information published under the NFRD must not be assured by an external auditor. The auditor merely has to assure whether a report has been published or not for a firm to comply with the directive (Agliati, 2021; Christensen et al., 2021; Hummel & Jobst, 2022; Mittelbach-Hörmanseder et al., 2021). The missing strictness in the construction of the directive will reduce the magnitude of the market reaction to the NFRD since it is to be assumed that less material and value-relevant information will end up being released.

Resulting from the preceding discussion on the costs and benefits to individual entities, in line with the rather negative value implications of the directive that literature points out, the extent to which firms withheld material ESG information prior to the passage of the mandate, the valuation of the newly released information, and the flaws in the construction of the mandate, there will likely be a weakly negative association between the NFRD and firm value on an aggregate level following the passage of the NFRD.

Hence, the first hypothesis is defined as:

> ***Hypothesis 1a (H1a):*** *On an aggregate level, the NFRD is likely to negatively affect firm value.*

Carnini Pulino et al. (2022), Fiechter et al. (2022), Grewal et al. (2019), Ioannou and Serafeim (2017), and Mittelbach-Hörmanseder et al. (2021), among others, demonstrate a differentiated effect of the NFRD on firm value depending on the topics that the NFRD affects. In accordance with prior literature, this topical relevance will be measured by the individual E, S, and G scores of the combined ESG score from Refinitiv's database to understand the driving pillars of the combined ESG score. Therefore, 1b is sub-hypothesized:

> ***Hypothesis 1b (H1b):*** *Firm value effects will likely emerge with a different magnitude depending on which of the three ESG score subcomponents E, S, and G are concerned.*

A second sub-hypothesis deals with the effect of time on the magnitude of the combined effect of the NFRD on firm value. In accordance with the findings of Fiechter et al. (2022), who show that the anticipation effects prior to the entry-into-force in 2017 kicked in immediately after the passage of the directive in 2014 and that they are more pronounced in the late post-period than in the early post-period

[9] See European Commission (2014a, Article 1(1)): The report must include information "*to the extent possible*" to understand a firm's performance and its impact (dual-materiality). Moreover, risks linked to a firm's operations should be mentioned "*where relevant and proportionate*".

for the ESG scores[10], we can assume that the same association will hold for the association with firm value. Hence, third hypothesis 1c is:

> ***Hypothesis 1c (H1c):*** *The firm value results from H1a are likely to be more significant in the late post-period (2018-2019) than in the early post-period (2014-2017).*

The hereafter following cross-sectional prediction is based on the premise that the above elucidated individual levels of costs and benefits, the level of ESG disclosure prior to the directive and the market valuation of this information are individual to every firm.

Cross-sectional hypothesis ***H2*** follows from the premise that there are differences inherent to firms, which result in varying effects of the NFRD on firm value. A difference especially relevant in the context of ESG and mandatory disclosures is the ESG performance prior to the directive and the affiliation with a specific sector. For example, Krueger (2015a) shows that some industries have a more substantial environmental impact than others, such as the Oil and Gas and the Basic Materials industries (as measured by greenhouse gas emissions and thus primarily affecting the "E" of the combined ESG score). These firms are under higher public pressure and tend to release more ESG information to legitimize their actions, as research suggests (Cahan et al., 2016; Cho, Michelon, et al., 2015; Patten, 1992). Since this ESG information differs in relevance to market participants depending on the sector, the NFRD also has a different relevance (Eccles et al., 2012). Since sector affiliation tends to be associated with lower or higher ESG scores, this cross-sectional hypothesis is checked before the sectoral analysis for more robust results. It can be expected that sector affiliation is, on average, highly value relevant following the passage of the NFRD (Grewal et al., 2019; Ioannou & Serafeim, 2017; Jackson et al., 2020; Krueger, 2015a; Mittelbach-Hörmanseder et al., 2021). Accordingly, the value-relevance for pre-directive ESG performance and sectors can be predicted in the form of the following two cross-sectional hypotheses:

> ***Hypothesis 2a (H2a):*** *For firms with higher pre-directive ESG performance, the effect of the NFRD on firm value is less pronounced than for firms with lower pre-directive ESG performance.*

> ***Hypothesis 2b (H2b):*** *For some industries, the effect of the NFRD on firm value is more pronounced than for others.*

4. Sample, Summary Statistics, and Main Variables

4.1. Identification Strategy

This chapter opens with the strategy on how the main effects needed to answer the research question are extracted and how the time frame for the analysis is chosen. It continues with explanations of the sample construction and the matching procedure. In the perpetuation, summary statistics are reported for the matched control and treatment group. This chapter closes with elucidations on the two main variables in this work, ESG score and Tobin's Q.

In order to examine the effect of the NFRD on firm value, the passage of the directive in 2014 is used as a shock to ESG performance. The supranational and regulation-driven nature of the introduction across the EU, which transitioned ESG reporting from voluntary to mandatory, presents an ideal setting to exploit the effect of mandatory ESG disclosure on firm value. (Atanasov & Black, 2016; Christensen et al., 2017; La Torre et al., 2018; Leuz & Wysocki, 2015; Mittelbach-Hörmanseder et al., 2021).

Based on the remarks in Chapter 2.3 concerning the theoretical principles of ESG disclosure, an argumentative path for the examination of the research question must entail a reduction (increase) of frictions (benefits) precipitated by the disclosure mandate (e.g., reduced information asymmetry). It has to be noted here that this work does not aspire to analyse through which channel the market reaction to ESG disclosure (such as firm-specific and internalized market-wide cost or benefit assessment) shapes firm value but instead focuses on the aggregate effect of the NFRD on firm value itself.[11] Consequently, for example, firm value can be affected through reduced information asymmetry. Nonetheless, this supposition may not hold if firms do not increase their information disclosure and performance (measured by the ESG score (Fatemi et al., 2018)) due to, e.g., construction flaws inherent to the directive. Hence, it is per se not clear whether and how the passage of the NFRD influences firm value.

To answer the research question, in the first stage of the analysis, the legal shock will be tested for validity by estimating the direct effect of the NFRD on ESG performance (measured by the combined ESG score) of treatment firms (EU) compared to control firms (U.S.). This first stage in the 2SLS instrumental variable examination is conducted with a DID-analysis. Consistent with previous approaches (Allman & Won, 2022; Cahan et al., 2016; Fatemi et al., 2018; Fiechter et al., 2022; Gibbons, 2020; Ioannou & Serafeim, 2017) to show the impact of ESG disclosure or performance on firm value this serves as a falsification test that would eventuate in an invalid relationship if the result amounted to zero. Successively, instrumental variable regression is employed in the spirit of Fatemi et al. (2018) and Ioannou and Serafeim (2017) to estimate the effect of ESG performance on firm value.

4.2. Temporal Considerations

Since this study analyses the impact of the NFRD on firm value over time, relevant data for the sample at hand are retrieved over the period from 2011 to 2019. Taking into

[10] 1.3% (2014), 2.4% (2015), 3.8% (2016), 3.8% (2017), and 6.8% (2018), relative to the base year 2013 (Fiechter et al., 2022).

[11] For a deeper understanding of those channels, see e.g., Chang et al. (2022).

account the elucidations on the introduction period of the NFRD in 2013/2014 in Chapter 2.2, and the anticipatory effects prior to the entry into force in 2017, outlined by Cuomo et al. (2022), Fiechter et al. (2022), Grewal et al. (2019), and Mittelbach-Hörmanseder et al. (2021)[12], year 2014 is denoted as the shock date, in this research setting. Since all countries in the EU experienced the shock simultaneously, the differently timed transposition into national law in each country can be neglected in this research setting. Hence, the pre-period is defined as 2011-2013 and the post-period as 2014-2019.

The starting year of the sample is set to the year 2011 to minimize the impact of confounding events such as the introduction of the Dodd-Frank Act (2010) and the aftermath of the Global Financial Crisis (2008-2009) (IMF, 2013). The effects of the European Debt crisis, which lasted from 2009 until nearly the end of the 2010s, cannot be entirely excluded but are minimized since my sample starts after the crisis started and is present throughout the whole sample period (Frieden & Walter, 2017; Gross & Zahner, 2021). The end date for the sample is set to 2019 to first exclude the confounding effects of the COVID-19 pandemic that started to affect the economy in countries included in my sample at the beginning of 2020. Second, two ESG-disclosure-related events happened at the end of 2019. The adoption of the SFDR (December 2019) and the announcement of the Green Deal (December 2019) (European Commission, 2019b, 2019c). The temporal considerations result in the dummy variable, $Mandate_t$ that equals 1 for the years 2014-2019 and 0 for the years 2011-2013.

4.3. Sample Selection and Data

To test the directive's impact on firm value, firms exposed to the NFRD (treatment group) are compared to firms not exposed to the NFRD (control group). Given the condition that the directive pertains to all large undertakings in the EU, the analytical setup is not up to the standards of an experiment with a randomly assigned treatment group. Therefore, in the empirical analysis, EU public interest entities affected by the NFRD are compared to a propensity score-matched sample consisting of U.S. firms. The basis for the sample is a list of firms (primary equity securities) headquartered in the 28 EU countries and the United States (European Commission, 2014a). In line with Ottenstein et al. (2022), the sample still includes the United Kingdom, which left the EU on January 31, 2020.

The United States present a particularly suitable country to construct a control group since until now, and unlike many other countries in the world, the U.S. did not adopt any market-wide ESG-related disclosure regulations, afar from financial, risk, and litigation disclosure requirements concerning public companies with environmental issues, as well as human capital management related aspects from 2020 onwards (Christensen et al., 2021; Cifrino, 2023; Ioannou & Serafeim, 2017). In related works and during the construction of this sample, it became clear that Refinitiv's ESG database imposes a significant constraint on the sample size. The U.S. offers one of the most comprehensive country coverages of ESG data, easing control firms' matching (Fiechter et al., 2022; Refinitiv, 2022).

Contrary to Allman and Won (2022), who compare U.S. firms exposed to the NFRD to U.S. firms not exposed to the NFRD, a more significant number of scholars[13] do not use a sample of non-EU-reporting firms because there are only an infinitesimally small number of firms that are not in the EU that are obliged to report under the NFRD. In the "Study on the Non-Financial Reporting Directive – Final Report" published by the European Commission in November 2020, the authors explain that there are only 54 companies with shares and bonds listed on EU-regulated markets but domiciled outside the EU that are required to report under the NFRD. Most were in the UK (De Groen et al., 2020).[14] Only the introduction of the Corporate Sustainability Reporting Directive (CSRD; publication on December 16, 2022) required third-country issuers within the EU to prepare reports according to the CSRD (Baumüller & Grbenic, 2021; European Commission, 2022). Around the publication of the CSRD, many consultancies and advisors released information on the CSRD and its potential effects on their clients. Announcements from, e.g., law firms Gibson Dunn, White&Case, and Latham&Watkins or consultancy Deloitte show further proof that the NFRD virtually mandates no non-EU firm to report ESG information (Davies et al., 2023; Deloitte Touche Tohmatsu Limited, 2023; McGarry et al., 2022; Sagayam et al., 2022). Moreover, the European Parliament posted a press release on November 11, 2022, stating that the CSRD is extending the scope to "Non-EU companies with substantial activity in the EU" and "addressing "shortcomings in existing legislation on the disclosure of non-financial information [NFRD] perceived as largely insufficient and unreliable." (European Parliament, 2022, both p. 1). Following the clarification in this controversy, the control group used in this work is constructed using U.S. firms. This defines the start of the sample selection process with in total 23,383 firms (Table 1).

As a first step, firms operating in the Financials and Utilities sector (TRBC economic sector classification) are excluded as they follow different market mechanisms and are subject to distinctive regulations (Allman & Won, 2022;

[12] Krueger (2015a) uses the same anticipatory approach in a different DiD-Setting, analysing the effect of a mandatory greenhouse gas emissions disclosure law on corporate value, announced in 2012 in the United Kingdom.

[13] Scholars that do not classify non-EU firms as reporting firms in the context of the NFRD are e.g., Cuomo et al. (2022) and Fiechter et al. (2022), and Cicchiello et al. (2023) who compare EU and U.S. firms, Ottenstein et al. (2022) who compare EU with OECD less EU firms, and Z. Li and Jia (2022) who focus on a comparison of Danish, French, Norwegian, and Swedish firms with U.S. firms.

[14] Since the report was written *after* the United Kingdom left the EU, and hence UK firms are still included in the sample used for this work, the neglectable, small number of U.S. firms left in the group of these 54 companies will not be excluded from the sample.

Chen et al., 2018; Cuomo et al., 2022; Fama & French, 1992; Fuente et al., 2022; Ioannou & Serafeim, 2017). The inclusion in the TRBC sector categorization significantly reduces the sample size, as not all firms are covered in this classification. Nevertheless, in Refinitiv Eikon, this sector classification leaves the most extensive sample. After this stage, the sample consists of 13,543 firms. For each of these respective firms, the Refinitiv Eikon Excel-Add-In was used to obtain firm-level data concerning the EU thresholds of revenue, assets, and revenue.

In the next step, the sample is loaded into the Python code used for data cleaning, preparation, matching, and, ultimately, the DID analysis. It is narrowed down to the firms that are – and in the case of the U.S., firms would have been – affected by the NFRD by applying the restrictions established in Article (1) of the NFRD in combination with references to the Accounting Directive 2013/34/EU, Article (2). According to these, the NFRD only affects large undertakings that are public-interest entities with more than 500 employees on average. "Large undertakings[15]" exceed at least two of the three criteria, total assets of EUR€ 20,000,000, revenue of EUR€ 40,000,000, or number of employees more than 250 on average (European Commission, 2013). With the 500 employees pre-determined by the NFRD, this condition of the large undertaking is fulfilled, and only one of the two monetary size thresholds needs to be satisfied. To address potential data collection issues in the data basis provided by Refinitiv, a 5% safety margin is added on top of the respective NFRD thresholds, further reducing the sample size. Furthermore, firm years where all data points are missing are not imputed but excluded. As a result, 2,879 firms are identified in the sample.

Opposing previous literature (Allman & Won, 2022), it must be highlighted that firms below the thresholds set out above are deliberately not included in the control group because it is likely that ESG and firm value are moderated by firm size. Evidence is brought forward by D'Amato and Falivena (2020), who conducted an analysis based on a dataset of Western European listed firms and found that ESG and firm value are moderated by firm size and age with a negative association when small and/or new companies are studied.

