(Mandatory) ESG Disclosure and the Impact on Firm Value of Publicly Listed Companies on the Western Stock Market

Anne Gretsch

Dissertation written under the supervision of Isaiah Hull

Abstract

This thesis investigates the influence of ESG transparency (ESG disclosure) on the firm value of European and US equities, as assessed by Tobin's Q, with the aim of providing a comprehensive picture of the effects ESG Disclosure can have on firm value. Bloomberg's ESG disclosure score is used to evaluate a sample of 644 firms from Europe and the United States (US). To distinguish the sole influence of the mandatory ESG reporting rules, a difference-in-difference regression is performed with the exogenous shock being the Non-Financial Reporting Disclosure (NFRD). For this, European enterprises of the Stoxx Europe 600 which are subject to the European Union's (EU) NFRD are benchmarked to US firms of the S&P 500 that do not yet have mandatory reporting processes in place. The empirical study in this thesis demonstrates that ESG disclosure, particularly driven by environmental information disclosure, improves firm value. Mandatory reporting standards, such as the NFRD, impede this positive effect since firms are legally required to reveal ESG information, implying information asymmetry between firms and investors because firms tend to conceal unfavourable information. This thesis emphasizes the significance of developing universal ESG reporting standards to increase transparency and comparability on the stock markets.

Keywords: ESG Disclosure, Environmental Disclosure Score, Bloomberg, Firm Value, Voluntary and Mandatory Reporting Standards, Non-Financial Reporting Disclosure, Stoxx Europe 600, S&P 500

Resumo

Esta tese é sobre a **divulgação (obrigatória) de ESG e o impacto no valor da empresa de empresas cotadas na bolsa de valores ocidental**. A presente tese investiga a influência da transparência ESG (divulgação ESG) no valor das empresas de ações europeias e norte-americanas, avaliado pelo Tobin's Q, com o objetivo de fornecer uma imagem abrangente dos efeitos que a divulgação ESG pode ter no valor das empresas. A pontuação de divulgação ESG da Bloomberg é utilizada para avaliar uma amostra de 644 empresas da Europa e dos Estados Unidos. Para distinguir a influência exclusiva das regras de divulgação obrigatória de informações ESG, uma regressão diferença-em-diferença é realizada com o choque exógeno sendo a divulgação de informações não financeiras (NFRD). Para o efeito, as empresas europeias do Stoxx Europe 600, que estão sujeitas à NFRD da União Europeia (UE), são comparadas com as empresas norte-americanas do S&P 500, que ainda não dispõem de processos de relato obrigatórios. O estudo empírico realizado na presente tese demonstra que a divulgação de informações ESG, em particular a divulgação de informações ambientais, aumenta o valor da empresa. As normas de divulgação obrigatória, como a NFRD, impedem este efeito positivo, uma vez que as empresas são legalmente obrigadas a revelar informações ESG, o que implica uma assimetria de informação entre as empresas e os investidores, uma vez que as empresas tendem a ocultar informações desfavoráveis. Esta tese sublinha a importância de desenvolver normas universais de relato ESG para aumentar a transparência e a comparabilidade nos mercados bolsistas.

Palavras-chave: Divulgação ESG, Pontuação de divulgação ambiental, Bloomberg, Valor da empresa, Normas de divulgação voluntárias e obrigatórias, Divulgação de relatórios não financeiros, Stoxx Europe 600, S&P 500

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List of Abbreviations

ESG	Environmental, Social and Governance
EMH	Efficient Market Hypothesis
US	United States
EU	European Union
NFRD	Non-Financial Reporting Directive
SRI	Socially Responsible Investment
CSR	Corporate Social Responsibility
ROA	Return on Assets
DAX	Deutscher Aktienindex
UNPRI	UN Principles for Responsible Investment
SDG	Sustainable Development Goals
TCFD	Task Force on Climate-Related Financial Disclosures
CDP	Carbon Disclosure Project
CDSB	Climate Disclosure Standards Board
IFRS	International Financial Reporting Standards
ISSB	International Sustainability Standards Board
GRI	Global Reporting Initiative
SASB	Sustainability Accounting Standards Board
IIRC	International Integrated Reporting Council
VBA	Value Balancing Alliance
VRF	Value Reporting Foundation
SFDR	Sustainable Financial Disclosure Regulation
CSRD	Corporate Sustainability Reporting Directive
SEC	The US Securities and Exchange Commission
OLS	Ordinary Least Square
F&F MOM	Fama and French Momentum Factor
Imr	Inverse Mills Ratio

1. Introduction

Back in the 1990's John Elkington coined a term called the "triple bottom line" which aimed to transform the traditional financial accounting measurement towards a more holistic approach in measuring impact and success at the same time. It aims to provide a framework which examines a company's economic, ecological as well as social impact (Elkington, 2018). The triple bottom line serves as the basis for Environmental, Social and Governance (ESG) disclosure, where companies complement their financial statements with ESG-related information. Since then, the demand for ESG related funds by private as well as institutional investors has increased drastically by incorporating ESG criteria into their investment decisions (Escrig-Olmedo et al., 2013).

In order to have an impact on society, Blitz and Swinkels (2019) investigated the effectiveness of exclusion strategies, which means excluding (sin) stocks from their investment decisions. According to the authors, investors achieve more by exerting influence as an active owner. The annual meeting of ExxonMobil's shareholders has shown one of the most recent examples. As a response to ExxonMobil's declining historical performance, climate activists were elected to the company's supervisory board at the annual meeting to ensure a future focus of the company towards long-term stakeholder value creation (Hiller & Herbst-Bayliss, 2021).

It is nearly unavoidable for companies to neglect these aspects in their corporate strategy as well as disclose ESG information to the investor to create transparency. This puts a lot of pressure on companies to disclose this information to satisfy the investor's needs. Thus, companies publish a statement of purpose, offer investors integrated financial and ESG reports, involve middle managers more in ESG matters, invest in reliable IT systems, and enhance internal systems for measuring and reporting ESG and impact performance data in order to adapt to this shift of attention (Eccles & Klimenko, 2019). Up to now, the number of firms disclosing ESG related data has grown significantly. The Governance and Accountability Institute shows that in 2012 only 20% of the firms included in the S&P 500 voluntarily published a sustainability report, while in 2019 the number of firms publishing such a report has increased drastically to 92% (G&A, n.d.). However, there are still companies not disclosing any non-financial information potentially to hide dissatisfactory performances or information from investors, making the company more vulnerable.

All over the world, legislators and companies are working on standardizing the way in which non-financial reporting is conducted to increase transparency as well as awareness for ESG on the stock market. For instance in Europe, the EU has published the *Directive 2014/95/EU* – also referred to as Non-Financial Reporting Directive (NFRD) - requiring large companies to report ESG related information since 2014 (European Union, n.d.).

However, by incorporating ESG information into the annual reports, companies may face a trade-off between the costs associated with it as well as the benefits resulting from it. ESG disclosure can come at a cost to companies, as additional resources are required to produce the non-financial reports, resulting in a reduction in the corresponding financial performance (Chen et al., 2018). However, according to Eliwa et al. (2021), ESG disclosure is negatively correlated with the cost of debt. Additionally, Rossi and Harjoto (2020) found a negative correlation between ESG disclosure and agency costs. This negative correlation can be described by a reduction of information asymmetry in both cases (Eliwa et al., 2021; Rossi & Harjoto, 2020).

In this context, the question arises to which extent ESG disclosure can be predictive of the value of a company and therefore contradict the efficient market hypothesis (EMH). Since the 1970s, scholars and investors have published more than 2000 empirical studies on the relation between ESG and financial performance (Friede et al., 2015). However, according to Friede et al. (2015), knowledge about the financial effects of ESG criteria remains fragmented. ESG could potentially contradict the EMH depending on the investors' under- or overvaluation of companies which incorporate ESG criteria into their strategies and operations. It could be that a company which excels in terms of ESG outperforms companies neglecting to incorporate these aspects in the long-run (Nakajima, 2021). The existing research conducted on the relationship between ESG and financial performance will be discussed in more detail in chapter 2 of this thesis.

Since the majority of ESG reporting is currently done on a voluntary basis and investors are lacking transparency, this thesis aims to find answers for the following sub questions:

Do investors value additional information with regards to ESG in a company's annual report? Do companies and investors benefit from mandatory reporting requirements due to a value increase as transparency increases?