To avoid potential country bias in my sample, firms that have been subject to the NFRD following a deviation from the EU definition when transposed into national law are not included in the sample. As mentioned in Chapter 2.2, 13 states have introduced a broader definition of the minimum threshold, ramping up the number of mandated companies to around 11,500 (De Groen et al., 2020). This divergence could be exploited in future research to further explore the effect of the NFRD on firm value.

The Refinitiv Eikon Data API is accessed and used via Python code to obtain all ESG and firm-level financial data.[16] After checking if at least one ESG score observation is available throughout the period from 2011 to 2019, firms that do not fulfil this requirement are dropped. This yields 2,231 firms. Moreover, firm years with missing variables are dropped. Firms with any missing values for all variables in the matching year 2013 are dropped. Refinitiv's coverage for the ESG score imposes, by the absolute number of firms the sample is reduced by, a significant constraint to the sample composition. Lastly, with these exclusions, the sample consists of 1,034 U.S. and EU firms before matching.

Matching

After identifying the sample of EU and U.S. firms and cleaning the data for the matching year, propensity score matching (PSM) is applied to account for fundamental differences between treatment and control firms. For all of these 1,034 firms, the complete data set for the observed period from 2011-2019 is drawn from the master data file. Manual random tests are conducted for firms' financial and ESG data validity. For this data set, no exclusion nor imputation of missing values is conducted as introducing bias to the sample can thus be prevented (Seaman et al., 2013). In my final data set after matching, missing values are within reasonable limits below the 25% threshold suggested by researchers such as Collins et al. (2001) or Graham (2003). This approach allows for a steadier view of firms' financial data as, in some cases, in the data of the sample used, ESG scores are missing where financial data are available. These missing values explain the differences in the number of observations in the tables and experiments conducted in the work at hand (Fiechter et al., 2022). Table 1 in section 4.4 *Summary Statistics* reports on the different variables in the sample.

Specifically, the matching is performed one year prior to the shock (matching in 2013) to account for the pre-directive anticipation effects. Matching prior to the shock reduces the possibility that the matching variables are affected by the treatment (Atanasov & Black, 2016; Fiechter et al., 2022; Flammer, 2015; Ioannou & Serafeim, 2017; Z. Li & Jia, 2022; Shipman et al., 2017). To obtain the control group, the sample is matched on firm-level characteristics that may covariate ESG performance and Tobin's Q (Bajic & Yurtoglu, 2018). These include ln($SIZE$) (natural logarithm of total assets), $SECTOR$ (TRBC sector classification), LEV (Leverage; total liabilities over total assets), ESG (ESG score), and Q_i (Tobin's Q, which is the market expectation about potential growth opportunities). The matching variables were selected after an analysis of matching variables from similar studies applied by Chen et al. (2018), Cicchiello et al. (2023), Cuomo et al. (2022), Flammer (2015), Gibbons (2020), Grewal et al. (2019), Ioannou and Serafeim (2017), Krueger (2015a), Z. Li and Jia (2022), and Ottenstein et al. (2022). Chapter 5.1 *Baseline Analysis* further expands on their relevance. All variables are explained in *Appendix A*. The matching is run using the Python PsmPy-package, developed by Kline and Luo (2022). It is "based on a logistic regression logit score where a match is selected using k-nearest neigh-

[15] Defined by directive 2013/34/EU.

[16] See Chapter 4.5 for a detailed explanation on why Refinitiv was used to obtain ESG data.

bours." (Kline & Luo, 2022, Abstract). Following Shipman et al.'s (2017) remarks related to PSM design choices and an exemplary application by Fiechter et al. (2022) in their assessment of the NFRD, the PSM is run without replacement and a caliper distance of 0.05 to increase the likelihood of high-quality matches and improve covariate balance without a too significant reduction of the sample size.[17] No winsorizing was conducted as all variables were checked for outliers manually, and only one outlier company was found and excluded. Closest neighbours for each firm are matched in the year 2013 based on Ioannou and Serafeim (2017):

$$Treatment_i = \tau_0 + \tau_1 \ln(SIZE)_i + \tau_2 SECTOR_i + \tau_3 LEV_i + \tau_4 ESG_i + \tau_4 Q_i + \varepsilon_i \quad (1)$$

Where i represents firms and τ_0 denotes the intercept of the equation. ε is the unobserved error term. The treatment categorization results in the dummy variable $Treatment_i$ that equals 1 if firm i is subject to the NFRD and 0 otherwise. The matching further reduces the sample size due to the matching without replacement. From in total 1,034 firms before matching, 708 are left in the sample after matching. The final sample includes 354 firms in the treatment and 354 firms in the control group.

4.4. Summary Statistics

Table 1 Panel A describes the selection approach for the sample used in this work. Firm observations span from 2011 to 2019 and from the 23,383 firms headquartered in the 28 EU countries and the U.S., 708 firms make it into the final sample.

Overall, out of the 28 EU countries included in the sample at the start of the selection process, only 17 made it into the final sample (Cuomo et al. (2022) also obtained a sample with firms based in 17 EU countries in a related study). Furthermore, as panel D of Table 1 depicts, 60% of firms in the EU treatment group are concentrated in the United Kingdom, France, and Germany. This distribution may be attributed to the coverage in the Refinitiv databases or the notation in major stock indices[18] (Ottenstein et al., 2022). Apart from these observations, the sample composition appears plausible as the United Kingdom, France, and Germany were the largest economies in the European Union in 2013/2014 in terms of GDP (World Bank, 2023).

A similar 60% weight can be observed in the sector distribution in the sample. For both control and treatment groups, the Consumer Cyclicals, Industrials, and Technology sectors combined comprise around 60% of the sample. In the control and treatment group, the best-performing sectors in the combined ESG score are Real Estate, Consumer Non-Cyclicals, and Healthcare. Worst performing sectors are different for both groups. The treatment group includes the Industrials, Basic Materials, and Energy sectors. In contrast, in the control group, the Industrials, Basic Materials, and Consumer Cyclicals sectors are the bottom three performers (Academic & Educational Services is excluded as it includes one non-representative observation). A more detailed view of the individual properties of both the control and treatment group is given in section 6.1 Descriptive Statistics.

4.5. Main Variables

Measuring Firm Value

The primary dependent variable used to measure firm value and assess the effect of the NFRD on the latter is Tobin's *Q*. This approach aligns with prior literature that commonly uses Tobin's Q as a proxy for firm value[19] (De Groen et al., 2020). In this work, Tobin's Q is calculated as the sum of assets and market value of equity minus common book equity (book value of liabilities) over the total assets (Ahmad et al., 2023; Barth et al., 2017; Daske et al., 2008; Ioannou & Serafeim, 2017; Manchiraju & Rajgopal, 2017; Pestana Pavan, 2020). Tobin's Q integrates an investor's evaluation of a firm's potential cash flows as well as its level of risk. Based on the theoretical perspectives regarding the reduction of information asymmetries and the effects on risk and cost of capital/cash flows outlined in Chapter 2.3, one can assume that ESG information and their disclosure have implications for firm value (Cahan et al., 2016; Easley & O'Hara, 2004; Grewal et al., 2019; Krueger et al., 2021; Lambert et al., 2012). Cahan et al. (2016) exemplify that the ESG information disclosure induced by the directive could hypothetically uncover sustainability-related market opportunities or good relationships with specific interest groups that are important for some investors, increasing the market's expectations of future cash flows and reducing investment risk and thus affect Tobin's Q. Adversely, when disclosed ESG information such as environmental management procedures or certain sustainability or humanitarian projects are contrasting market expectations of these, investors may reduce expectations for cash flows or increase expectations for firm risk, hence decreasing Tobin's Q.

Measuring ESG Performance

As pointed out previously, research commonly agrees that ESG performance is relevant to investors (Christensen et al., 2021; Eccles et al., 2011). One of the most common ways for investors to quickly assess a company's ESG performance is to look at its ESG ratings (Eccles et al., 2011; Fiechter et al., 2022; Ioannou & Serafeim, 2017). Mainly in the form of a cumulative number that allows investors to easily compare investment opportunities via a single number, which saves time and cost. In a comparison with numbers obtained from data

[17] To test sensitivity and ensure high-quality matching, the code was run with larger and smaller calipers or with replacement.
[18] FTSE100, DAX30, or the CAC40.
[19] Or market reaction (Agostini et al., 2022; Buallay, 2019; Conway, 2019).

Table 1: Sample Description

Panel A: Sample Selection

Selection Criteria	EU Sample	U.S. Sample	$\sum$	Unit
Start: Firms headquartered in EU28 and U.S.	**10,364**	**13,019**	**23,383**	Firms
Less observations of firms:				
Without TRBC Economic Sector classification	2,268	3,672	5,940	Firms
Without duplicates and TRBS Sector Utilities and Financials	1,539	2,361	3,900	Firms
Firms before NFRD filter	**6,557**	**6,986**	**13,543**	Firms
Without number of employees <525 AND <EUR€ 21,000,000 total assets or EUR€ 42,000,000 revenue	5,056	5,608	10,664	Firms
Firms before data cleaning	**1,501**	**1,378**	**2,879**	Firms
Without *ANY* ESG score value between 2011-2019	589	59	648	Firms
Without firms with rows with missing values for variables	14	12	26	Firms
Without firms with missing control variable data in 2013	409	762	1,171	Firms
Final sample before matching	**489**	**545**	**1,034**	Firms
Final sample after matching	**354**	**354**	**708**	Firms

Panel B: Sample Distribution per Sector - EU Firms

Sector	N	Firm Years	Firm years (%)	ESG Score	Env. Score	Soc. Score	Gov. Score	ln(SIZE)	Q	Lev
Consumer Cyclicals	81	712	22.682%	55.109	51.343	59.368	50.820	31.801	2.259	0.589
Industrials	79	706	22.491%	50.927	49.697	54.059	47.501	32.049	1.663	0.680
Technology	51	451	14.368%	54.066	48.318	57.437	53.865	32.179	1.950	0.603
Basic Materials	42	370	11.787%	53.312	50.506	54.427	56.486	32.120	1.544	0.541
Consumer Non-Cyclicals	41	365	11.628%	58.786	60.571	60.928	53.462	32.691	1.908	0.617
Healthcare	32	286	9.111%	55.616	48.617	62.014	51.399	32.053	2.852	0.529
Energy	19	169	5.384%	53.045	52.955	55.664	49.003	32.649	1.123	0.546
Real Estate	9	80	2.549%	60.855	70.391	62.762	47.300	32.760	1.141	0.553

Panel C: Sample Distribution per Sector - U.S. Firms

Sector	N	Firm Years	Firm years (%)	ESG Score	Env. Score	Soc. Score	Gov. Score	ln(SIZE)	Q	Lev
Industrials	84	749	23.725%	48.241	39.890	48.698	54.795	32.212	2.377	0.640
Consumer Cydicals	78	694	21.983%	53.422	45.018	56.835	53.381	32.364	2.454	0.673
Technology	54	482	15.268%	57.898	51.017	61.229	58.636	32.726	2.823	0.557
Basic Materials	41	368	11.657%	50.414	46.755	47.692	60.694	32.205	1.774	0.649
Consumer Non-Cyclicals	36	324	10.263%	64.490	61.634	65.532	65.604	33.417	2.605	0.697
Healthcare	26	228	7.222%	62.528	54.635	64.585	63.266	33.889	2.524	0.595
Energy	22	195	6.177%	56.910	54.410	55.454	63.843	34.125	1.301	0.521
Real Estate	12	108	3.421%	62.405	57.539	67.202	63.337	33.067	1.839	0.616
Academic & Edu. Services	1	9	0.285%	27.752	0.000	35.362	43.986	29.111	1.319	0.788

The shown table depicts the sample and its properties after filtering, data cleaning, and propensity score matching. All data is retrieved via Refinitiv Eikon Data API. PSM is conducted based on the pre-directive values of the matching variables in 2013 and uses a caliper of 0.05 without replacement. Variables used are: ln(SIZE), Sector association, Leverage, ESG score, and Tobin's Q.

Table 1 — continued

Panel D: Sample Distribution with Mean Values per Country

Couuntry	N	Firm Years	Firm years (%)	ESG Score	Env. Score	Soc. Score	Gov. Score	ln(SIZE)	Q	Lev
U.S.	366	3294	100%	54.823	47.926	56.177	58.271	32.688	2.366	0.625
UK	121	1089	33.060%	52.193	46.822	53.656	55.201	31.576	3.598	0.574
France	50	450	13.661%	60.666	67.949	65.674	46.626	33.333	1.710	0.628
Germany	45	405	12.295%	55.404	51.633	59.317	51.308	32.794	1.769	0.620
Sweden	20	180	5.464%	61.224	56.500	67.645	55.314	31.947	1.627	0.596
Ireland (Rep.)	19	171	5.191%	46.117	36.958	46.950	54.481	32.043	2.363	0.630
Netherlands	19	171	5.191%	59.967	58.385	65.426	54.044	32.943	1.584	0.640
Denmark	16	144	4.372%	53.695	49.560	58.012	49.004	31.102	3.696	0.503
Spain	16	144	4.372%	61.462	61.706	70.446	48.345	32.347	1.896	0.657
Belgium	11	99	3.005%	48.747	48.202	49.311	50.348	32.222	1.401	0.611
Finland	10	90	2.732%	56.109	62.233	60.497	42.748	31.094	2.216	0.580
Italy	10	90	2.732%	54.078	45.385	57.945	53.600	32.747	1.321	0.711
Poland	8	72	2.186%	38.419	32.704	34.034	47.537	31.353	1.186	0.568
Greece	7	63	1.913%	37.971	33.084	40.440	38.940	31.190	1.113	0.666
Luxembourg	5	45	1.366%	55.212	50.963	59.572	50.444	32.908	1.435	0.520
Austria	4	36	1.093%	49.905	51.859	50.598	46.803	32.522	1.259	0.622
Portugal	3	27	0.820%	58.574	61.911	63.211	45.550	32.322	1.791	0.700
Hungary	2	18	0.546%	50.362	46.914	53.741	44.491	32.453	1.232	0.419
$\sum$ // M EU firms	366	3294	100%	52.947	50.751	56.263	49.105	32.170	1.835	0.603

provider Bloomberg, Eccles et al. (2011) quantify the relevance of this combined score that summarizes a company's ESG performance: In a time frame of six months in 2010 and 2011, the data point "ESG Disclosure Score" was 60% more accessed than the second next data point, "GHG Scope 1". Following these capital market insights, Fatemi et al. (2018) built a model arguing that the value of a firm can be affected by ESG activities and the disclosure of those. To assess an association between the NFRD – which mandated the disclosure – and firm value, a measure for ESG performance is needed.