Due to the above-mentioned questions, it still seems to be unclear, to which degree investors care and value the extent to which ESG information is disclosed. Therefore, the following key research question is posed:

"How does the disclosure of ESG data of publicly listed companies impact their firm value and does this differ when mandatory ESG disclosure requirements are imposed?"

By presenting a comprehensive picture and assessing whether investors place a higher value on companies that provide detailed ESG information in their annual reports, this research topic intends to give transparency and support the ongoing work on adopting mandatory, universal standards. Significant positive estimates of ESG disclosure on financial performance would in turn lead to higher firm value and thus higher stock return for both investors and companies and emphasize the importance of universal, mandatory ESG reporting. This would proof companies that they should disclose more information since it is positively correlated with firm value. Earlier works have investigated the effect between ESG disclosure and firm performance, however, many of them are focused on the Chinese stock market, such as studies conducted by Chen et al. (2018), Wang et al. (2020), and Chen & Xie (2022). By examining the European and US stock markets from the perspective of investors and utilizing the firm value as the dependent variable to reflect investors' valuations of the respective stock, this thesis attempts to fill a research gap. A study conducted by Yu et al. (2018) investigates the degree to which companies disclose ESG information on the firm value of companies in developed and emerging territories which is similar to the approach of this thesis. However, this thesis extends this analysis by investigating the impact of each ESG determinant on firm value separately and furthermore focuses on the difference between the effect of mandatory and voluntary disclosure requirements to provide a holistic picture of the different impacts ESG disclosure can have on firm value. To address the endogeneity problem, fixed effects are included in each model and a difference-in-difference estimation is conducted to increase the validity of the data. This is done to highlight the significance of disclosing ESG information to investors, which should promote stock market transparency, combat greenwashing, and help ongoing legislative efforts to create a general framework that applies to all businesses.

In order to answer the research question, this thesis is structured as follows. In Chapter 2 existing theories as well as the current findings of the relationship between ESG and financial performance are discussed. In chapter 3 the research methodology and hypothesis are

developed. Chapter 4 describes the data used for the empirical analysis. Chapter 5 shows and explains the regression results which are critically reflected on in chapter 6. The final chapter (chapter 7) concludes this thesis and additionally provides a prospective academic outlook.

2. Theories and Literature Review

2.1 Demarcation of the terms ESG, SRI and CSR

When it comes to sustainable or responsible investing, there are many different terms associated with it. "Socially responsible investment" (SRI) and "corporate social responsibility" (CSR) are two additional concepts that are frequently used in conjunction with ESG investing (Eccles & Viviers, 2011). Since these terms have no standardized meaning, they are commonly used interchangeably (Cooper & Schlegelmilch, 1993). Particularly in this context, Cowton and Sparkes (2004) sought for precise definitions of these terminologies. They argue that SRI has developed substantially over time and is now seen as a mainstream investing approach that is increasingly applied by large institutional investors in addition to ethical funds. In an individual study, Sparkes (2001) defines SRI as an investment strategy that combines social and environmental aims with the financial goal of maximizing risk-adjusted return.

SRI relates to the standpoint of the investor, whereas CSR can be considered from the perspective of the organization. CSR deals with the managerial consideration to include social aspects such as employee welfare or environmental protection in the corporate activity (Carter et al., 2000). According to Lindgreen and Swaen (2010), CSR is about managers and organizations "doing good" in order to increase a firm's competitive advantage by meeting stakeholders' expectations.

John Elkington coined the term ESG with the "triple bottom line," which expanded the traditional profit-focused view of a company by two more factors: people and the planet (Elkington, 2018). Nowadays, it is simply referred to as ESG. ESG, according to De Spiegeleer et al. (2020), is at the heart of any long-term investment strategy. CSR and ESG are linked because companies are increasingly focusing on ESG determinants in their sustainable strategy. In some studies, the terms CSR reporting and ESG reporting are used interchangeably (de la Cuesta & Valor, 2013).

The term "ESG" is used exclusively in this thesis because it more accurately reflects the perspective of both investors and organizations when addressing investments that have an influence on the environment, society, and the economy.

2.2 Shareholder vs. Stakeholder Theory

"There is one and only one social responsibility of business — to use its resources and engage in activities designed to increase its profits." (Friedman, 1962, p. 133)

Referring to the statement by Friedman (1962), the traditional, neoclassical purpose of an organization has been to increase the value of shareholders by focusing on the maximization of profits. Berk and DeMarzo (2017) emphasize the importance of shareholder value creation when discussing the capital structure of a firm since shareholders are better off if the management makes decisions which increase the value of their shares and thus lead to an increase in firm value. Since shareholders provide the equity of a firm but are the residual claimants and thus bear the greatest risk at the same time, shareholder value creation should be emphasized (Berk & DeMarzo, 2017). In 1999, the OECD issued *"The OECD Principles of Corporate Governance"* (OECD, 1999) which emphasize Friedman's and Berk & De Marzo's (2017) perspective that companies should be run in the interest of shareholders. There has also been a remarkable shift in the allocation of corporate resources towards an increase of dividend payments in order to increase the return on equity (ROE) (Lazonick & O'Sullivan, 2000). If the ROE is higher than the cost of equity, the firm is creating shareholder value.

However, there has been a remarkable shift in society and studies concerning the creation of firm value. One of the first presenters of the stakeholder theory was Freeman, claiming that organizations must create value for all of its stakeholders (Freeman, 2010). Various other studies and researchers support this view. According to Mayer (2013), other stakeholders also have long-term specific investments in the firm and should therefore be taken into consideration in managements' decisions. The stakeholder approach is implemented by an increasing number of organizations given that organizations are increasingly sensitized to consider the environment, society as well as economy at the same time requiring a degree of corporation between the organization and its different stakeholders (Friedman & Miles, 2002).

However, this does not necessarily imply that the transition from shareholder value creation to stakeholder value creation contradicts investors' perspectives, as there has been a shift in investors' awareness of the importance of ESG consideration in their investment strategy. For instance, they often consider past environmental or social events in their investments and require additional return to the sole financial yield (Bugg-Levine & Emerson, 2011). In 2014 over 1400 institutional investors have signed the UN Principles for Responsible Investment

(UNPRI) which underlines the shift in investors' thinking towards a more holistic perspective (Kotsantonis et al., 2016). As a response to this shift, the number of organizations disclosing ESG reports has increased significantly since investors incorporate this information in their investment decisions (Amel-Zadeh & Serafeim, 2018). The question remains to what extent the degree of ESG disclosure has an impact on the corporate financial performance and therefore increases value and thus return for investors. While some studies found advantages of companies with high ESG scores over companies with lower ESG scores (Friede et al., 2015; Schröder, 2014), others argue that there is a low likelihood that companies with high ESG scores produce competitive shareholder returns due to an increase in costs (Palmer et al., 1995). In the following, the current findings of studies of firm's ESG activities on financial performance is investigated.

2.3 Literature Review on ESG and Financial Performance

The discussion concerning whether and to what extent ESG actions relate to corporate value and financial success is a crucial part of the ESG conversation. It is possible to distinguish between the quantity of ESG information provided by companies (ESG disclosure) and the quality of ESG activities (ESG performance). The relationship between ESG and financial success has been the topic of more than 2000 empirical studies published by scholars since the 1970s (Friede et al., 2015). Friede et al. (2015) assert that there is still a lack of consensus regarding the financial implications of ESG standards. The following subchapters provide an overview of how academic research is currently progressing on both fronts.

2.3.1   Previous Findings on ESG Performance and Financial Performance

Since the awareness within the society for ESG related activities has increased drastically over the last decade, one could assume that firms with better ESG performance are rewarded by market participants and thus outperform companies with worse ESG performances. Most of the research conducted around ESG has been focused on the link between ESG performance and financial performance. However, as opposed to the general assumption that better ESG performance drives financial performance, empirical research to date has produced mixed findings regarding the nature of the relationship between these variables. As previously mentioned, this has also been detected by Friede et al. (2015) when reviewing over 2000 empirical studies in this field. One of the explanations for a negative correlation can be the increase in costs occurring from costly investments for ESG activities (Palmer et al., 1995).

Servaes and Tamayo (2013) found that ESG can add value to a firm but only under certain conditions. One of them is the degree of customer awareness. Hence, for firms with a high degree of customer awareness, there is a positive relation between ESG and firm value, but otherwise they either found a negative or insignificant relationship (Servaes & Tamayo, 2013).

There has been extensive research on how ESG activities and their performance impact the stock market (Fisher-Vanden & Thorburn, 2011; Krüger, 2015; La Torre et al., 2020). Krüger et al. (2015) considered positive as well as negative events concerning a firm's ESG activities and found that investors respond strongly negatively to negative events but also weakly negatively to positive events (Krüger, 2015). This result is also supported by La Torre et al. (2020), who investigated whether the ESG index affects the Eurostoxx 50 stock return and found that the constituents' performance is not affected by their efforts in ESG commitments. Additionally, when companies invest into green initiatives, insignificant and some even negative stock price reactions were found (Fisher-Vanden & Thorburn, 2011).

However, still, most studies in this field found a positive relationship. One of the ways in which shareholders benefit from a firm's commitment to ESG activities, is that it reduces a firm's downside risk, especially when a firm addresses environmental topics (Hoepner et al., 2022). Also, firms benefit from an improvement of their ESG performance since financial institutions reward firms with a better ESG performance by providing cheaper capital. Eliwa et al. (2021) found that firms with a stronger ESG performance and higher ESG disclosure have a lower cost of debt and thus benefit from lower cost of capital. This is also supported by Schröder (2014), who conducted a literature review on the financial effects of ESG and showed that, both, cost of equity and cost of debt, are lower for firms with good ESG ratings. Furthermore, when analyzing the effects of ESG performance on the financial performance, differences in the findings can occur, depending on accounting-based or market-based measures as dependent variables. According to Velte (2017) who investigated the effect of ESG performance on financial performance of the "Deutscher Aktienindex" (DAX) constituents, there is a positive effect of ESG performance on financial performance, when performance is measured by accounting-based measures, such as Return on Assets (ROA). However, no effect has been found when using market-based measures such as Tobin's Q (Velte, 2017). In contrast to Velte (2017), Hartzmark and Sussman (2019) found evidence that investors have a strong preference for sustainable investments.

However, the quality of ESG activities of firms can only be assessed depending on the information that is disclosed by companies. Therefore, when investigating whether ESG performance impacts financial performance, the degree to which firms disclose information should be considered since otherwise the results might be subject to selection bias. The more information that is disclosed the more the investor knows which in turn reduces information asymmetry. Thus, it must also be assessed to what extent the quantity of ESG information (ESG disclosure) impacts the financial performance. The findings of previous studies are discussed in the following subsection.

2.3.2   Previous Findings on ESG Disclosure and Financial Performance

Some researchers have begun to include the degree to which corporations disclose ESG information in their investigations when researching the link between ESG performance and financial performance. Fatemi et al. (2018) found that ESG disclosure has a moderating effect when investigating the effect of ESG performance on firm value. According to the authors, a high disclosure score weakens the ESG performance of companies, while disclosure of ESG information can also weaken a low ESG performance. The first can be a result of an interpretation of the market to justify an overinvestment in ESG activities, while the latter can be explained by the fact that disclosure helps to legitimate firm behavior and convince investors (Fatemi et al., 2018). Furthermore, firms with better ESG performance benefit from lower cost of debt which influences a firm's cost of capital (Eliwa et al., 2021; Schröder, 2014). However, this is not only valid for companies with a better ESG performance but also for firms which disclose more information and thus contribute to more transparency (Eliwa et al., 2021). A fixed-effects analysis between ESG disclosure and cost of debt financing conducted by Raimo et al. (2021) also shows that firms with a higher degree of ESG disclosure benefit from accessing third party capital at better conditions. This is supported by Christensen et al. (2021) who find that capital markets benefit from a higher degree of ESG disclosure of firms by providing greater liquidity and a lower cost of capital as a result of especially lower cost of debt. This lower cost of capital thus influences a firm's market value positively.

Firms can construct their reporting approach in a variety of ways. Because ESG disclosure is still mostly voluntary, companies can either create an integrated report, which includes both non-financial and financial information, or they can create stand-alone reports, which include only non-financial information. Mervelskemper and Streit (2017) have investigated whether the

type of ESG report is valued differently by investors and found that the ESG performance is valued strongly by investors when firms publish an ESG report, irrespective of its type. Therefore, this provides evidence, that ESG reports increase the transparency on the stock market while reducing information asymmetry. In contrast, some researchers found evidence that investors do not change their investment strategy when ESG information is disclosed and thus reject the hypothesis that investors value ESG information (Moss et al., 2020). However, this must be conceived carefully since this specific study only investigates the portfolio adjustments of retail investors when firms disclose ESG information. Nevertheless, it contributes to the investigation on how universal reporting standards should be created (Moss et al., 2020).

Overall, there are various studies finding a positive relationship between ESG disclosure and financial performance, such as the studies conducted by Wang et al. (2020), Albitar et al. (2020), and Chen and Xie (2022). Wang et al. (2020) discovered that environmental information disclosure improves Chinese firm performance. Albitar et al. (2020) confirms this finding for FTSE 300 firms. Chen and Xie (2022) studied the effect of ESG disclosure on corporate financial performance by using a market-based measure (Tobin's Q) to measure investors valuation for the disclosure of ESG information by companies. However, they have also only looked at the Chinese market and there has been no distinction between voluntary and mandatory reporting standards. The study most similar to this thesis is provided by Yu et al. (2018) who also investigated whether ESG transparency impacts firm value. Their findings confirm that ESG disclosure can reduce investors information asymmetry and agency costs and thereby affecting firm value positively. However, they also focused on the Chinese market and do not examine the quality of ESG disclosure and therefore suggest that disclosure data must be made comparable across firms and countries. This is analyzed in this thesis by comparing companies subject to mandatory reporting guidelines to companies with voluntary reporting standards. There are some studies which have investigated the effect of mandatory disclosure regulations, however, their findings are limited to one specific geographical market. Chen et al. (2018) investigated the impact of mandatory ESG disclosure on Chinese firm profitability and discovered that firms that are legally required to report ESG information face a decline in profitability. Carnini et al. (2022) and Cordazzo et al. (2020) investigated the effect of the NFRD on the greatest Italian listed firms to study the influence of ESG disclosure on firm performance in the European market. They, on the contrary, were solely focused on Italian enterprises.

Therefore, this thesis uses a cross-country analysis by investigating the European and US market as well as considering a longer time frame to have a long-term perspective.

The findings by Christensen et al. (2021) show that research on mandatory ESG (CSR) reporting is largely scarce and mention that there is more research needed on whether mandatory CSR reporting mitigate information asymmetry and provide comparability benefits by reducing agency costs.

Overall, it can be recognized that the influence of ESG disclosure remains fragmented since different studies found different results. Following this discrepancy, this study does not only investigate the effect of general ESG disclosure on firm value but also follows the suggestion of Christensen et al. (2021) by analyzing the effect stemming from the implementation of mandatory reporting guidelines by comparing EU companies covered by the NFRD and benchmarking them to similar US companies which are not covered by the directive. Furthermore, as opposed to most studies, this study provides further insights into the effect of each determinant of ESG disclosure to provide a holistic picture and support legislators with the creation of mandatory reporting guidelines.

2.4 ESG Disclosure Standards

As previously discussed, an increasing number of companies adhere to ESG reporting practices since they create transparency and meet stakeholders' expectations for sustainability information disclosure. Even though there are no global mandatory guidelines applicable to any firm, businesses are expected to disclose ESG information by their stakeholders (Shabana et al., 2017). Adhering to specific guidelines not only offers firms directions on the content they should disclose but also increases the trustworthiness of the firm itself (Darnall et al., 2022). However, universal ESG reporting guidelines are still lacking and thus ESG reports by companies cannot be clearly compared and assessed (Hahn & Kühnen, 2013). This is one of the main challenges that is being discussed by legislators right now when it comes to ESG reporting guidelines. Some firms have to disclose ESG reports while other firms can choose voluntarily to do so (KPMG, 2016). Many new standards and frameworks have been published in the recent years, of which most of them can be applied on a voluntary basis. However, there has been a remarkable push for mandatory reporting requirements in order to create advanced and more reliable sources on the market (Van der Lugt et al., 2020). The following subsections provide an overview of the current landscape of ESG reporting guidelines.