Investigating ESG performance, not only investors but also research commonly relies on ESG scores (Fiechter et al., 2022; Flammer, 2021; Grewal et al., 2019; Ioannou & Serafeim, 2017; Jackson et al., 2020; T. Li et al., 2023; Z. Li & Jia, 2022; Liang & Renneboog, 2020; Mittelbach-Hörmanseder et al., 2021; Ottenstein et al., 2022). In line with the relevance for capital market participants and previous research as well as due to the fact that it offers one of the largest and most reliable sources for ESG performance information, the Refinitiv ESG database (formerly Thomson Reuters ASSET4), specifically the Eikon Data API is used to obtain ESG scores for sample companies in this work (Eccles et al., 2014; Fiechter et al., 2022; Jackson et al., 2020; Mittelbach-Hörmanseder et al., 2021; Ottenstein et al., 2022).

Refinitiv's ESG score (and its sub-scores, Environmental (E), Social (S), and Governance (G)) is a comprehensive measure of a company's ESG performance, commitment and effectiveness grounded on publicly disclosed information. The score is based on thoroughly collected, verifiable reported data in the public domain, such as company reports, company websites, and other sources, such as newspapers and nongovernmental organizations. This information is only included in the score when the switch from private to public is made mandatorily or voluntarily (or coincidentally) by the company. This enables the score to be used as a proxy for ESG performance that reflects changes in the disclosure switch from voluntary to mandatory disclosure.

The score summarizes 630 firm-level ESG measures, which, in a smaller subset, are grouped into ten categories that constitute the three pillar scores and the final ESG score[20]. The individual ESG pillar score is a relative sum of the category weights, which vary per sector for the environmental and social categories and remain the same across

[20] For a more detailed look at the construction of the score, see Refinitiv's „ESG scores methodology" under: https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/refinitiv-esg-scores-methodology.pdf.

industries for governance. Afterwards, the pillar weights are normalised to percentages between 0 to 100. Refinitiv updates all its scores on a weekly basis (Refinitiv, 2022).

5. Research Design

5.1. Baseline Analysis

In order to identify the effect of the Non-Financial Reporting Directive on firm value, an instrumental variable model, specifically a 2SLS research setting in the sense of Fatemi et al. (2018) and Ioannou and Serafeim (2017), is applied.

The DID approach is commonly applied by scholarship to evaluate the effects of regulatory policies and in studies similar to the work in hand (Atanasov & Black, 2016; Bajic & Yurtoglu, 2018; Christensen et al., 2017; Daske et al., 2008; Fiechter et al., 2022; Flammer, 2015; Ioannou & Serafeim, 2017; Krueger et al., 2021; Ottenstein et al., 2022). The average treatment effect can be estimated by observing the change in the dependent variable for the treatment group compared to the control group both before and after the introduction of the policy studied. Hence, in this work, EU firms (treatment group) are compared to U.S. firms (control group) before and after the adoption of the NFRD in 2014. In absence of this directive, trend outcomes for both treated and control firms would remain in parallel trends. This functions as the central assumption for the DID approach used in this work.

The IV2SLS (Instrumental Variable Two Staged Least Squares model) was chosen on the basis that there is a well-researched connection between ESG performance and firm value (e.g., Bajic and Yurtoglu, 2018; Fatemi et al., 2018) and to monitor the value implications of ESG performance (measured through ESG scores) in the presence of mandatory ESG disclosure regulation. Furthermore, when examining the effect of the NFRD on firm value, potential endogeneity issues need to be addressed. This can be done with the IV approach (De Andrés et al., 2017; Fatemi et al., 2018; Fuente et al., 2022; Jiao, 2010). As Angrist and Krueger (2001) mention, "the most efficient way to combine multiple instruments is usually two-stage least squares" (p.70). The instruments chosen for the IV must fulfil two conditions. First, the instrument must be correlated with the endogenous variable (relevance condition) and second; the instrument must be uncorrelated to the error term (exogeneity condition) (Bascle, 2008).

Henceforth, following suggestions and applications by Angrist and Krueger (2001), Angrist and Pischke (2009), Fatemi et al. (2018), Huntington-Klein (2021), and Ioannou and Serafeim (2017), in the first stage, the endogenous variable ESG_{it} is predicted using a DID OLS. In the second stage, the predicted ESG score (ESG_{it}) from the first stage regression is inserted into the second-stage equation using the interaction term $Treatment_i * Mandate_t$ as an instrument. Thus, the IV model can yield results for the impact of the NFRD on firm value through ESG performance.

Confirming the Shock to ESG Performance – First Stage of IV

Prior to the second stage, which tests the effect of the directive on firm value through ESG performance, the legal shock will be tested for validity and significance by exhibiting that the ESG performance (measured by the combined ESG score) of treatment firms significantly increases after the passage of the NFRD in 2014 compared to control firms. With the DID design, the treatment effect for the sample with all years between 2011 and 2019 is estimated. In the sense of Ioannou and Serafeim (2017) and Krueger (2015a), the following OLS regression is used for the first stage of the IV approach:

$$ESG_{it} = \beta_0 + \beta_1(Treatment_i * Mandate_t) + \beta_2 \ln(SIZE)_{it} + \beta_3 LEV_{it} + \alpha_i + \mu_t + \gamma_{jt} + \varepsilon_{it} \quad (2)$$

ESG_{it} denotes the ESG score from Refinitiv for firm i in year t. Drawn from equation (1), $Treatment$ takes the value of 1 if firm i is subject to the NFRD and 0 otherwise. The dummy variable $Mandate_t$ marks years where the directive was adopted and in force (2014-2019) with 1 and 0 otherwise (2011-2013).

With the endogenous nature of ESG disclosure, the analysed association between ESG performance and firm value may be driven by reverse causality or correlated or omitted and thus biased variables. Hence, following Angrist and Pischke (2009) and Gormley and Matsa (2012) and the exemplary application of their findings in Cahan et al. (2016), Cuomo et al. (2022), Ioannou and Serafeim (2017), Jackson et al. (2020), and Krueger (2015a), firm, year, and year-sector fixed effects, $(\alpha_i + \mu_t + \gamma_{jt})$ are incorporated in equation (2). These fixed effects increase the quality of the findings as they account for unobservable differences (e.g., legal system, political events, cultural influence, increasing influence of ESG) among sample firms. Among all equations for ***H1***, standard errors are clustered at the firm level to account for potential serial correlation in the error terms (Gibbons, 2020; Ioannou & Serafeim, 2017; Krueger, 2015a; M. Lang et al., 2012; Petersen, 2009).

The average treatment effect to confirm the shock induced by the passage of the NFRD in 2014 is depicted in the β_1 on the interaction term $Treatment_i * Mandate_t$, which displays the difference after the switch from voluntary to mandatory ESG disclosure for treated firms in comparison to the difference for the control group. A positive coefficient β_1 would reveal an increase in the average ESG score after the passage. To complete the first stage, which first assesses the effect of the NFRD on ESG performance and to mitigate the potential omitted variable bias, two control variables are added: $\ln(SIZE)$ (natural logarithm of total assets) and LEV (leverage; total liabilities over total assets). These firm characteristics are thought to be potentially linked with both ESG performance and Tobin's Q (Bajic & Yurtoglu, 2018).

These controls have been used in prior literature related to the work at hand (Cahan et al., 2016; Carnini Pulino et

al., 2022; Cicchiello et al., 2023; Daske et al., 2008; Dhaliwal et al., 2011; Eccles et al., 2014; Fiechter et al., 2022; Flammer, 2015; Ioannou & Serafeim, 2017; Jackson et al., 2020; Krueger, 2015a). Specifically, $\ln(SIZE)$ is used as a control since larger firms are inclined to release more ESG-related information and have higher ESG performance and related scores (Baran & King, 2014; Drempetic et al., 2020; M. Lang & Lundholm, 1993). LEV is accounted for because a monitoring role is inherent to debt servicing, and holders of debt request more release of information (Dhaliwal et al., 2011; Leftwich et al., 1981). Furthermore, leveraged firms are riskier, focused on short-term investments, have lower future growth[21], and tend less to reveal ESG information and hence negatively affect ESG ratings (Fama & French, 2002; Krueger et al., 2021; L. Lang et al., 1996).

In the sense of Angrist and Pischke (2009) and an exemplary application of their "good/bad control"-definition in a work examining the impact of a greenhouse gas emission disclosure mandate on firm value by Krueger (2015a), no further variables (e.g., ownership concentration, profitability, or research and development expenses) are included in the equations applied in this work.

Second-Stage of IV

In the second step of the IV, equation (3) tests the effect of the directive on firm value through the estimated ESG score from the first stage. With the dependent variable firm value, measured using Tobin's Q (Q_{it}), the following second-stage IV equation, similarly applied in Ioannou and Serafeim (2017), is estimated to answer ***H1a*** and slightly altered, ***H1b*** and ***H1c***:

$$Q_{it} = \vartheta_0 + \vartheta_1 \widehat{ESG}_{it} + \vartheta_2 \ln(SIZE)_{it} + \vartheta_3 LEV_{it} + \alpha_i + \mu_t + \gamma_{jt} + \varepsilon_{it} \quad (3)$$

In equation (3), $\widehat{ESG}_{it}$ serves as an independent variable with the hat denoting the predicted ESG score from Refinitiv for firm i in year t. ϑ_1 captures the effect of ESG scores on firm value. If ϑ_1 is positive and significant, it would imply that the directive positively affects Tobin's Q through the mandated disclosure of ESG information. The set of control variables employed in equation (3) – including the fixed effects – is the same as in equation (2) since these firm characteristics are thought to be potentially linked with both ESG performance and Tobin's Q (Bajic & Yurtoglu, 2018). Herewith, this approach expands scholarship that evaluates the impact of ESG performance on firm value as well (Fatemi et al., 2018; Fiechter et al., 2022; Fuente et al., 2022; Gibbons, 2020; Ioannou & Serafeim, 2017; Lee & Yeo, 2016; Manchiraju & Rajgopal, 2017). Contrary to ***H1a***, which assesses the impact of the NFRD on firm value on an aggregate level, ***H1b*** investigates the effects of the individual ESG score components E, S, and G on firm value to understand which components may be driving the aggregate effect on firm value. ***H1b*** will be tested in accordance with the procedure applied in Ioannou and Serafeim (2017) by running equation (2) and (3) with the subcomponent scores obtained from Refinitiv for E ($ESG_{E,it}$), S ($ESG_{S,it}$), and G ($ESG_{G,it}$), respectively.

To assess ***H1c***, whether the effects of the NFRD on firm value are more significant in the late post-period (2018-2019) than in the early post-period (2014-2017), a model estimating *yearly* treatment effects in relation to the base year 2013, developed by Fiechter et al. (2022) is deployed. A two-staged DID approach is estimated to utilise the predicted ESG score from the first stage (4; $\widehat{ESG}_{it}$) as a control variable in the second stage (5). The first- and second-stage results can be observed in the respective coefficient on the interaction term. Equations (4) and (5) are established to answer ***H1c***:

$$ESG_{it} = \beta_0 + \sum_n (\beta_n Year_n * Treatment_i) + \sum_q \beta_q \ln(SIZE)_{it} + \sum_p \beta_p LEV_{it} + \alpha_i + \mu_t + \gamma_{jt} + \varepsilon_{it} \quad (4)$$

$$Q_{it} = \vartheta_0 + \sum_n (\vartheta_n Year_n * Treatment_i) + \sum_q \vartheta_q \ln(SIZE)_{it} + \sum_p \vartheta_p LEV_{it} + \sum_r \vartheta_r \widehat{ESG}_{it} + \alpha_i + \mu_t + \gamma_{jt} + \varepsilon_{it} \quad (5)$$

Applying Larcker and Rusticus (2010) suggestion – which found application in Fatemi et al. (2018) – that results of a 2SLS approach should be compared to those obtained after running an OLS approach, the yearly effects estimated in equations (4) and (5) with an OLS regression simultaneously serve as an early robustness test to the findings of ***H1a*** which resulted from a 2SLS model.

5.2. Cross Sectional Analysis

To test whether the sample specification affects any of the results, cross-sectional analyses are performed on two sample specifications. As discussed in the hypothesis development section, the two cross-sectional predictions (***H2a*** and ***H2b***) are based on the premise that individual levels of costs and benefits, the level of ESG disclosure prior to the directive and the market valuation of this information are individual to every firm. A difference especially relevant in the context of ESG and mandatory disclosures is the affiliation with a specific sector and the pre-directive ESG performance, as prior research related to mandatory disclosure regulations shows that these attributes are entangled (Jackson et al., 2020; Krueger, 2015a; Mittelbach-Hörmanseder et al., 2021).

[21] According to L. Lang et al. (1996, Abstract), leverage is "negatively related to growth for firms whose growth opportunities are either not recognized by the capital markets or are not sufficiently valuable to overcome the effects of their debt overhang.".