2.4.1   Landscape of Sustainability Disclosure Standards

Since there are still no universal reporting standards applicable to any company globally, many NGO's independently work on the development of sustainability reporting standards. Figure 1 illustrates the current reporting landscape of standards which are already used by companies, or which are still under development.
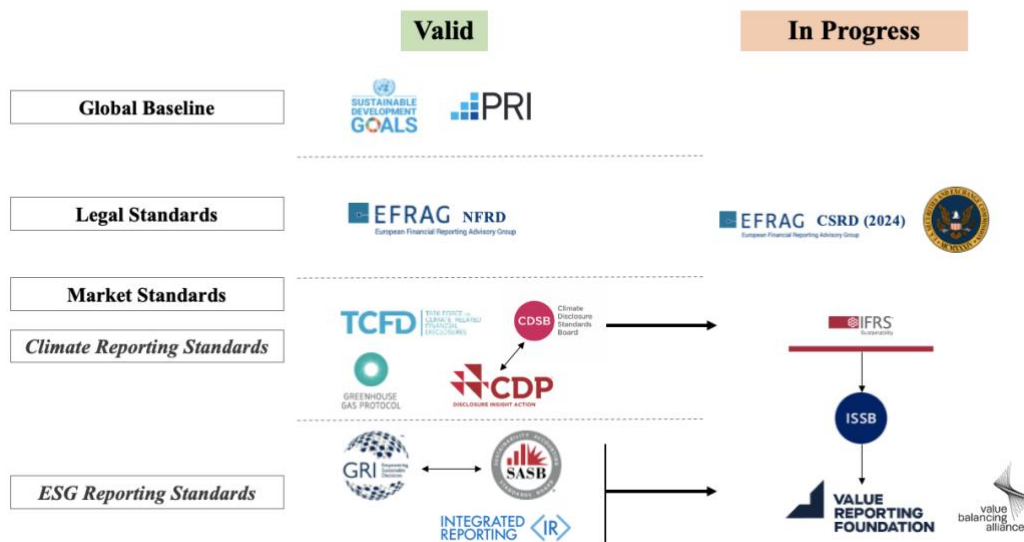
Figure 1. Global Sustainability Reporting Landscape

The global baseline for all sustainable reporting standards is set by the Sustainable Development Goals (SDG) as well as the UN PRI. The SDGs encourage governments to work together to develop measures to accomplish them, and investors are increasingly putting pressure on firms to contribute to the achievement of the SDGs (Esty & Cort, 2020). Additionally the UN PRI help to understand how ESG affects investment decisions and support the incorporation of these factors into investment and ownership decisions (UN PRI, n.d.).

After the publication of these general guidelines, several institutions have started the process of creating sustainability reporting standards, which aim to enhance the transparency on the investment market as well as the comparability among companies. As shown by figure 1, it must be distinguished between climate reporting standards and standards which focus on all three ESG components. One of the most applied frameworks for climate disclosure was created by the Task Force on Climate-Related Financial Disclosure (TCFD). This framework was formed in 2015 to promote a transparent decision-making when it comes to sustainable investment decisions. However, companies applying this framework cannot be compared since there is little common guidance on the parameters and assumptions used to create the respective

reports (Esty & Cort, 2020, p. 27). With the help of the Carbon Disclosure Protocol (CDP), companies can disclose climate-related information through universal questionnaires regarding their carbon emissions across their operations and supply chains and contribute to a high level of consistency across responses (Esty & Cort, 2020, p. 20). The Climate Disclosure Standards Board (CDSB) cooperates with the CDP to provide "(…) a complete, reliable and verified system for climate disclosure." (CDSB, n.d.). The three organizations (i.e. TCFD, CDP and CDSB) aim to launch an information hub for the disclosure of climate-related information (TCFD, n.d.). In 2021, the International Financial Reporting Standards (IFRS) Foundation announced the consolidation of CDSB into the IFRS Foundation and its newly created International Sustainability Standards Board (ISSB) (IFRS, n.d.-a).

In terms of ESG Reporting, many different standards have been developed over the last years. One of the first reporting standards in this area was set by the Global Reporting Initiative (GRI), which was founded in 1997 and guides the voluntary preparation of sustainability reports. Furthermore, the GRI emphasize that these standards can be used with other standards to create an extensive sustainability report (Esty & Cort, 2020, pp. 17–18). Furthermore, the Sustainability Accounting Standards Board (SASB) issues 77 different standards and focuses on financial materiality. The International Integrated Reporting Council (IIRC), on the other hand, is a principle-based approach to evaluate an organization's business model. However, this is more difficult to apply than the GRI standards and therefore are not as common (Esty & Cort, 2020). The Value Balancing Alliance (VBA) works together with the "EU Platform of Sustainable Finance" and aims to develop green accounting principles to measure the impact of large corporations on the environment, society and economy and translates this into financial numbers. However, they have only recently started to create a first method which was tested by the founding members of the VBA and is further developed based on the feedback from the first round of implementation (VBA, n.d.). There was a global confusion about the available ESG reporting standards and investors and companies alike have been frustrated by the lack of transparency (Barker et al., 2020). The IFRS Foundation has recognized this and created the ISSB to help meet this demand. The aim of the ISSB is to deliver a comprehensive set of standards to support investor's decision-making and consolidate the landscape of voluntary disclosure standards into one applicable standard (IFRS, n.d.-b). Furthermore, the ISSB is the supervisory board of the Value Reporting Foundation (VRF). The VRF is a consolidated entity of the SASB and the IIRC with the ultimate goal to create a universal set of standards. Therefore, with the consolidation of SASB, IIRC and the CDSB into the IFRS Foundation, the

ISSB has a strong intellectual property to address investors and organizations demands for a greater alignment of ESG standards (Mirchandani, 2021).

The before-mentioned standards are all voluntary practices which can be applied by companies. However, some nations have established legal (mandatory) ESG reporting guidelines. The following chapter elaborates the mandatory reporting guidelines in Europe as well as the US.

2.4.2 Mandatory ESG Disclosure Standards

Globally, mandatory ESG reporting varies due to different national legislation and the lack of a "global government". While some countries made ESG reporting mandatory for businesses a few years ago, other countries are only now beginning the legislative process of making ESG reporting legally binding. When examining the national laws pertaining to ESG, it becomes apparent that, in general, the amount of mandatory ESG reporting is increasing. This shows that governments and other legislators are becoming increasingly mindful of the need for greater transparency. Since the focus of this thesis is on the western stock market, this chapter elaborates on the mandatory reporting guidelines for the EU und US, respectively.

The NFRD directive (2014/95/EU), the Sustainable Financial Disclosure Regulation (SFDR), and the EU Taxonomy are the central components of the sustainability reporting requirements in the EU. The NFRD is most applicable here as the SFDR governs how financial market participants disclose ESG information to investors while the NFRD governs how companies must disclose ESG information.

The NFRD was published in 2014 and became first effective for businesses in the fiscal year 2017. Since then, large European companies with more than 500 employees have been required to include non-financial information about ESG in their annual reports. Furthermore, companies from outside the EU are subject to this directive if they generate significant revenue in the EU. While the directive specifies the content of ESG information that must be disclosed, it does not specify how companies must publish this information, whether as stand-alone reports, as part of their annual report, or in accordance with a specific framework. This legislation currently applies to approximately 11.700 businesses (European Union, 2014).

The NFRD was extended in 2021 by the Corporate Sustainability Reporting Directive (CSRD), which expanded the scope to include all large (listed and non-listed) companies, as

well as all listed companies of any size. The NFRD's issue is addressed by the CSRD as under the NFRD, each corporation can report using a different set of standards, which leads to a lack of precision. As a result, the CSRD envisions the development of a universal set of standards which will apply to all companies subject to this directive (European Union, 2021, pp. 5, 45).