To analyse the first cross-sectional hypothesis, ***H2a***, whether the value effect is less pronounced for firms with higher pre-directive ESG performance than for firms with lower pre-directive ESG performance, a partition "*ESG*" based on the ESG performance prior to the directive is introduced. Treatment firms with their respective controls are allocated to group "LowESG" if they have an ESG score in the lower tercile (lowest 33.3% of firms) in the matching year 2013. Similarly, the group "HighESG" comprises treatment firms in the upper tercile (66.6% and above) of ESG scores and their matched controls. This method is similar to the one used by Fiechter et al. (2022), Grewal et al. (2019), Ioannou and Serafeim (2017), and Jackson et al. (2020). Based on the anticipatory effects reported in, e.g., Fiechter et al. (2022) and the changes in firm behaviour already as early as 2014, each partition, LowESG and HighESG is run with their respective matched control firms and the same IV2SLS regression with equation (2) and (3) used to test ***H1a***. For the cross-sectional analyses, all three fixed effects stay in place, in line with Ioannou and Serafeim (2017). Standard errors for the partitions on ex-ante ESG performance are clustered at the firm level, whereas the separation by sectors clusters by sector (Fiechter et al., 2022). These considerations result in equations ((6) and (7)) and ((8) and (9)) to answer ***H2***:

For LowESG firms:

$$\begin{aligned} ESG_{it}^{Low} = {} & \beta_0^* + \beta_1^*(Treatment_i * Mandate_t) \\ & + \beta_2^* \ln(SIZE)_{it} + \beta_3^* LEV_{it} \\ & + \alpha_i + \mu_t + \gamma_{jt} + \varepsilon_{it} \end{aligned} \tag{6}$$

$$\begin{aligned} Q_{it}^{Low} = {} & \vartheta_0^* + \vartheta_1^* \widehat{ESG}_{it}^{Pre} + \vartheta_2^* \ln(SIZE)_{it} \\ & + \vartheta_3^* LEV_{it} + \alpha_i + \mu_t + \gamma_{jt} + \varepsilon_{it} \end{aligned} \tag{7}$$

For HighESG firms:

$$\begin{aligned} ESG_{it}^{High} = {} & \beta_0^{**} + \beta_1^{**}(Treatment_i * Mandate_t) \\ & + \beta_2^{**} \ln(SIZE)_{it} + \beta_3^{**} LEV_{it} \\ & + \alpha_i + \mu_t + \gamma_{jt} + \varepsilon_{it} \end{aligned} \tag{8}$$

$$\begin{aligned} Q_{it}^{High} = {} & \vartheta_0^{**} + \vartheta_1^{**} \widehat{ESG}_{it}^{Post} + \vartheta_2^{**} \ln(SIZE)_{it} \\ & + \vartheta_3^{**} LEV_{it} + \alpha_i + \mu_t + \gamma_{jt} + \varepsilon_{it} \end{aligned} \tag{9}$$

Since sector affiliation tends to be associated with lower or higher ESG scores, cross-sectional hypothesis ***H2a*** is checked to obtain more robust results on ***H2a.*** It can be expected that sector affiliation is, on average value relevant following the passage of the NFRD (Grewal et al., 2019; Ioannou & Serafeim, 2017; Jackson et al., 2020; Krueger, 2015a; Mittelbach-Hörmanseder et al., 2021). For example, Krueger (2015a) shows that some industries have a more substantial environmental impact than others, such as the Oil and Gas and the Basic Materials industries. These firms are under higher public pressure and tend to release more ESG information to legitimize their actions, as research suggests (Cahan et al., 2016; Cho, Michelon, et al., 2015; Patten, 1992). Accordingly, to answer ***H2b,*** the value relevance for TRBC sectors is tested by introducing a second partition ("*ESGSector*"). This partition was created after the treatment group was ranked by mean ESG scores per industry based on the pre-directive matching year data from 2013 (see Table 1). The top three ESG score-means belonged to the sectors: Real Estate, Consumer Non-Cyclicals, and Healthcare ("HighESGSector"). The bottom three performing sectors were Basic Materials, Energy, and Industrials ("LowESGSector") ((Krueger, 2015a) reports similar bottom sectors). Firms in these sectors are used with their previously matched U.S. control firm. Followingly, similar to equations (6) to (9), the IV2SLS are run for both sub-groups individually.

6. Empirical Results

6.1. Descriptive Statistics

Table 2 Panel A and B report the descriptive statistics for the dependent and independent variables of the treatment and the control group after matching. With the mean (M) of the ESG score and each pillar score lower than the median (50%), a slightly left-skewed distribution can be observed for the scores in the treatment and the control group. Opposing the left-skewness, Panel A and B report a slight right-skewness throughout both groups for the control variables ln(SIZE), Tobin's Q (Q), and leverage (LEV) as well as for the firm characteristics revenue, assets, and ROA (variables defined in *Appendix A*). Moreover, the mean of the individual social score is higher than that of the environmental and governance score, which are relatively similar to the treatment group. The control group has a higher mean governance score than the social and even higher than the environmental score.

The average firm in the treatment group has an ESG score of 54.366 and relatively similar Environmental and Governance scores of 51.316 and 51.351, respectively, while the Social score is higher with a mean of 57.624. The firm reports a natural logarithm of total assets of 32.145, Tobin's Q of 1.92, leverage of 0.6, revenues of around EUR€ 10.05mn., total assets of EUR€ 14.74mn., and a ROA of 5.903% on average. In comparison, the control group can put forward a mean for the ESG score of 54.769. Compared to the treatment group, the Social score is marginally lower, whereas with a mean of 48.2, the Environmental score has a more pronounced distance to its EU peer. Opposite, the Governance score is significantly higher for the average firm in the control group, with a mean of 58.3. The average control firm reports a natural logarithm of total assets of 32.707 with a Tobin's Q of 2.338 and leverage of 0.631. Firm characteristics not used for matching are higher for the average control firm with revenues of EUR€ 15.15mn., total assets of EUR€ 18.28mn., and a ROA of 7.114%. A country and sector distribution for the sample after matching is included in Chapter 4.4 *Summary Statistics* in Table 1 Panel B, C, and D.

Table 2: Descriptive Statistics

Panel A: Descriptive Statistics of Dependent and Independent Variables and General Characteristics After Matching - Treatment Group

	ESG Score	Env. Score	Soc. Score	Gov. Score	ln(SIZE)	Q	LEV	Revenue	Assets	ROA
Firm Years	3139	3139	3139	3139	3139	3139	3139	3139	3139	3139
M	54.316	51.836	57.624	51.351	32.145	1.920	0.600	10,052,070,000	14,735,840,000	5.903%
Min	0.627	0.000	0.432	0.867	26.440	0.250	0.026	0	91,053,470	-33.262%
25%	41.386	32.563	39.969	33.504	30.590	1.114	0.480	1,219,148,000	1,616,346,000	2.432%
50%	54.784	54.117	59.081	52.626	31.994	1.478	0.595	3,135,515,000	4,276,185,000	5.050%
75%	68.638	73.481	76.331	68.842	33.492	2.176	0.719	9,333,205,000	12,078,360,000	8.818%
Max	94.688	97.435	98.185	95.993	38.737	18.490	1.812	292,277,000,000	458,156,000,000	100.620%
SD	18.668	25.810	22.866	21.669	2.100	1.454	0.197	22,393,940,000	33,709,640,000	7.532%

Panel B: Descriptive Statistics of Dependent and Independent Variables and General Characteristics After Matching - Control Group

	ESG Score	Env. Score	Soc. Score	Gov. Score	ln(SIZE)	Q	LEV	Revenue	Assets	ROA
Firm Years	3157	3157	3157	3157	3157	3157	3157	3157	3157	3157
M	54.769	48.200	56.170	58.300	32.707	2.338	0.631	15,151,870,000	18,277,690,000	7.114%
Min	6.866	0.000	0.840	1.032	27.100	0.296	0.065	38,545,500	143,824,900	-54.915%
25%	40.682	25.975	39.171	43.367	31.314	1.371	0.497	2,252,896,000	2,669,145,000	3.423%
50%	55.696	52.228	57.225	60.223	32.546	1.876	0.612	4,984,658,000	6,269,581,000	6.611%
75%	69.522	71.054	73.935	74.452	33.949	2.763	0.749	12,876,730,000	16,587,390,000	10.571%
Max	95.162	98.546	98.011	98.795	38.755	15.969	2.919	450,088,500,000	463,742,900,000	58.026%
SD	18.624	26.984	21.540	20.480	1.890	1.520	0.222	34,599,310,000	37,938,420,000	7.348%

Chapter 4.3 reports an explanation for the differences in the amount of firm years in the treatment and control group. General firm characteristics include Revenue, Assets, and ROA. Revenue and Assets are reported in EUR€. "M" stands for "Mean", "Min" is the minimum value, "25%, 50%, and 75%" report quartiles, "Max" is the maximum value. "SD" refers to the standard deviation. All variables are defined in Appendix A.

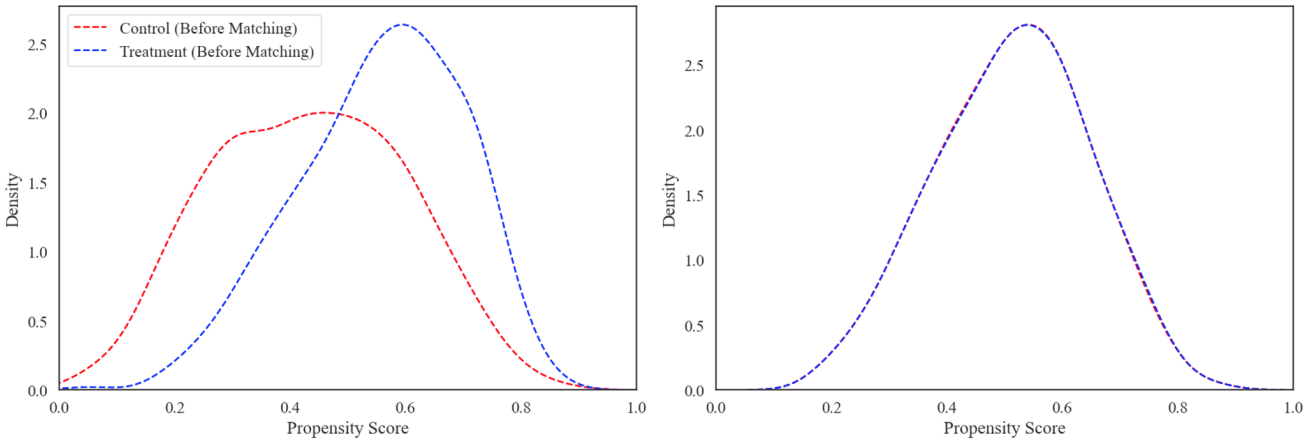

Figure 1: Distribution of Propensity Scores Before (Left) and After (Right) Matching

Table 3 and corresponding Figure 1 show the results of the propensity score matching on the used variables. These variables stay below the threshold of 0.25 standardized difference of means suggested by Rubin (2001), which indicates trustworthy regression adjustments. This is further supported by the concentration of the matched sample near the 0.5 propensity score (Figure 1) and no further distribution into extremes in the 0 or 1 direction, which would indicate a very high or low probability of falling under the treatment condition (F. Li & Thomas, 2018).

Table 3: Standardized Mean Differences Across Covariates Before and After Matching

Matching Variable	Effect Size in Standardized Mean Differences	
	Before Matching	After Matching
ln(SIZE)	0.139	0.240
LEV	0.132	0.063
ESG Score	0.497	0.128
Q	0.126	0.182
Sector_Basic Materials	0.155	0.008
Sector_Consumer Cyclicals	0.004	0.019
Sector_Consumer Non-Cyclicals	0.027	0.044
Sector_Energy	0.008	0.037
Sector_Healthcare	0.130	0.072
Sector_Industrials	0.185	0.035
Sector_Real Estate	0.165	0.050
Sector_Technology	0.140	0.025

The shown table depicts the standardized mean differences across all matching variables. All data is retrieved via Refinitiv Eikon Data API. PSM is conducted based on the pre-directive values of the matching variables in 2013 and uses a caliper of 0.05 without replacement. Variables used are: ln(SIZE), Sector association, Leverage, ESG score, and Tobin's Q.

6.2. Baseline Analysis

Aggregated ESG (H1a) and Individual E, S, and G (H1b) Firm Value Effects

To answer the research question drawn out at the beginning of this work on whether and if so, with which significance the introduction of the NFRD affected firm value, a two-stage IV approach was chosen in line with relevant scholarship (Allman & Won, 2022; Cahan et al., 2016; Fiechter et al., 2022; Gibbons, 2020; Ioannou & Serafeim, 2017). Following the notion that firm value is associated with ESG performance (e.g., Fatemi et al., 2018) and Refinitiv's ESG score may serve as a proxy for firm performance (e.g., Eccles et al., 2014; Fiechter et al., 2022), the first stage of the approach tests the legal shock of the NFRD for validity by exhibiting that ESG scores of treatment firms significantly increase after the passage of the NFRD compared to control firms.

Figure 2 depicts the development of the average ESG Scores for the matched sample. It shows the development from 2011 to 2019, with 2014 marked as shock date. The dotted lines show the continuation of the 2011-2014 trend. The figure demonstrates parallel trends leading up to the shock year 2014. From 2014 on, the average ESG score of the treatment group (EU firms) increases more significantly than the score of the control group (U.S. firms), which grows as well but starts later and with a significantly lower slope. A similar trend development for EU+ and U.S. firms between 2011 and 2018 can be found in Fiechter et al. (2022, p. 1516).

Uncovering the driving pillar of the ESG score development, *Appendix B* reports a comparison of the average Environmental, Social, and Governance scores, respectively, for the control and treatment group. Strikingly, the increase in the overall ESG score for the control group in 2015 was mainly driven by the Governance score, whereas for the treatment group, all three scores showed an increase from 2014 onwards. Since market participants are mainly interested in the combined ESG score – as explained in section 4.5 *Main Variables* – the utilization of the combined ESG score is continued. However, following this observation, a robustness test in the spirit of Ioannou and Serafeim (2017), which employs the Governance score as a further control variable for the primary 2SLS model, is included in the robustness test section.

The increase in ESG scores in the EU starts as early as 2014 when the NFRD was adopted, which supports the findings of Cuomo et al. (2022), Fiechter et al. (2022), Grewal et al. (2019), and Mittelbach-Hörmanseder et al. (2021) who uncovered the existence of anticipatory effects prior to the entry into force of the NFRD in 2017. As Table 2 and Figure 2 depict, treatment and control group show relatively similar ESG scores throughout the observation period, which reflects the employed matching variable ESG_i.

The mere graphical presentation of the sample ESG scores does not provide enough evidence to confirm the shock, as other confounding effects could lead to the increase. Thus, to increase the exploitability of the findings, the first stage of the IV2SLS works with controls for leverage and size, standard errors clustered at the firm level, and firm, year, and year-sector fixed effects. Table 4 provides results for the effect of the NFRD on the four dependent variables, ESG performance and the disaggregate E, S, and G scores, respectively. Results on the controls, the coefficient β_1 on the interaction term $Treatment_i * Mandate_t$, their respective significance and standard errors, and the fit of the estimated model are included. In the spirit of Fiechter et al. (2022), Ioannou and Serafeim (2017), and Ottenstein et al. (2022), models are reported with all three fixed effects included.