In contrast, the United States lacks a predefined mandatory reporting standard. It remains a voluntary practice for US companies, however, the number of companies reporting ESG information voluntarily has increased drastically over the years. While in 2012 only 20% of the firms included in the S&P 500 published a sustainability report, the number of firms publishing such a report has increased to 92% in 2019 (G&A, n.d.). The US Securities and Exchange Commission (SEC) announced in March 2022 that by 2024, ESG information must be disclosed (SEC, 2021). The proposed legislation focuses on the GHG protocol as well as the Task Force on Climate-Related Financial Disclosures (TCFD), but does not fully adapt to these, giving companies some flexibility (Deloitte, 2022). The SEC stated in their proposed rule that the existence of multiple frameworks and disclosure standards has failed to produce the expected market transparency (SEC, n.d.).

3. Hypothesis Development and Research Methodology

After reviewing the present state of research on ESG disclosure and company performance, this chapter explains the hypotheses tested in this thesis and the research design. For this, it is assumed that all firms want to maximize their value.

3.1 Hypothesis Development

To answer the research question of ***"How does the disclosure of ESG data of publicly listed companies impact their firm value and does this differ when mandatory ESG disclosure requirements are imposed?"***, the following economical hypotheses are developed:

Hypothesis 1: ESG disclosure affects firm value positively.

    Hypothesis 1a: Companies which disclose ESG information have a higher firm value compared to companies which do not disclose any ESG information.

    Hypothesis 1b: The greater the disclosure of ESG information, the higher the firm value.

Hypothesis 2: Increasing the extent to which companies disclose information on individual ESG determinants has a positive impact on firm value.

Hypothesis 3: Firm value is positively affected by the implementation of mandatory disclosure standards such as the NFRD.

In order to test the hypothesis, Ordinary least square (OLS) regressions are constructed and executed in order to describe the relationship between the dependent and independent variables. Further details on the models as well as variables used for the hypothesis testing can be found in the following chapters.

3.2 Variables

3.2.1   Dependent Variable

Because this thesis focuses on the investor's perspective and the value of ESG disclosure, a market-based metric is chosen as the dependent variable. In this case, an appropriate measure for the firm value is Tobin's Q, which represents the valuation of a firm by comparing the market value of a company's assets and liabilities to their book market. This follows the approach of previous studies of Yu et al. (2018), Chen and Xie (2022), as well as Cordazzo et al. (2020) who all used market-based measures as their dependent variable for their empirical analysis. Using a market-based measure, such as Tobin's Q, is a suitable strategy for this thesis since it not only analyzes whether there is an influence on the company's financial performance but also considers investors' valuation for ESG information. The theories outlined in Chapter 2 support this, highlighting the shift in investor thinking.

3.2.2   Independent Variable

The ESG disclosure score, which can be retrieved from the Bloomberg database, serves as the primary independent variable in the models of this thesis as it focuses on the quantity and transparency of ESG information. The Bloomberg ESG Disclosure score allocates a number between 0.1 and 100 to companies, depending on the quantity of ESG information they report. If a firm does not disclose any information, the value is represented with N/A. Each datapoint of this score is weighted according to its importance. Furthermore, it is also tailored to different industry classes. It neglects the firm's actual performance of their ESG activities which is also not in scope for this study. The higher the score, the more transparent is the company. The ESG disclosure therefore represents the company's commitment in reporting their respective ESG activities to the public. It includes the reporting of all activities in the environmental, social and governance field. Based on the definition of the Bloomberg ESG disclosure score, it can be viewed as an appropriate measure for information which is – voluntarily as well as mandatorily – disclosed by firms. It has also been commonly used by other studies such as Yu et al. (2018).

Furthermore, other variables of interest are the disaggregated disclosure scores. For this, the environmental, social and governance score are evaluated separately. A similar methodology for each score is applied by Bloomberg, with the only difference that it only considers data for each category (E,S,G), separately.

3.2.3 Control Variables

Following existing studies (Chen et al., 2018; Yu et al., 2018; Carnini et al., 2022), the models in this thesis control for the following variables:

- **Firm size:** Since the behavior of large firms is usually imitated by others, it is a relevant control variable. Institutional investors often focus on larger firms. Therefore, they usually have more financial resources available to invest, affecting the firm's market value (Yu et al., 2018; Chen & Xie, 2022). Thus, a positive coefficient is expected for this variable.

- **Financial leverage:** The leverage of a firm impacts firm performance since the corresponding costs arising from interest payments are expected to have a negative impact. The higher the Leverage Ratio, the higher the agency costs for the investor since the investor is facing a higher risk in case of financial distress.

- **Cash:** Having more cash at hand means looser external financing constraints, leading to more investment opportunities. An appropriate measure for a company's liquidity is the Free Cash Flow. Therefore, a positive coefficient for this variable is expected.

- **Fama and French Momentum Factor (F&F MOM):** F&F MOM reflects the influence of stronger market reactions in times of a negative market-sentiment and therefore, a more severe decrease in market returns affect firm value. It represents the tendency for rising asset prices to rise further or falling asset prices to drop further. This variable is used by financial analysts in buy and sell recommendations and consequently, this variable is included in this study as it is correlated with the market value of a firm (Fama and French, n.d.).

- **Time (year) and Industry fixed effects:** In order to mitigate the issue of endogeneity from potential omitted variables, two fixed effects are included in the models, keeping the year and the industry constant. The choice for industry fixed effects is done in order to control for firm specific effects which are similar between the industries. This shuts down any industry-specific characteristics which are constant over time. Time fixed effects shut down any time-related characteristics which are constant across the sampled firms. The fixed effect method is an effective way to overcome the problem of endogeneity since it eliminates common events for all firms at one point of time.

3.3 Model Specification

In order to test the hypothesis described in chapter 3.1, OLS regressions are run with the dependent, independent and control variables described in chapter 3.2. A full list of the variables used, the specified names, definitions and respective data source can be taken from Appendix 1. A normal distribution as well as homoscedasticity of the error terms is assumed by including a sufficient amount of control variables.

The following models are constructed to test each hypothesis individually.

Hypothesis 1a:

$$Tobin's\ Q_{i,t} = \alpha_{i,t} + \beta_{1\ i,t}\ x\ ESG\ Dummy + \beta_{2\ i,t}\ x\ Size + \beta_{3\ i,t}\ x\ Leverage + \beta_{4\ i,t}\ x\ Cash + \beta_{6\ i,t}\ x\ F\&F\ MOM + \lambda_i + \lambda_t + \mu_{i,t}$$

Equation 1. Regression Model for Hypothesis 1a

To be able to test the extensive margins of ESG disclosure, the ESG disclosure must be transformed into a dummy variable where all companies disclosing any amount of ESG information receive a value of 1 and all other companies with a ESG disclosure score, specified as N/A in the original dataset, receive a value of 0. However, as most firms disclose ESG information, this dummy variable is calculated manually by assigning all firms below the median of this variable a value of 0 and vice versa.

Hypothesis 1b:

$$Tobin's\ Q_{i,t} = \alpha_{i,t} + \beta_{1\ i,t}\ x\ ESG\ Disclosure + \beta_{2\ i,t}\ x\ Size + \beta_{3\ i,t}\ x\ Leverage + \beta_{4\ i,t}\ x\ Cash + \beta_{6\ i,t}\ x\ F\&F\ MOM + \lambda_i + \lambda_t + \mu_{i,t}$$

Equation 2. Regression Model for Hypothesis 1b

Since the intensive margins are tested for hypothesis 1b, the ESG disclosure score is taken as a number between 0.1 and 100, as specified and calculated by Bloomberg.

Hypothesis 2:

$$Tobin's\ Q_{i,t} = \alpha_{i,t} + \beta_{1\ i,t}\ x\ Environmental\ Disclosure + \beta_{2\ i,t}\ x\ Size + \beta_{3\ i,t}\ x\ Leverage + \beta_{4\ i,t}\ x\ Cash + \beta_{6\ i,t}\ x\ F\&F\ MOM + \lambda_i + \lambda_t + \mu_{i,t}$$

Equation 3. Regression Model for Hypothesis 2: Environmental Disclosure Score

Tobin's Q$_{i,t}$ = α$_{i,t}$ + β$_{1\ i,t}$ x Social Disclosure + β$_{2\ i,t}$ x Size + β$_{3\ i,t}$ x Leverage + β$_{4\ i,t}$ x Cash +
β$_{6\ i,t}$ x F&F MOM + λ$_i$ + λ$_t$ + μ$_{i,t}$

<p align="center">Equation 4. Regression Model for Hypothesis 2: Social Disclosure Score</p>

Tobin's Q$_{i,t}$ = α$_{i,t}$ + β$_{1\ i,t}$ x Governance Disclosure + β$_{2\ i,t}$ x Size + β$_{3\ i,t}$ x Leverage + β$_{4\ i,t}$ x Cash
+ β$_{6\ i,t}$ x F&F MOM + λ$_i$ + λ$_t$ + μ$_{i,t}$

<p align="center">Equation 5. Regression Model for Hypothesis 2: Governance Disclosure Score</p>

In order to test hypothesis 2, three estimating equations with different variables of interest must be constructed, since there are three ESG determinants: the environmental, social and governance pillar.

Hypothesis 3:

To test hypothesis 3, a difference-in-difference estimation must be constructed to determine the sole effect stemming from the implementation of a mandatory disclosure requirement in the EU. Therefore, two groups of firms must be used, where one represents the treated group and the other one represents the control group. The treated group includes public, European firms with more than 500 employees, which fall under the NFRD mandate. The control group is represented by similar US firms which do not fall under the proposed mandate. The exogeneous shock used for this difference-in-difference estimation is the implementation of the NFRD of the EU, which became effective for all listed, European public entities with more than 500 employees in 2017. Therefore, the time frame before 2017 is considered as the pre-treatment phase while the time frame after 2017 but before 2020 is used as the post-treatment phase. It must be highlighted, that the post-treatment phase only represents a short time frame, however, due to the Covid-19 crisis affecting stock markets in 2020 and the economic crisis due to the Ukrainian war in 2022, the time frame between 2020 and 2022 is neglected as this would lead to a biased result. When looking at a shorter time frame in the difference-in-difference estimation, the probability of including confounding events is lower and therefore the time frame for this empirical test only considers the time frame between 2016-2020 (two years pre- and two years post treatment phase with the treatment in 2017). The defining premise behind this is that results for both European and US firms would have maintained parallel trajectories

in the absence of the Directive. The following table (table 1) gives a precise distinction of the difference-in-difference method.

Table 1 – Detailed Difference-in-Difference Model Set up

_

Effect of Mandatory Disclosure	Before 2017 (A = 0)	After 2017 (A = 1)	After - Before
European Listed Firms with employees > 500 – Treatment group (T = 1)	$\alpha + \beta$	$\alpha + \beta + \delta + \psi$	$\delta + \psi$
Similar US firms – Control group (T = 0)	α	$\alpha + \delta$	δ
Treated - Control	β	$\beta + \psi$	ψ

_

Tobin's $Q_{i,t} = \alpha_{i,t} + \beta_{1\,i,t}$ x Treatment $+ \delta_{i,t}$ x After $+ \psi$ x (Treatment x After) $+ \beta_{n\,i,t}$ x Control Variables[1] $+ \lambda_i + \lambda_t + \mu_{i,t}$

Equation 6. Regression Model for Hypothesis 3[2]

Applying a difference-in-difference method supports the establishment of a causal inference between (mandatory) ESG disclosure and firm value by calculating the effect of the implementation of mandatory ESG reporting guidelines. This is done by comparing the average change over time of the firm value of the European firms to the average change over time for the firms not falling under the NFRD mandate and comparing the respective differences.

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[1] Control Variables are the same as in the previous models, specifically Size, Leverage, Cash, F&F MOM
[2] Where
- _A = 1: assigned to observations after 2017_
- _T = 1: assigned to European companies with more than 500 employees_

3.4 Selection Bias

Selection bias is a major econometric issue that must be addressed. There might be firms that do not report any ESG information and hence do not appear in the research sample. This could be because organizations with better ESG information to disclose are more likely to reveal a greater volume of this information, compared to firms with weaker information to disclose to the public. Because investors are likely to prefer companies with better ESG information over others, it is projected that companies with poor ESG information will hide it as long as ESG information is disclosed voluntarily. As a result, the data sample must be modified to reduce the dataset's bias. Because there is a defined treatment and control group (binary variable) for hypothesis 1, this can be done with the propensity score matching approach. Since hypothesis 1b and 2 include a continuous variable as the independent variable, a Heckman Correction is performed to see if selection bias is a severe issue in this research design. Since the two methods are examined as part of the robustness tests to see whether selection bias provides a significant problem, they will be outlined and explained in greater detail in chapter 5 in regard to the data utilized in this thesis.

4. Data

4.1 The Sample

The data sample for this thesis consists of index constituents of both, the Stoxx Europe 600 and the S&P 500, since they represent a wide range of small, medium, and large cap companies on the European and North American Stock Market. Indices are chosen since they provide a clear cut on the selection of companies for the dataset to be used in this thesis. The Stoxx Europe 600 index is chosen since it represents a broad range of companies among the European countries within different industries. The S&P 500 is chosen since it can be seen as the North American equivalent of the Stoxx Europe 600 due to a similar number of index constituents and similar market capitalizations of the included companies.

For each index constituent, historic data was collected for the time frame from 01st January 2010 to 01st January 2020. All variables listed in Appendix 1 are collected from Bloomberg except for one variable – the F&F momentum – which is collected from WRDS. This time frame is selected due to the increasing amount of voluntary ESG reporting standards disclosed after 2010, as discussed in chapter 2.4.2. It does not include data after the 01st January 2020 due to the economic crisis at that time posed by the Covid-19 crisis and the Russian-Ukrainian war. In order for the financial data to be comparable, all measures are retrieved in USD.

With the date always set to the first of January of the respective year, data for each index constituent is retrieved year by year before being combined into a single dataset. Variables which are not described as a ratio or percentage are transformed into their natural logarithm form to reduce skewness and to receive an approximate normal distribution. In order to evaluate the geographical and industry belongingness of the different assets, the respective data is retrieved for 2010 as well. For the following years it is assumed that the industry and geographical belongingness remained constant until 2020. Companies without financial data for each year are ignored. Since it is crucial to include organizations with missing ESG disclosure scores in the observation to test hypothesis 1a (extensive margins), companies with lacking ESG disclosure scores are included in the dataset. It is ensured that each organization is represented in the dataset each year to produce a balanced dataset. The main dependent variable of the specified models – Tobin's Q – is not available on Bloomberg. Thus, it is manually calculated by dividing the total market value of a firm by the total asset value of this firm. Since Tobin's Q is highly industry-dependent (Yu et al., 2018), industry-fixed effects are

included. In order to test the extensive margins, as specified by hypothesis 1a, an ESG dummy is created which is assigned a value of 0 for companies with a total ESG disclosure score of lower than the Sample Median (0.45) and vice versa. In order to test hypotheis 3, three dummies are created:

- *"Treatment" dummy:* assigns a value of 1 for companies located in Europe and more than 500 employees, assigns a value of 0 otherwise.
- *"After" dummy:* assigns a value of 1 for all observations after 2017, assigns a value of 0 otherwise.
- *"Interaction" dummy:* assigns a value of 1 if both the "treatment" as well as the "after" dummy equal 1, also referred to as the product of the "Treatment" and "After" Dummy.

As shown by table 2, the final dataset consists of 7084 firm-year observations with 334 companies located in Europe and 310 companies located in North America.

Table 2 – Number of Index Constituents obtained from Bloomberg with respective Industry Belongingness

Industry Sector	Europe	North America
Banking	27	10
Consumer Discretionary Products	22	14
Consumer Discretionary Services	3	7
Consumer Staple Products	21	22
Financial Services	15	16
Health Care	24	35
Industrial Products	35	25
Industrial Services	32	17
Insurance	20	17
Materials	32	15
Media	8	9
Oil and Gas	15	17
Real Estate	13	16
Retail and Wholesale	14	23
Software & Technology	8	21
Technology hardware	5	20
Telecommunications	17	3
Utilities	23	23
Total	334	310

4.2 Descriptive Statistics

A brief description of the variables used in the models is provided below.

Table 3 – Descriptive Statistics

This table reports descriptive statistics for the variables used in Equations (2) to (5). Refer to Appendix 1 for a description of the variables. For each variable, the full sample descriptive statistics are presented. It ignores the variables for equations (1) and (6) since the extra variables in these equations are dummy variables (Currency: USD).