The results of running equation (2) on an aggregate and disaggregate level for the ESG and the E, S, and G score individually reveal a strong positive as well as highly statically significant effect of the NFRD on ESG performance as the coefficient on the interaction term $Treatment_i * Mandate_t$ displays with a value of 3.007 units on the aggregate level (Table 4). On a disaggregated level of the pillars, this effect is most pronounced and statistically significant at the 1%-Level of the Social score. This suggests that this pillar had the most substantial contribution to the overall ESG performance increase. Interestingly, this coincides with the findings of Ioannou and Serafeim (2017, p. 40), who found that "the magnitude of the effect on social disclosures seems to be larger than the respective effect on environmental or governance disclosures.". This finding has to be handled carefully, as Ioannou and Serafeim analyzed ESG disclosure mandates outside the European Union. Another relevant obser-

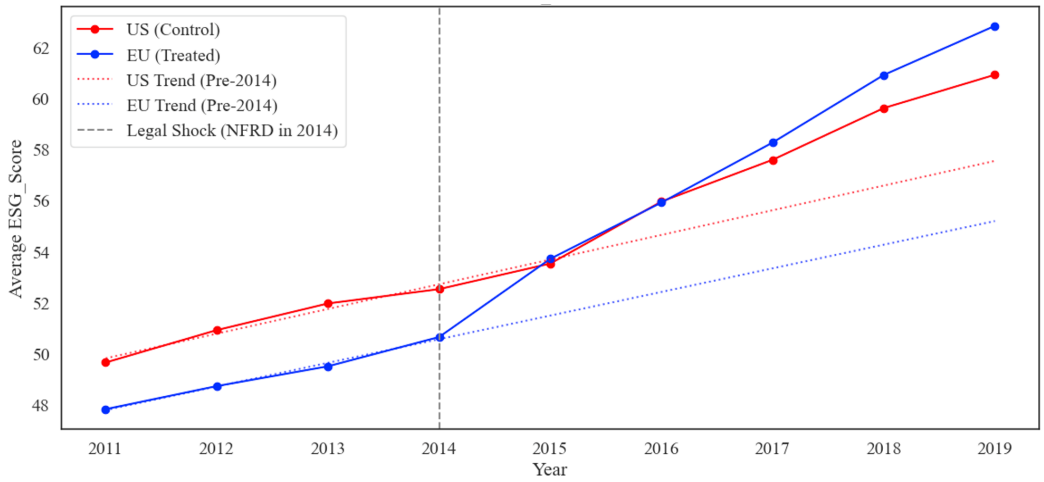

Figure 2: Comparison of Average ESG Scores Over Time with Pre-Directive Trend Lines

Table 4: First Stage: Impact of the NFRD on ESG Performance - (Dis)Aggregate Effects

	ESG Score	Env. Score	Soc. Score	Gov. Score
Intercept	6.468	-3.203	24.806	-8.298
	(16.887)	(24.744)	(21.540)	(25.749)
Treatment * Mandate	3.007***	0.392	5.912***	1.608
	(0.708)	(0.941)	(0.879)	(1.172)
ln(SIZE)	1.687***	1.827**	1.41**	1.98**
	(0.518)	(0.757)	(0.656)	(0.787)
LEV	0.012	-1.772	-1.841	3.155
	(1.851)	(2.379)	(2.144)	(3.252)
Firm fixed effects	Included	Included	Included	Included
Year fixed effects	Included	Included	Included	Included
Year-Sector fixed effects	Included	Included	Included	Included
Adjusted R^2	0.859	0.879	0.84	0.654
# of observations	6296	6296	6296	6296

The shown table depicts results of the coefficient on the interaction term of two dummy variables, $Treatment$ (1 if in treatment group (EU), 0 if in control group (U.S.)) and $Mandate$ (1 if after shock date in 2014 (2014-2019), 0 if before shock date (2011-2013)). This first stage of an IV2SLS is estimated in a difference-in-difference OLS regression using equation (2). Dependent variable of interest is ESG performance measured by ESG score and the three disaggregate pillar scores respectively. All retrieved via Refinitiv Eikon Data API. Control variables are: ln(SIZE) and LEV. ln(SIZE) is the natural logarithm of total assets. LEV is the total liabilities over total assets. ***, **, and * indicate statistical significance either at the 1%, 5%, or the 10% level (two-tailed), respectively. Following Flammer (2015) and Gibbons (2020), standard errors are included in parentheses. Standard errors clustered at the firm level are employed. The model was robust to running combinations of one less fixed effect of each. All variables are defined in Appendix A.

vation can be made for the positive coefficient on the variable size (ln(SIZE)), which is significant at the 1%-level across all specifications. As prior research found, larger firms are inclined to release more ESG-related information and have a higher ESG performance and scores (Baran & King, 2014; Drempetic et al., 2020; M. Lang & Lundholm, 1993). The results that equation (2) and its adapted version for the three individual scores yield support the findings of prior research that larger firms tend to have a higher ESG performance and score.

After confirming the shock to ESG performance in the first stage and estimating results on the interaction term, the second stage of the 2SLS model utilizes the predicted $\widehat{ESG}_{it}$ from the first stage to explore the effect of the NFRD-induced change in ESG performance on the dependent variable Tobin's Q as a measure of firm value. The model covers approximately 80% of the variance of Tobin's Q. In ***Hypothesis 1a,*** a negative capital market reaction via ESG scores, condensing into a low negative effect on firm value following the introduction of the NFRD, was formulated. This hypothesis can be

confirmed following an IV2SLS analysis on a propensity score matched sample of 354 U.S. and 354 EU firms. Indeed, statistically significant findings on the coefficient of "instrumented score" tabulated in Table 5 suggest that firm value (Tobin's Q) decreases after the introduction of the NFRD. Using the predicted $\widehat{ESG}_{it}$ from the first stage (see equation (2)), a statistically significant (at the 1%-level) negative value reaction of -0.078 on the instrumented ESG score can be reported for the aggregate effect (Table 5). Thus, firms in the treatment group experienced an average 0,078 unit decrease in firm value after the introduction of the NFRD from 2014-2019 compared to the control group of U.S. firms.

The disaggregate instrumented scores on E, S, and G show that each of the three pillars influenced Tobin's Q negatively but with a different magnitude, confirming ***Hypothesis 1b***. Interestingly, the social score, the only statistically significant and most substantial reactor in stage one, is the lowest of the three scores in stage two. Out of the three individual scores, the Environmental score reacts the strongest with a negative value of 0.598 (statistically significant at the 1%-level) after the introduction of the NFRD. In line with the results brought forward by Ioannou and Serafeim (2017), the coefficient on the control variable ln(SIZE) shows a negative sign throughout all four scores except for the Environmental score, which is positively associated. Results on the coefficient on LEV suggest a positively associated nature throughout all four scores, again, except for the Environmental score.

An explanation for this could potentially be the lower prevalence of topics that had a more pronounced negative market reaction in the annual or standalone reports. With the mandated disclosure of "information [...] relating to, as a minimum, environmental, social and employee matters, respect for human rights, anti-corruption and bribery matters..." (Directive 2014/95/EU (2014a), Article 19a (1)), and thus those topics that are included in e.g. the Environmental score which drove most of the negative market reaction, less prevalent topics are disclosed through the directive and thence lead to a more significant market reaction (Mittelbach-Hörmanseder et al., 2021).

The tabulated results on the disaggregate effects show – except for the contrasting sign for all values – a pattern tying with results previously reported by Ioannou and Serafeim (2017) on a worldwide and a U.S. control group. The Environmental score features the highest effects, followed by the Governance and Environmental scores. Moreover, the results from Table 5 match those of Mittelbach-Hörmanseder et al. (2021) first, in the overall negative market reaction to the NFRD for ***H1a*** and secondly, for ***H1b***, in the more substantial impact of the environmental score compared to the social score (Mittelbach-Hörmanseder et al., 2021, p. 325). Additionally, verifying the product of research of Fiechter et al. (2022), who tabulated a negative albeit not statistically significant firm value reaction to the adoption of the NFRD of -0.048, the IV analysis in the work at hand obtains results with a similar magnitude of -0.078 (Table 5).

As laid out in Chapter 6.3 on prior research in the field of mandatory ESG disclosure, scholarship on firm value implications of ESG disclosure mandates in countries outside the EU brings forward mixed but mainly positive market reactions (negative: Chen et al., 2018; positive: Ioannou and Serafeim, 2017; Krueger, 2015a; Lee and Yeo, 2016; T. Li et al., 2023). In comparison, the relatively small and emergent strand of scientific literature focussing on a specific disclosure mandate, the NFRD in Europe, the three studies mentioned in the literature review suggest a negative equity market perception of the mandated ESG disclosure (Fiechter et al., 2022; Grewal et al., 2019; Mittelbach-Hörmanseder et al., 2021).

The findings of ***Hypothesis 1a*** underpin existing literature on negative firm value implications of the NFRD. Additionally, in line with previous literature, the results of ***Hypothesis 1b*** show that, on average, the mandated ESG disclosure has a differentiated topical relevance condensation into a mixed market reaction depending on the topic disclosed, hence supporting ***H1b***.

Early and Late Post-Period Firm Value Effects (H1c)

Tabulated empirical results for ***Hypothesis 1a*** and***1b*** show that not only did treatment group firms' ESG performance increase after the adoption of the NFRD in 2014, but also firm value was negatively impacted. Based on these merely general, *post-directive* period results spanning from 2014 to 2019, one cannot identify whether the effects manifested with anticipatory effects or simply after the entry into force of the directive in 2017. Therefore, to assess ***Hypothesis 1c***, whether the effects of the NFRD on firm value are more significant in the late post-period (2018-2019) than in the early post-period (2014-2017), in line with the approach of Fiechter et al. (2022) yearly effects are estimated in a two-stage DID estimation, using equations (4) and (5). The predicted ESG score from the first stage does not function as in the IV but merely posits controlling properties in this setting in the second stage. Tables 6 and 7 report results on the first and second stage of the yearly effects estimation. Figures 3 and 4 graphically visualize the treatment point effects in a confidence band diagram, respectively.

The results in the first stage show that on average, in the years after the passage of the NFRD, firms' ESG performance significantly increased. Based on the findings in Table 6, which reveal statistically significant increasing coefficients on the yearly interaction terms for 2015 to 2019 with the base year 2013 (thence excluded), it becomes clear that after the European Union adopted the NFRD in 2014, anticipatory effects kicked in and ESG performance measured by ESG scores increased for the years mentioned. The most significant year out of the nine years under observation is 2015, with a value of 2.306, which is around 2.7 times bigger than the second highest value, 0.843 in 2017. This suggests that the anticipation of the NFRD by far had the single most significant impact on the ESG performance of firms rather than the actual entry-into-force of the directive.

Table 5: Second Stage: Impact on Tobin's Q - Aggregate and Disaggregate Effect

	ESG Score	Env. Score	Soc. Score	Gov. Score
Intercept	19.048***	16.532***	19.612***	16.948***
	(1.911)	(1.867)	(1.955)	(1.857)
Instrumented score (respect.)	-0.078***	-0.598***	-0.04***	-0.146***
	(0.022)	(0.166)	(0.011)	(0.040)
ln(SIZE)	-0.335***	0.627**	-0.411***	-0.178**
	(0.063)	(0.296)	(0.059)	(0.089)
LEV	0.857**	-0.205	0.783**	1.316***
	(0.375)	(0.445)	(0.373)	(0.412)
Firm fixed effects	Included	Included	Included	Included
Year fixed effects	Included	Included	Included	Included
Year-Sector fixed effects	Included	Included	Included	Included
# of observations	6296	6296	6296	6296

The shown table depicts results of the coefficient on the Predicted ESG score and the three disaggregate pillar scores from stage 1 respectively. Dependent variable of interest is Tobin's Q. This second stage of an IV2SLS, uses equation (3). All input retrieved via Refinitiv Eikon Data API. Control variables are: ln(SIZE) and LEV. ln(SIZE) is the natural logarithm of total assets. LEV is the total liabilities over total assets. Tobin's Q is calculated as sum of assets and market value of equity minus common book equity over the total assets. Adjusted R^2 is at 0.799. ***, **, and * indicate statistical significance either at the 1%, 5%, or the 10% level (two-tailed), respectively. Following Flammer (2015) and Gibbons (2020), standard errors are included in parentheses. Standard errors clustered at the firm level are employed. All variables are defined in Appendix A.

Grounded on the indications in Table 6, the anticipatory nature of the findings is in line with the findings of Fiechter et al. (2022) and Grewal et al. (2019), who were among the first to report that companies already in 2014 started to adapt to the upcoming entry-into-force of the directive in 2017. Fiechter et al. report an increase in ESG performance from 2014 on, but just in 2016, this increase becomes statistically significant. In congruence with their findings, compared to the U.S. control group, no meaningful pre-directive trends can be observed, as coefficients on the interaction term for 2011 and 2012 are low and insignificant.

Results are further subjected to graphical inspection (Figure 3), highlighting 2015 as the first year with statistical significance and the highest increase to the prior year. Similar to Fiechter et al., 2022, who report the first significant increase for the Refinitiv ESG score in 2016 and the subcomponent Social score in 2015. The jump in ESG scores in 2015 compared to 2014, the succeeding stable increase in 2016, and a following surge in 2017 again may be caused by general public attention in the years around the directive's adoption (Jessop & Kelly, 2014). Further, changes in management behaviour following stakeholder pressure or increased benchmarking opportunities to peers (Table 6) (Chen et al., 2018; Christensen et al., 2021; Fiechter et al., 2022; Ioannou & Serafeim, 2017; Tomar, 2019). Either, companies belong to the group that prepares early for the directive and plans on staying ahead of its competitors and have the "first-mover" advantage, which the capital market might reward (also see "race-to-the-top" by Ioannou and Serafeim (2017, p. 5 and 23). Alternatively, the company plans on waiting until the very last moment before mandatory compliance to increase efficiency in case any changes to the mandate or within the company happen until the entry into force ("internal learning" according to Fiechter et al., 2022, p. 1516). Moreover, Fiechter et al. (2022) suggest that even in the absence of immediate stakeholder pressure in the early years (2014-2015), an anticipation of stakeholder reactions could be a driver for the increase in ESG scores as it is harder to restore the lost reputation of clients and investors than to preserve it (Bolton et al., 2021; Fiechter et al., 2022). Further research might uncover the underlying drivers for these hypothesized explanations. From 2014 to 2017, an average 0.932 increase per year can be observed for the early post-directive period, whereas only 0.527 units of growth are tabulated for the late post-directive period. This described development of the ESG performance is plotted in Figure 3 with the accumulated yearly treatment effects from 2011 to 2019 for the dependent variable ESG score.