Variable	Obs	Mean	Std. Dev.	Min	Max
ESG Disclosure Score	7084	.448	.127	0	.781
Env Disclosure Score	7084	.284	.202	0	.923
Social Disclosure Score	7084	.249	.137	0	.732
Gov Disclosure Score	7084	.799	.165	0	1
Log Firm Size	7084	10.377	.669	8.557	12.544
Fin Leverage	6973	5.775	15.398	1.009	787.818
Log Cash	7064	7.774	3.16	0	11.408
ROA	7079	5.884	6.887	-61.82	127.509
Number of Employees	7003	59682.905	117930.85	2	2300000
MOM	7084	.008	.018	-.016	.06
Tobin's Q	7084	1.302	1.351	.007	14.416

The table shows that for each disclosure score, the minimum value is 0. This satisfies the requirement that the dataset includes firms which do not disclose any ESG information. Additionally, it becomes evident that the Governance score is the highest among the three individual disclosure scores (100%), followed by the environmental disclosure score (92.3%). On average, the firms of the S&P 500 and Stoxx Europe 600 have an ESG disclosure score of 44.8%. The main dependent variable of interest –Tobin's Q – is on average 1.3, indicating that most firms in this dataset have a higher market value than book value. From the standard deviation of Tobin's Q, it becomes evident that the values are quite spread out, whereas the values of the ESG disclosure score are more clustered around the mean. The average number of employees in this dataset is 59,683 employees, where the lowest value equals to 2 and the firm with the most employees reaches a total number of 2,300,000 employees. The firms with more than 500 employees are used to test hypothesis 3.

Table 4 presents the correlation matrix of the applied variables. It demonstrates that the disclosure scores, as well as Tobin's Q and ROA, are substantially correlated. Because Tobin's Q is the key dependent variable and ROA is utilized for robustness tests, this supports the

research design of this thesis. The table also shows that the control variables are not highly correlated, indicating that multicollinearity is not likely to be prevalent in the models.

Table 4 – Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) ESG Disclosure Score	1.000									
(2) Env Disclosure Score	0.874	1.000								
(3) Social Disclosure Score	0.854	0.750	1.000							
(4) Governance Disclosure Score	0.559	0.261	0.340	1.000						
(5) Tobin's Q	-0.051	-0.039	-0.076	0.002	1.000					
(6) ROA	-0.010	-0.005	-0.021	0.009	0.632	1.000				
(7) Log Firm Size	0.272	0.246	0.225	0.154	-0.483	-0.356	1.000			
(8) Financial Leverage	0.015	0.004	0.021	0.017	-0.115	-0.101	0.248	1.000		
(9) log Cash	0.031	0.011	-0.013	0.072	0.176	0.201	0.005	-0.021	1.000	
(10) MOM	0.163	0.127	0.160	0.095	0.047	0.010	0.032	0.004	0.013	1.000

Furthermore, the trend of the ESG Disclosure Score over the years is analyzed. Therefore, the average ESG disclosure score of all the firms for each year is calculated. Figure 2 shows an increasing amount of ESG information being disclosed by the firms of the S&P 500 and Stoxx Europe 600 which supports the information given in chapter 2.4, stating that an increasing number of firms publish ESG information from 2010 to 2020.
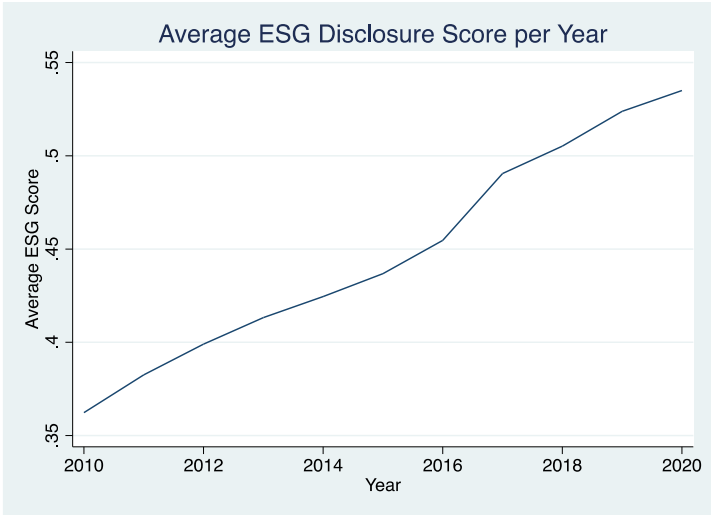
Figure 2. Trend of the Average ESG Disclosure Score from 2010 to 2020

5. Results

Before running the regressions, the Hausman Test is selected in order to determine whether fixed effects or random effects are applicable for the models. Since the p-values of this test are close to zero, the null hypothesis is rejected and therefore the fixed effects are used for further analysis which allows for controlling variation across industries and time. The detailed results of the Hausman Test can be found in Appendix 2.

5.1 Results for Hypothesis 1

To recall from chapter 3.1, the following hypothesis is intended to be tested:

Hypothesis 1a: Companies which disclose any ESG information have a higher firm value compared to companies which do not disclose any ESG information.

Table 5 represents the regression results with robust standard errors in order to mitigate potential heteroscedasticity (Croux et al., 2003). To compute robust standard errors, the Huber-White method is chosen as it adjusts the standard errors to account for potential heteroscedasticity and provides robust estimates (White, 1980).

Table 6 shows that the coefficient for the ESG dummy is statistically insignificant. Therefore, hypothesis 1a can be rejected, since simply disclosing ESG information compared to not disclosing ESG information does not affect firm value.

Looking at the control variables, table 5 shows that all control variables are significant on a 1% level, except for financial leverage. This is unexpected, since it was initially suggested that financial leverage is a significant control variable. However, the R-squared of 0.352 is reasonable and therefore the models are deemed to be well specified. An irregularity detected in these models is the sign of the control variable *"Firm Size"*. It was expected that the *"Firm Size"* has a positive coefficient, however, it turns out to be the opposite. One possible explanation for this contradiction is that firms of a larger size invest more in potential "stranded assets" and thus costs increase, negatively affecting firm value. Another possible explanation is that smaller firms are usually in an earlier stage of the business lifecycle and therefore have more potential to grow while representing a less volatile historic performance, leading to a higher valuation by investors. The sign of the remaining regression coefficients is in line with the initial expectations.

Table 5 – Panel Regression Results for Hypothesis 1a with Tobin's Q

Table 5 contains the regression coefficients, test statistics, number of observations and robust standard errors of the model used to test hypothesis 1a. It is determined whether companies which disclose any ESG information have a higher firm value compared to companies which do not disclose any ESG information. All fixed effects are included in the model. The dependent variable used in this model is Tobin's Q and the main variable of interest is the ESG Dummy. The ESG Dummy takes a value of 0 when the ESG disclosure score is below the median and a value of 1 if the disclosure score is above the median. The robust standard errors are stated in parentheses and statistical significance at 10%, 5% and 1% levels are labelled by *,** and ***.

VARIABLES	(1) Hypothesis 1a
ESG Dummy	**0.174**
	(0.113)
Log Firm Size	-0.894***
	(0.0311)
Financial Leverage	0.000295
	(0.000552)
Log Cash	0.0423***
	(0.00306)
MOM	9.114***
	(1.236)
Constant	9.973***
	(0.364)
Observations	6,954
R-squared	0.352
Fixed Effects	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Since simply comparing ESG disclosure to non ESG disclosure does not seem to have a significant impact, the degree of ESG disclosure and its impact on firm value must be determined. Therefore, as a next step, the intensive margins are tested. To recall, hypothesis 1b states:

Hypothesis 1b: The greater the disclosure of ESG information, the higher the firm value.

Table 6 shows the regression results. When testing the intensive margins, the variable of interest (ESG disclosure score) is statistically significant on a significance level of 1%. This is a strong result and indicates that firm value, as measured by Tobin's Q, is positively impacted by the degree of ESG disclosure of firms. A one-standard deviation increase of the ESG Disclosure score can increase Tobin's Q by around 5.32%, ceteris paribus. For this model, the changes in control coefficient estimates required to offset a one standard deviation increase in the ESG disclosure score is calculated in order to be able to provide a more insightful measure of the ESG score magnitude. Therefore, one control variable is chosen for this purpose. Due to its significance and interpretability, the control variable for a firm's liquidity (*Log Cash*) is chosen. To offset the effect of a one standard deviation increase in the ESG disclosure score on Tobin's Q, the liquidity of a firm (measured in *Log Cash*) would have to be increased by approximately 72%. Given the standard deviation of the control variable of 3.16 (table 3), it suggests that the increase is smaller than the variability observed in the control variable itself. This can be interpreted as a moderate effect.