The results of the first stage in Table 6 are, on average, lower than what e.g., Ioannou and Serafeim (2017, p. 40) reported in their work, where they assessed mandatory disclosure regulations in four countries around the world and outside of the European Union in comparison to a worldwide and U.S. control group. At the same time, the results in Table 6 are, on average, higher than what Allman and Won (2022) and Fiechter et al. (2022) estimate in their works assessing the NFRD. Therefore, the magnitude of the findings in this work is within reasonable boundaries compared to results from prior research.

The second stage of the yearly effects model utilizes a DID equation with the predicted ESG score from the first stage as

Table 6: Impact of the NFRD on ESG Performance - Yearly Effects

Dependent Variable		Accumulated ESG Score effect	Yearly effects
*2011*Treatment*		0.222	0.153
		(0.696)	
*2012*Treatment*		0.069	0.069
		(0.506)	
*2014*Treatment*	Adoption	0.571	0.571
	of NFRD	(0.466)	
*2015*Treatment*		2.877***	2.306***
		(0.626)	
*2016*Treatment*		2.885***	0.008***
		(0.736)	
*2017*Treatment*		3.728***	0.843***
		(0.866)	
*2018*Treatment*	Entry-into-force	4.072***	0.344***
		(0.962)	
*2019*Treatment*		4.781***	0.709***
		(0.981)	
Controls	Included		
Firm fixed effects	Included		
Year fixed effects	Included		
Year-Sector fixed effects	Included		
Adjusted R^2	0.86		
# of observations	6296		

The shown table depicts yearly effects estimated in a difference-in-difference OLS regression using equation (4). Dependent variable of interest is ESG performance measured by ESG score retrieved via Refinitiv Eikon Data API. Year 2013 is used as base year and therefore excluded. Control variables are: ln(SIZE) (1.814***, 0.520)and LEV (0.638, 1.854). ln(SIZE)is the natural logarithm of total assets. LEV is the total liabilities over total assets. ***, **, and * indicate statistical significance either at the 1%, 5%, or the 10% level (two-tailed), respectively. Following Flammer (2015) and Gibbons (2020), standard errors are included in parentheses Standard errors clustered at the firm level are employed. The model was robust to running all combinations of fixed effects. All variables are defined in Appendix A.

a control variable to estimate the yearly treatment effect on Tobin's Q as the measure of firm value. Table 7 reports findings on the accumulated and yearly effects of the NFRD on the interaction terms of Year*Treatment for years 2011-2012 and 2014-2019 since 2013 is denoted as the base year. These findings are presented graphically in Figure 4. The model is run with the exact specifications as equations (2) and (3) for the IV model and equation (4) for the first stage, except for the newly included predicted ESG score from the first stage (equation (4)) Coefficients on the controls are reported in the note under Table 7.

As the OLS regression utilized in this setting simultaneously serves as an early robustness test to the findings answering ***H1a*** and ***H1b***, results in Table 7 suggest that, on average, the negative market reaction to mandatory ESG disclosure in the EU can be confirmed, which further strengthens the implications of this work. Years after the adoption showed, in comparison to the two years prior to the base year 2013, a significant decrease in firm value on average. Out of the six years, two (2015 and 2017) demonstrate positive signs, whereas market responses are negative with different magnitudes in all other years after 2013. Similar to the results (Table 6) in stage one, the first significant coefficient on the interaction term after the introduction of the NFRD is the most considerable absolute value. Instead of 2015 for the first stage with ESG performance as the dependent variable, it is 2014 with Tobin's Q as the dependent variable, which reports the most considerable negative value (-0.287), followed by 2016 with a negative reaction of -0.227. Both values are statistically significant at the 1%-level.

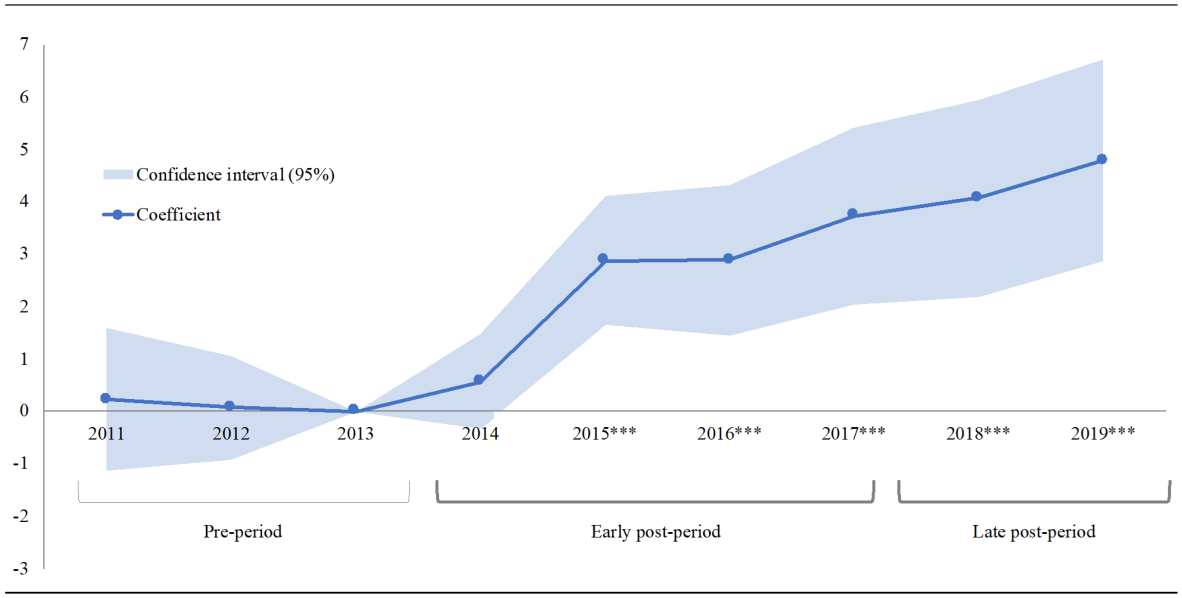

Figure 3: Yearly Treatment Effects – ESG score – with 95% Confidence Interval

The shown figure depicts the yearly treatment point estimates of ESG performance in a band plot. The dark blue line shows the yearly effects. The lighter blue shows the upper and lower boundaries of the 95% confidence interval. Year 2013 is used as base year and therefore excluded (shown as 0). This first stage of the yearly effects is estimated in a difference-in-difference OLS regression using equation (4). Dependent variable of interest is ESG score (as a proxy for ESG performance) retrieved via Refinitiv Eikon Data API. ***, **, and * indicate statistical significance of the interaction term either at 1%, 5%, or the 10% level (two-tailed), respectively for each year. All variables are defined in Appendix A.

Potentially, the negative market reaction in 2016 came from the Paris Agreement adopted by 196 Parties at the UN Climate Change Conference in Paris on December 12, 2015, and entered into force on November 4, 2016. This landmark event heaved worldwide commitment to ESG and thus reinforced the importance and impact of the NFRD (Hummel & Jobst, 2022; UNFCCC, n.d.). This relevance of the year 2016 falls into line with the novel contributions of Gibbons (2020, updated April 2023) who analysed detailed holdings data for firms subject to the staggered introduction of 40 country-level regulations which mandate disclosure and found that, generally, mandatory non-financial disclosure did not reduce ESG-based adverse selection problems in his sample and thus had no value relevance. Instead, he reported that the institutional clientele channel influenced value. Following mandatory non-financial disclosure, Gibbons' findings suggest that material real effects for firms emerge because ESG disclosure attracts institutional investors with ESG preferences and longer-term investment horizons. A landmark event such as the Paris Climate Conference could potentially bring elevated attention and relevance to the topic of ESG and thus to the NFRD from an institutional investor's perspective, which resulted in an increased focus on ESG in investment decisions in the EU that lead to the negative reaction in 2016 among two years of low positive value effects (2015 and 2017). This research-backed public attention channel was already mentioned in a previous explanation for the increase in ESG scores (Christensen et al., 2017, 2021; Fiechter et al., 2022; Grewal et al., 2019). The potential existence of this value-destruction channel may be attributable to the clientele-channel mechanism but could also be due to a reduction in adverse selection, following, e.g., the findings of Krueger (2015a), who showed that in a GHG emission disclosure mandate in the UK, this adverse selection problem was reduced. Indeed, these findings do not explain a positive or negative value relevance of the NFRD but explain why 2016 stands out (Gibson & Krueger, 2017; Liang & Renneboog, 2020).

Adducing the Efficient Market Hypothesis and the knowledge of the sample composition, which includes, on average, only large stocks on established markets, the findings from Table 7 indicate that as soon as the adoption of the NFRD happened, market participants priced in the anticipated costs (benefits) of the NFRD, which furthermore explains the flip from positive to negative sign from 2017 to 2018, the years of entry-into-force (Fama, 1970). This was the first year when prior non-reporting firms subject to the thresholds were forced to disclose ESG information. Coming back to the results of Table 6, the first significant and positive ESG performance effects manifested in 2015, which shows the difference in reaction speed: Markets reacted immediately (effect in 2014), whereas firms needed to adapt their ESG actions and ESG scores consequently needed adjustment (effect in 2015). A similar conclusion was reached by Grewal et al. (2019), who analysed the market reaction to events leading up to the NFRD and found a negative market reaction to the adoption of the NFRD as well.

Even though the market reacted as early as 2014 to the adoption of the NFRD, the for the subclusters' early and late post-directive periods, on average, most significant negative

Table 7: Impact of the NFRD on Tobin's Q - Yearly Effects

Dependent Variable		Accumulated Tobin's Q effect	Yearly effects
*2011*Treatment*		-0.133**	-0.163**
		(0.059)	
*2012*Treatment*		0.032	0.032
		(0.048)	
*2014*Treatment*	Adoption	-0.287***	-0.287***
	of NFRD	(0.053)	
*2015*Treatment*		-0.162**	0.125***
		(0.077)	
*2016*Treatment*		-0.389***	-0.227***
		(0.076)	
*2017*Treatment*		-0.334***	0.055***
		(0.084)	
*2018*Treatment*	Entry-into-force	-0.489***	-0.155***
		(0.096)	
*2019*Treatment*		-0.669***	-0.18***
		(0.119)	
Controls	Included		
Firm fixed effects	Included		
Year fixed effects	Included		
Year-Sector fixed effects	Included		
Adjusted R^2	0.8		
# of observations	6296		

The shown table depicts yearly effects estimated in a difference-in-difference OLS regression using equation (5). Dependent variable of interest is Tobin's Q calculated with items retrieved via Refinitiv Eikon Data API. Year 2013 is used as base year and therefore excluded. Control variables are: ln(SIZE) (-0.539***, 0.067), Predicted ESG Score (0.039***, 0.004), and LEV (0.801**, 0.375). ln(SIZE)is the natural logarithm of total assets. LEV is the total liabilities over total assets. Tobin's Q is calculated as sum of assets and market value of equity minus common book equity over the total assets. Predicted ESG Score is predicted in the first stage regression of the yearly effects model. ***, **, and * indicate statistical significance either at the 1%, 5%, or the 10% level (two-tailed), respectively. Following Flammer (2015) and Gibbons (2020), standard errors are included in parentheses. Standard errors clustered at the firm level are employed. The model was robust to running all combinations of fixed effects. All variables are defined in Appendix A.

reaction happened in the late post period from 2018 to 2019 after the entry into force. This can be concluded from averaging the yearly effects within the early post-period (-0.084) and the late post-period (-0.168), respectively. These findings support the notion hypothesized in ***H1c*** that the negative firm value implications found in ***H1a*** are likely to be more significant in the late post-period (2018-2019) than in the early post-period (2014-2017). Nevertheless, this confirmation must be handled cautiously since the post-period merely entails results for two years, whereas the early post-period accounts for four years. Comparing two averages with a low number of years in each does not yield robust mean values.

As mentioned earlier, this work does not intend to shed light on the specific value creation or destruction channels with which the NFRD affects firm value. Questions like how market participants value the newly released information, how much the comply-or-explain-approach of the NFRD contributed to the value effects, or how the flaws in the construction of the directive are seen by markets are not answered here. As literature regarding the value implications of the NFRD is still in its infancy, solely an overall evaluation of the value effects of the directive is contributed with this work. Nevertheless, some minor suggestions for these relevant questions based on prior research are given to further back the findings of this work and explain their relevance. Further scholarship may pick up on the discussion of the underlying mechanisms and expand this field of research.

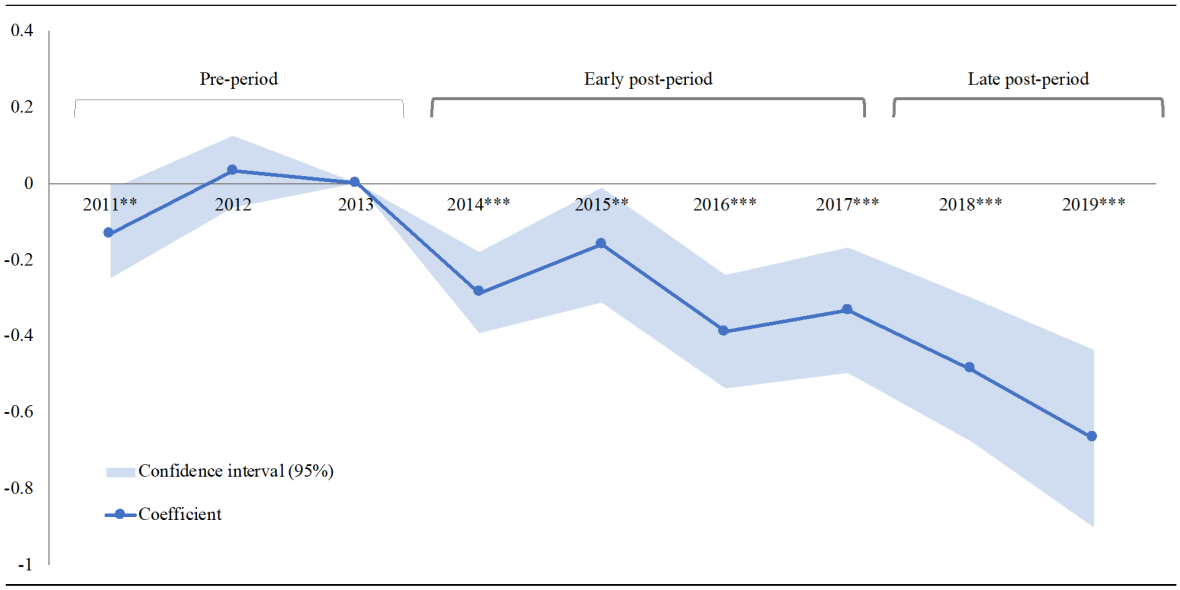

Figure 4: Yearly Treatment Effects – Tobin's Q – with 95% Confidence Interval

The shown figure depicts the yearly treatment point estimates of ESG performance in a band plot. The dark blue line shows the yearly effects. The lighter blue shows the upper and lower boundaries of the 95% confidence interval. Year 2013 is used as base year and therefore excluded (shown as 0). This first stage of the yearly effects is estimated in a difference-in-difference OLS regression using equation (5). Dependent variable of interest is ESG score (as a proxy for ESG performance) retrieved via Refinitiv Eikon Data API. ***, **, and * indicate statistical significance of the interaction term either at 1%, 5%, or the 10% level (two-tailed), respectively for each year. All variables are defined in Appendix A.

6.3. Cross-Sectional Analysis

Next, credible cross-sectional variation is investigated to answer ***H2a*** and ***H2b***. Grounded on prior research and the extant theoretical background given, it is to be expected that market reaction to the NFRD differs depending on prior ESG performance and sector association.

Results of running the two introduced cross-sectional partitions separately based on first, pre-directive high or low ESG disclosure and second, sector association with a partition into the three highest and three lowest ESG score sectors are reported in Tables 9 and 10. Both tables report combined results for the sectoral and pre-directive ESG performance relevance. Table 9 exhibits results for equations (6) and (7) with both stages of the IV2SLS done for each partition on *LowESG* and *LowESGSector*. Table 10 displays findings for equations (8) and (9) with, again, both stages of the IV2SLS but now for the higher performing partitions *HighESG* and *HighESGSector*. The sector partition (Table 8) includes the top three ESG score-mean sectors, Real Estate, Consumer Non-Cyclicals, and Healthcare ("HighESGSector") and the bottom three performing sectors, Basic Materials, Energy, and Industrials ("LowESGSector"). Low and HighESG was partitioned based on the top and bottom tercile of ESG firm performance in the matching year. The only conceptual alteration between the two models for sectoral and pre-directive ESG performance differences was made in the clustering of the standard errors, whereas for the sectoral model, the clustering was switched from firm to sector level.

As there is considerable overlap (conceptually and empirically) between the two partitions of *ESG* and *ESGSector*, not surprisingly, Table 9 exhibits similar results for LowESG and LowESGSector (first and second stage) and Table 10 for HighESG and HighESGSector (first and second stage). This was to be expected following extant literature confirming that some sectors have an on average higher or lower ESG score (Grewal et al., 2019; Ioannou & Serafeim, 2017; Jackson et al., 2020; Krueger, 2015a; Mittelbach-Hörmanseder et al., 2021).

Results in Table 9 expose that for the sample employed, LowESG and LowESGSector firms' coefficient (β_1^*) on the interaction term significantly (at the 1%-level) increases. Hence, firms in these groups post an increase in ESG performance after the introduction of the NFRD in 2014, with 3.996 and 4.127 units, respectively. For the HighESG and HighESGSector firms in Table 10, this increase in ESG performance does not turn out as severe as for the lower group in Table 9 but is still positive (2.792 and 2.622, respectively). In accordance with Ioannou and Serafeim (2017) and Jackson et al. (2020), who reported identical outcomes, the results allow for the educated deduction that the higher increase by lower-performing firms is caused by their overall lower level of ESG performance. Grounded on the theory laid out in the theoretical foundation part of this work, firms will only increase their disclosure if the marginal cost of every additional unit of disclosure is exceeded by the resulting benefits. Thence, firms with a lower level of ESG performance can more efficiently increase their performance by larger margins than companies with high ESG performance. Still, high ESG firms increase their disclosure as well, just not by the same magnitude. The reaction might be triggered by the

Table 8: Sector Partition Statistics - HighESGSector and LowESGSector

Sector (EU)	N	Firm Years	Firm years (%)	ESG Score	Env. Score	Soc. Score	Gov. Score	ln(SIZE)	Q	Lev
HighESGSector	82	731	23.288%	58.419	59.859	61.901	50.720	32.501	1.967	0.566
Real Estate										
Consumer Non-Cyclicals										
Healthcare										
LowESGSector	140	1245	39.662%	52.428	51.053	54.717	50.997	32.272	1.443	0.589
Basic Materials										
Energy										
Industrials										

The shown table depicts the partition in HighESGSector and LowESGSector. The split is based on the top three and lowest three sectors in terms of sectoral ESG performance in the sample in 2013. Measures "N" and "Firm Years" are summarized. All other measures reports means of the three indented sectors belonging to the partition.

Table 9: Impact of the NFRD on ESG Performance and Tobin's Q - LowESG(Sector)

	LowESG		LowESGSector	
	First Stage (ESG)	Second Stage (Q)	First Stage (ESG)	Second Stage (Q)
Intercept	32.84	19.039***	-1.407	10.26***
	(23.769)	(3.367)	(18.672)	(2.405)
coefficient 1 on β or ϑ	3.996***	-0.038	4.127***	-0.028***
	(1.279)	(0.030)	(0.325)	(0.009)
ln(SIZE)	0.316	-0.456***	1.784***	-0.23***
	(0.758)	(0.111)	(0.607)	(0.069)
LEV	1.995	1.044**	-2.921	0.495
	(3.189)	(0.514)	(2.755)	(0.339)
Firm fixed effects	Included	Included	Included	Included
Year fixed effects	Included	Included	Included	Included
Year-Sector fixed effects	Included	Included	Included	Included
Adjusted R^2	0.791	0.79	0.856	0.817
# of observations	2076	2076	2497	2497

The shown table depicts results of the two stages of the IV2SLS analysis conducted for both partitions to test H2a and H2b, LowESG and LowSectorESG. LowESG includes firms and their matched controls who have been in the bottom tercile of ESG performance in the year of matching 2013. LowSectorESG includes firms who are associated with the bottom three ESG performance sectors, namely Basic Materials, Energy, and Industrials ("LowESGSector"). Coefficient 1 on β and ϑ is the main variable of interest. It includes either: the coefficent from equation (6) for the first stage of the IV, β which is the coefficient on the interaction term of two dummy variables, *Treatment* (1 if in treatment group (EU), 0 if in control group (U.S.)) and *Mandate* (1 if after shock date in 2014 (2014-2019), 0 if before shock date (2011-2013)). Or, it includes coefficient ϑ which is the coefficient on the predicted ESG score in the second stage. Dependent variable of interest is ESG performance measured by ESG score in the first stage and Tobin's Q in the second stage. All data retrieved via Refinitiv Eikon Data API. Control variables are: ln(SIZE) and LEV. ln(SIZE) is the natural logarithm of total assets. LEV is the total liabilities over total assets. ***, **, and * indicate statistical significance either at the 1%, 5%, or the 10% level (two-tailed), respectively. Following Flammer (2015) and Gibbons (2020), standard errors are included in parentheses. Standard errors clustered at the firm level are employed for the Low/HighESG partition. Standard errors clustered at the sector level are used for the Low/HighESGSector partition. The model was robust to running all combinations of fixed effects. All variables are defined in Appendix A.

"race-to-the-top mechanism, mentioned in the *Early and Late Post-Period Firm Value Effects (H1c)* analysis. Firms with high ESG performance prior to the NFRD want to distance themselves from competitors to signal their superior ESG performance to the market. With an increasing focus on ESG in investment decisions, this behaviour would be rational if the associated line of action yielded a positive NPV for the firm.

Turning to the conditional effects revealed by the 2SLS regressions of Tobin's q on ESG performance and the control variables in Tables 9 and 10, it is to be concluded that all four firm value reactions for high and low partitions in ESG performance and sector affiliation occur in relatively moderate negative digits. Between high and low categorisation, Tobin's Q is affected similarly. A more negative and statistically significant reaction is suggested by coefficient ϑ_1^{**} for the HighESG and HighESGSector partitions, respectively (-0.092 and -0.099), compared to insignificant -0.038 for LowESG and -0.028 – significant at the 1%-level – for LowESGSector.

The introduced partitions allow for a more nuanced examination of the findings of the baseline analysis. The confirmation of an overall weakly negative firm value reaction to the introduction of the NFRD in 2014 can be backed by the findings in Tables 9 and 10. Moreover, following the remarks in this section and the results stated in Tables 9 and 10, hypothesis 2b, that for some sectors the effect of the NFRD is more significant than for others, can be confirmed.

However, following the results described in the previous paragraph, hypothesis 2a must be rejected, as for firms with higher pre-directive ESG performance, the effect of the NFRD on firm value is *not* less pronounced than for firms with lower pre-directive ESG performance. It even more comes to light that based on the findings in Tables 9 and 10, firms within the HighESG or HighESGSector partition are more negatively affected by the NFRD. This finding adds to disagreeing literature that, on the one hand, suggests that lower pre-directive ESG performance results in higher (negative) firm value effects (e.g., Grewal et al. (2019) and Ioannou and Serafeim (2017)) and, on the other hand states that the negative association between ESG performance and firm value is more pronounced for firms with higher ex-ante ESG performance (e.g., Cho, Michelon, et al. (2015), Fatemi et al. (2018), and Mittelbach-Hörmanseder et al. (2021)).

Fatemi et al. (2018) assume that this more intense negative market reaction could result from firms utilizing ESG disclosure and, hence ESG scores as a vehicle to signal good ESG performance irrespective of their actual ESG performance. This argument gains strength with the "comply-or-explain-approach" utilized in the NFRD – and criticised by scholars and practitioners alike Christensen et al. (2021) – that allows companies to opt out of reporting specific topics if they provide a reasonable explanation for not reporting and weakens the directive (Cho, Laine, et al., 2015). Additionally, a possible explanation might be grounded in overinvestment signalling to markets. Engaging in ESG activities is likely to be associated with costs. Resultingly, higher ESG scores would signal higher costs and potentially overinvesting in ESG (Kim & Lyon, 2015). Furthermore, for these lower ESG-performing firms, the market reaction might come with a lower absolute value because investors expect that these firms will increase their ESG scores (as also shown in this research) and can thus increase the interest of other market participants, which would raise their value. Therefore, they do not lower their value expectation to the extent they do for HighESG and HighESGSector firms. An equally plausible consideration from an investor's view might be the reduction of costs needed to maintain a weak ESG performance by paying, e.g., penalties. (Chang et al., 2022; Grewal et al., 2019; Healy & Palepu, 2001; Jensen & Meckling, 1978; Watts & Zimmerman, 1978).

Since the absolute value of the negative reaction of both high and low ESG-performing firms is not of a high magnitude, inferences of this and the work of others, who reported results of similar magnitude as well, need to be interpreted carefully.

Tables 9 and 10 unroll the relevance of firm size (measured as the natural logarithm of total assets) for ESG performance and IV predicted firm value. That relationship is, for all four coefficients in the lower area flipped compared to the higher area in Table 10. In Table 9, for the first stage of LowESG and LowESGSector, ln(SIZE) is more pronounced in the sectoral partition, whereas size is more pronounced for the first stage in the ESG performance partition in Table 10. In the first stage (ESG performance as dependent variable), firm size seems to be of higher importance for firms in ex-ante lower ESG sectors than for firms with lower ESG performance. In the lower area, sector association seems more critical than prior ESG performance as a predictor of post-directive ESG performance. The relationship is reversed in the first stage for firms with higher ESG performance and those belonging to higher ESG sectors (Table 10). Here, ex-ante sector affiliation plays a minor role compared to ex-ante ESG performance.

Similar to the reversed characteristics for low/high ESG(Sector) firms, the same pattern holds for the second stage of the IV2SLS that was run. In the lower score partition, Tobin's Q is more negatively affected by size for firms with ex-ante lower ESG performance than for firms who belong to ex-ante lower-performing sectors (Table 9). However, ex-ante sector affiliation seems more size-sensitive than prior ESG performance, as findings in in Table 10 suggest.

The relationship of firm size with Tobin's Q as the measure of interest in this work with regards to pre-directive ESG performance and sector affiliation can be summarized into the deduction that the value relevance of size is more pronounced for firms with a HighESGSector affiliation than firms with a prior high level of ESG performance (Table 10). On the contrary, in the lower ex-ante group (performance and sector, Table 9), the value relevance of size is more pronounced for firms with low ESG performance than those in LowESGSectors.

Overall, the results of the two cross-sectional analyses rejected but could explain the results for hypothesis 2a, were able to confirm hypothesis 2b, and further strengthened the

Table 10: Impact of the NFRD on ESG Performance and Tobin's Q - HighESG(Sector)

	HighESG		HighESGSector	
	First Stage (ESG)	Second Stage (Q)	First Stage (ESG)	Second Stage (Q)
Intercept	7.744	13.731***	9.045	20.056***
	(29.660)	(2.215)	(19.096)	(2.737)
coefficient 1 on β or ϑ	2.792**	-0.092***	2.622	-0.099***
	(1.095)	(0.028)	(2.260)	(0.021)
ln(SIZE)	1.761**	-0.204***	1	-0.46***
	(0.898)	(0.066)	(0.612)	(0.092)
LEV	-1.794	1.058*	0.008	0.174
	(3.427)	(0.601)	(4.357)	(0.654)
Firm fixed effects	Included	Included	Included	Included
Year fixed effects	Included	Included	Included	Included
Year-Sector fixed effects	Included	Included	Included	Included
Adjusted R^2	0.791	0.79	0.856	0.817
# of observations	2076	2076	2497	2497

The shown table depicts results of the two stages of the IV2SLS analysis conducted for both partitions to test H2a and H2b, HighESG and HighSectorESG. HighESG includes firms and their matched controls who have been in the upper tercile of ESG performance in the year of matching 2013. HighSectorESG includes firms who are associated with the upper three ESG performance sectors, namely Real Estate, Consumer Non-Cyclicals, and Healthcare ("HighESGSector"). Coefficient 1 on β and ϑ is the main variable of interest. It includes either: the coefficent from equation (6) for the first stage of the IV, β which is the coefficient on the interaction term of two dummy variables, *Treatment* (1 if in treatment group (EU), 0 if in control group (U.S.)) and *Mandate* (1 if after shock date in 2014 (2014-2019), 0 if before shock date (2011-2013)). Or, it includes coefficient ϑ which is the coefficient on the predicted ESG score in the second stage. Dependent variable of interest is ESG performance measured by ESG score in the first stage and Tobin's Q in the second stage. All data retrieved via Refinitiv Eikon Data API. Control variables are: ln(SIZE) and LEV. ln(SIZE) is the natural logarithm of total assets. LEV is the total liabilities over total assets. ***, **, and * indicate statistical significance either at the 1%, 5%, or the 10% level (two-tailed), respectively. Following Flammer (2015) and Gibbons (2020), standard errors are included in parentheses. Standard errors clustered at the firm level are employed for the Low/HighESG partition. Standard errors clustered at the sector level are used for the Low/HighESGSector partition. The model was robust to running all combinations of fixed effects. All variables are defined in Appendix A.

results of hypotheses 1a-c, which were also confirmed earlier. A third cross-sectional analysis regarding the pre-directive reporting status was conducted but discarded and is not reported since results were based on too few firms in the sample that did not report ESG information prior to the directive, which would have made results too unreliable. In the treatment group of 354 EU firms, only 54 firms did not report ESG information in either a standalone report or a section in its annual report in 2013. A potential contribution to an explanation for why there was no substantial firm value effect could be inferred from the low number of firms not reporting prior to the announcement. As there was already a high level of ESG performance maturity, no substantial firm value effect could be detected (Ottenstein et al., 2022). The approach was operationalized with a measure for the pre-directive reporting status. Following De Villiers et al. (2017), Fiechter et al. (2022), Ottenstein et al. (2022), and Stolowy and Paugam (2018), the partition was based on Refinitiv item "CGVSDP026" as a proxy for whether a sample firm reports ESG information in either a standalone report or in a section in its annual report[22] in year t or not.

Based on prior research that showed mainly positive market reactions to mandatory ESG reporting outside the EU (see Chapter 3.1), the findings of this work allow for the potential deduction that either the flawed construction of the NFRD or the information of newly reporting firms caused the negative value reaction in the market. Since only a small number of firms were first-time reporters in the sample, market reaction to this new information must have been considerable, and/or the effect stemmed from the construction of the NFRD itself. As the knowledge of the market reaction is crucial to evaluating the overall effect of the NFRD on firm value, further examination should continue exploring this avenue of research.

6.4. Robustness Tests

To strengthen the above empirical findings, four supplemental robustness checks are included in the following section. First, in the spirit of a recommendation by Larcker and Rusticus (2010) and an exemplary application in Fatemi et al. (2018) and Gibbons (2020), OLS regression results are

[22] This approach was in line with the NFRD requirement that requires a standalone report or an integration in the annual report.

compared to the estimates from the 2SLS analysis. Larcker and Rusticus (2010) advocate that this may mitigate potential difficulties accompanying the IV approach resulting from selecting instrumental variables that meet both the relevance and exogeneity condition for a sound conclusion. The test has been undertaken by contrasting the overall implications from the analysis for answer ***H1a***, which were obtained in an IV setting, with the results from the yearly effects model, which was realised with a two-stage OLS regression (***H1c***). Inferences from this comparison were already mentioned in the *Early and Late Post-Period Firm Value Effects* ***(H1c)*** section. Moreover, equation (3) runs in an OLS setting, which as well resulted in a low negative and significant outcome. Similar results and significance levels suggest that, on average, post-directive ESG performance increased for treatment firms, and the observed market reaction to mandatory ESG disclosure in the EU was weakly negative. This further strengthens the implications of this work.

Second, in accordance with the results of the section *Aggregated ESG* ***(H1a)*** *and Individual E, S, and G* ***(H1b)*** *Firm Value Effects*, in Chapter 6.2 *Baseline Analysis* and the approach of Ioannou and Serafeim (2017), the Governance score is included as a further control variable in both stages of the baseline 2SLS model (equations (2) and (3)) with the Environmental and the Social scores used as dependent variable instead of the overall ESG score. This serves as a simultaneous check which increases statistical resilience since it reduces potential omitted variable bias in this work as Bajic and Yurtoglu (2018) explain. Results in Chapter 6.2 showed that the Governance score was the driving pillar for the control group's combined ESG performance. *Appendix B* shows the individual score development and one plot with the Governance score excluded, where this notion becomes visible. As extant literature and the results of this work demonstrate, each pillar of the ESG score has a different effect, and especially the Governance score has a differentiated effect from the two other scores (Adams et al., 2009; Bajic & Yurtoglu, 2018; Cek & Eyupoglu, 2020; Paolone et al., 2022). Hence, Ioannou and Serafeim's (2017) line of thought is adopted. They argue that "if firms' increase in governance disclosure is associated with improvements in corporate governance and increases in governance disclosure are also associated with increases in environmental and social disclosure, then the results suggesting an association between increases in ESG disclosure and firm value could be the result of improvements in corporate governance." (Ioannou & Serafeim, 2017, p. 26). Results for this robustness test are recorded in Table 11 in *Appendix D*. Overall inferences of an increase in ESG performance and a decrease in firm value remain unchanged. Resultingly, it can be deduced that changes in Governance scores (performance) do not solely influence firm value or ESG scores. Not surprisingly, based on the results of the analysis for ***H1b*** and observable in the plotted development of each subcomponents' performance in *Appendix B*, the Social performance is the main driver for the positive development of the overall ESG performance. However, the Environmental performance seems more relevant for the firm value, as the second stage in Table 11 depicts. This test's importance arises from the potential endogeneity problem associated with corporate governance and firm value, which can be addressed by utilizing the governance performance as a control variable (Ioannou & Serafeim, 2017).

Third, a placebo event is placed in 2012, two years prior to the shock, in line with Atanasov and Black (2016) and the application by Ioannou and Serafeim (2017) and Krueger (2015a). Specifically, the IV2SLS model used to test ***H1a*** was run for the changed shock date and the exact main specifications, and no significant results were obtained. This stands in line with the findings depicted in Figure 2.

The statistical power is additionally elevated as the sample obtained after propensity score matching is relatively large in absolute terms as well as in comparison to other works in the field of research on the implications of the NFRD (e.g., Cuomo et al. (2022), who obtain a sample of 656 firms; Agostini et al. (2022), who work with a sample of 20 firms; Grewal et al. (2019), who receive a sample of 380 firms when additionally matching on ESG performance, and Carnini Pulino et al. (2022), who obtain a sample of 263 firms). All regression models used in this work are run with widely employed model specifications such as utilizing fixed effects (Firm, Year, and Sector-Year), using an IV2SLS setting, and clustering of standard errors. As a fourth robustness test, the three fixed effects are excluded one by one from the baseline model. No diverging effects to the inferences based on the estimated models can be reported (Fatemi et al., 2018). Information on variable correlations are recorded in Table 12 in *Appendix E*.

7. Conclusion

7.1. Summary and Contributions

Revisiting Milton Friedmans' previously quoted view that "The social responsibility of business is to increase its profits" (Friedman, 1970), the findings of this work could potentially fall into his line of reasoning. Robust evidence provided in this work suggests a negative market reaction following the introduction of the NFRD. Nevertheless, this work does not include research on the channels of value destruction. Prior research seems to coincide that higher ESG performance is associated with higher firm value. Thus, one might argue that it is not the market reaction to ESG performance but the enforcement of information disclosure itself or the construction of the directive that creates the negative reaction. It is to be left to future research to explore these drivers.

The implications of the first-time mandate of ESG information disclosure in the EU are examined using an instrumental variable and difference-in-difference approach on a propensity score matched sample. Difference-in-difference results suggest that firm's ESG performance, measured by Refinitiv's ESG scores, significantly increased after the adoption of the directive. Subsequent instrumental variables analysis indicates that the increased ESG performance resulting from the directive is associated with statistically significant

negative effects for Tobin's Q as the measure of firm value. Furthermore, findings indicate that based on the employed sample of 708 firms based in the EU and the U.S., significant anticipatory effects existed. The most considerable effect on ESG performance and Tobin's Q emerges in the first statistically significant year (2015 and 2014, respectively). Moreover, this work finds that sector affiliation and prior ESG performance of firms were pertinent to its valuation in the form that firms with higher ESG ratings or those who belong to sectors with an on average high ESG rating carried a more negative market reaction than firms with lower ex-ante ESG ratings or those belonging to lower rated sectors.

To the best of current understanding, this work offers the first approach to research on firm value implication of the NFRD with an instrumental variables analysis, backed by results from difference-in-difference analyses. Moreover, it is the first work that analyses the implications of the NFRD on Tobin's Q in a yearly effects model. Given the contemporary body of knowledge, this work expands scant research that deals with the value implications of the NFRD and further adds to the notion that the NFRD had an overall negative effect on firm value (Fiechter et al., 2022; Grewal et al., 2019; Mittelbach-Hörmanseder et al., 2021). Furthermore, research on the anticipatory effects of mandatory disclosure regulation (Fiechter et al., 2022; Grewal et al., 2019) as well as the relevance of sectoral affiliation (Cahan et al., 2016; Christensen et al., 2017; Eccles et al., 2012; Krueger, 2015a) and prior ESG performance (Fiechter et al., 2022; Grewal et al., 2019; Ioannou & Serafeim, 2017; Jackson et al., 2020; Mittelbach-Hörmanseder et al., 2021) is extended with the observations in this work. Moreover, the findings further support literature in the field of disclosure and its relationship with ESG/CSR activities (Christensen et al., 2017; Cutler et al., 2004; Schlenker & Scorse, 2017).

More generally, the examination at hand expands earlier scholarly efforts in the field of information disclosure regulation (Armstrong et al., 2010; Bolton et al., 2021; Daske et al., 2008; Leuz & Wysocki, 2015) and can have implications for the field of Mergers & Acquisitions as well (Fich et al., 2021; T. Li et al., 2023). Furthermore, it adds to literature on non-financial disclosure (Cheng et al., 2014; Dhaliwal et al., 2011). Overall, the outcomes of this work may offer insights for further research, policymakers, and practitioners alike.

7.2. Implications for Managerial Practice and Policy

Four central insights for managerial practice and policy are derived following the analysis of the first mandated ESG disclosure regulation in the European Union. First, results suggest that overall, the introduction of the NFRD proved to be a significant event for the information landscape of capital markets, which condensates into an (negative) effect on firm value, as depicted in this work. Hence, it can be deducted that investors view the directive as costly and attribute specific costs and/or benefits to the directive. Second, results of the baseline analysis and the cross-sectional analyses, which were mostly in line with prior research, have revealed that, on average and based on the sample and methods employed, the NFRD had weakly negative firm value implications that differed across firms. From these, it can be inferred that if managers of high ESG-performing firms anticipate a more negative market reaction to a directive than those of low ESG-performing firms, they would be incentivized to disclose less ESG information or reduce their ESG activities to reduce the negative market reaction. Since the goal of the NFRD was to increase the information environment for market participants and spark an internalization of externalities through market mechanisms (see Grewal et al., 2019), such management behaviour would be counterproductive.

Third, because the negative market reaction might partly stem from the flaws in its construction, as the European Union itself had to recognize (Baumüller & Grbenic, 2021; European Parliament, 2022), it does not incentivize firms to disclose or improve ESG performance. Hence, an alteration to the directive (which was made in form of the CSRD) can improve the incentivization and materialize the long-range efforts of the EU. Thus, this work could serve as information for future improvement work on ESG disclosure jurisdiction in general. Fourth, moreover the results of this work have important implications for ESG information disclosure regulation in other jurisdictions, as e.g., the market reaction following the upcoming first-time announcement of climate-related disclosure requirements by the U.S. Securities and Exchange Commission in October 2023 can be predicted more precisely (McGowan, 2023). Additionally, by conducting cross-comparisons of market reactions to the NFRD with other ESG reporting mandates in the EU, such as the CSRD, or outside the EU, such as Integrated Reporting in South Africa, policymakers can draw conclusions about how to construct such a mandate best.

7.3. Limitations and Future Research

The findings of this work are subject to limitations. First, the analysis includes a sample with data obtained from 2011 to 2019. It is pertinent to mention that as the NFRD came into force in 2017, only two years after this date are covered in the sample since the Covid-19 pandemic impacted markets from the beginning of 2020 onwards. The same situation holds for the pre-directive period, where due to various reasons laid out in the temporal considerations section, data was not collected earlier. Hence, this work reports results that a time frame of limited extent could flaw. Second, it is invariably possible that other shocks, which have not been accounted for by the thoroughly conducted analyses, such as the mentioned Paris Climate Agreement or elections in the EU or the U.S., had different effects on each group.

Third, this work draws conclusions on associations, not on causal relationships. Hence, it cannot be ruled out entirely that reverse causality might influence obtained results. Fourth, as models are only as good as their input, this work can be subject to bias or errors caused by the data provided by Refinitiv's Eikon Data API. Specifically, as current research shows, ESG ratings can diverge by rating agency and should be treated with caution because of, e.g., rater effects, where

a rater's total view of a company affects the measurement of particular ESG categories (Berg et al., 2022). Consequently, further research should consult more than one data provider, conduct manual data collection, invest in developing category-specific metrics, and bear in mind that reported data may be structurally flawed by incentivization. Fifth, it cannot be conclusively negated that greenwashing might partly influence the findings of this work. The measure of ESG scores, as a proxy for ESG performance, could potentially include merely symbolic activities that Refinitiv has not detected.

Henceforward, as not analysed in this work, further avenues for research in the contemporary field of mandatory ESG disclosure and firm value implications of the latter may include research on the channels of value creation. To not only draw out the overall macroeconomic value implication of the directive but also to illustrate a more nuanced palette of implications with deeper managerial insights, further research, especially into the channels of value creation or destruction, need to be conducted (e.g., as mentioned, costs, benefits, good/bad ESG information valuation, the legal enforcement of the NFRD and the "comply-or-explain-approach"). Academic research could additionally address the underlying mechanisms by studying anecdotal evidence with individual firm reactions. Furthermore, scholars should leverage the conceptual opportunity to exploit the enlarged potential sample resulting from the individual national transposition. As mentioned, this increased the number from around 2,000 to an estimated 11,500 firms in the EU that had to comply with the NFRD. Simultaneously, studies could employ other measures of firm value, especially different versions of Tobin's Q, as research suggests (see Bartlett and Partnoy, 2018).

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