Furthermore, the R-squared of the regression is nearly the same as in the previous regression (shown in table 5), indicating a well-specified model. As in table 5, all control variables are statistically significant on a 1% significance level, with financial leverage being marginally statistically significant on a 10% significance level. This indicates that testing the intensive margins is a better model to explain the impact on firm value since the explanatory variable is statistically significant and financial leverage is a (marginally) statistically significant control variable. The same explanation for the control variables as for the results in table 5 above (hypothesis 1a) can be applied here.

Overall, while the results illustrated in table 5 do not provide supporting evidence for hypothesis 1a, the results presented in table 6 do provide supporting evidence for hypothesis 1b by showing statistically significant, positive coefficients. This is in line with the initial expectations.

However, the results must be interpreted with caution since they might be biased due to selection issues. Therefore, before drawing a final conclusion, the results must be validated by robustness checks, which are presented and discussed in chapter 5.4.

Table 6 – Panel Regression Results for Hypothesis 1b with Tobin's Q

Table 6 contains the regression coefficients, test statistics, number of observations and robust standard errors of the model used to test hypothesis 1b. It is determined whether increasing ESG disclosure results in a higher firm value. All fixed effects are included in the model. The dependent variable used in this model is Tobin's Q and the main variable of interest is the ESG Disclosure Score. The robust standard errors are stated in parentheses and statistical significance at 10%, 5% and 1% levels are labelled by *,** and ***.

	(1)
VARIABLES	Hypothesis 1b
ESG Disclosure Score	**0.566*****
	(0.132)
Log Firm Size	-0.938***
	(0.0336)
Financial Leverage	0.000928*
	(0.000550)
Log Cash	0.0416***
	(0.00307)
MOM	7.478***
	(1.293)
Constant	10.28***
	(0.377)
Observations	6,954
R-squared	0.353
Fixed Effects	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

5.2 Results for Hypothesis 2

In this chapter, it is tested whether each determinant of ESG – E, S and/or G – (positively) impacts firm value. The results are presented in table 7.

To recall, hypothesis 2 states:

Hypothesis 2: The extent to which companies disclose information on individual ESG determinants has a positive impact on firm value.

Column (1) – (3) in table 7 show that only the ESG determinants for E (Environment) and G (Governance) are statistically significant on a 1% significance level. The Social disclosure score, in contrast, is not statistically significant as depicted by column (2). These results indicate that only a higher score of environmental and governance disclosure is positively valued by investors and increases firm value. In terms of magnitude of the regression coefficients, a one standard deviation increase in the environmental disclosure score can positively influence Tobin's Q by a 6.62% increase. The governance score has lower effect on Tobin's Q since a one standard deviation increase in governance disclosure score only increases Tobin's Q by 2.81%, ceteris paribus. This is related to the existence of market standards for sustainability disclosure, as explained in chapter 2.4.1, because most of these standards cover the environmental and governance aspects but fall short on the social side due to the lack of a uniform definition of social sustainability. Firms tend to disclose more information in these areas when complying to one or more of these standards. Therefore, the results are reasonable. Looking at the R-squared it is also similar to the previous models and therefore reasonable. As mentioned before, also the results must be validated by robustness checks before drawing fundamental conclusions.

Table 7 – Panel Regression Results for Hypothesis 2 with Tobin's Q

Table 7 contains the regression coefficients, test statistics, number of observations and robust standard errors of the model used to test hypothesis 2. It is determined whether increasing the extent to which companies disclose information on the individual ESG determinants has a positive impact on firm value. All fixed effects are included in the model. The dependent variable used in this model is Tobin's Q and the main variable of interest are the environmental disclosure score, social disclosure score and governance disclosure score. The robust standard errors are stated in parentheses and statistical significance at 10%, 5% and 1% levels are labelled by *,** and ***.

VARIABLES	(1) Environmental Disclosure Score	(2) Social Disclosure Score	(3) Governance Disclosure Score
Env Disclosure Score	**0.443*****		
	(0.0837)		
Social Disclosure Score		**0.0945**	
		(0.116)	
Gov Disclosure Score			**0.230*****
			(0.0837)
Log Firm Size	-0.950***	-0.900***	-0.904***
	(0.0347)	(0.0327)	(0.0311)
Financial Leverage	0.000936*	0.000956*	0.000977*
	(0.000536)	(0.000556)	(0.000571)
Log Cash	0.0426***	0.0424***	0.0414***
	(0.00309)	(0.00307)	(0.00302)
MOM	7.364***	8.798***	8.304***
	(1.266)	(1.306)	(1.282)
Constant	10.56***	10.02***	9.927***
	(0.400)	(0.378)	(0.366)
Observations	6,954	6,954	6,954
R-squared	0.354	0.352	0.352
Fixed Effects	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

5.3 Results for Hypothesis 3

To be able to test hypothesis 3, the dataset of this thesis is adjusted to only include the time frame from 01/01/2016 to 01/01/2020. This time frame is chosen to make it as narrow as possible around the event of the implementation of the NFRD in order to prevent the inclusion of confounding events. All remaining years are dropped.

To recall, hypothesis 3 states the following:

Hypothesis 3: Firm value is positively affected by the implementation of mandatory disclosure standards such as the NFRD.

Table 8 shows the regression results for Equation 6 with robust standard errors and all fixed effects included.

The positive regression coefficient for the "After Dummy" indicates that, on average, firms experience an increase in Tobin's Q following the NFRD implementation. On a 5% significance level, this coefficient is statistically significant. The main variable of interest, the difference-in-difference estimator (Interaction Dummy), in contrast, demonstrates a negative regression coefficient that is statistically significant on a 1% significance level. This implies that, compared to the control group, European firms, subject to the directive, experience a significant decrease in Tobin's Q after the directive's implementation. To be more specific, a one standard deviation increase in the Interaction Dummy leads to a 5.94% decrease in Tobin's Q. As a result, the results shown in table 8 lead to a rejection of hypothesis 3. One possible explanation is that once the NFRD becomes legally binding, firms are required to disclose ESG information that they would prefer to keep hidden if they were not required to disclose it, whereas US firms can simply disclose any ESG information they want and still hide if they perform poorly in certain ESG areas. This model also shows that Firm Size has a negative impact on Tobin's Q. The same explanations as in Section 5.1 apply here. In contrast to the previous tests, the control variable "Financial Leverage" is statistically significant on a 1% level. The variable's coefficient also contradicts the initial expectation of being negative. One possible explanation is that firms with higher leverage are monitored more closely by large financial institutions and other debtholders, reducing agency costs and are thus more trustworthy, which positively affects firm value.

Table 8 – Panel Regression Results for Hypothesis 3 with Tobin's Q

Table 8 contains the difference-in-difference regression coefficients, test statistics, number of observations and robust standard errors of the model used to test hypothesis 3. It is tested whether firm value is positively affected by the implementation of mandatory ESG disclosure standards such as the NFRD. All fixed effects are included in the model. The dependent variable used in this model is Tobin's Q and the main variable of interest is the Interaction Dummy. The Treatment dummy is 1 for all companies subject to the NFRD and 0 otherwise. The After Dummy equals 1 for all data points after 2017 and 0 otherwise. The Interaction Dummy is the product of the Treatment and After Dummy. The robust standard errors are stated in parentheses and statistical significance at 10%, 5% and 1% levels are labelled by *,** and ***.

VARIABLES	(1) Hypothesis 3
Treatment Dummy	0.0579
	(0.0842)
After Dummy	0.0933**
	(0.0381)
Interaction Dummy	**-0.209***
	(0.0464)
Log Firm Size	-2.051***
	(0.181)
Financial Leverage	0.00165***
	(0.000511)
Log Cash	0.00310
	(0.00281)
MOM	4.734***
	(0.425)
Constant	20.14***
	(1.775)
Observations	2,986
R-squared	0.903
Fixed Effects	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Furthermore, Figure 3 represents a visual illustration of the difference-in-difference model. Because of the way the data in the dataset is created, the treatment line is shown in 2018. Since the years are always represented by the 1st of January of each year instead of the 31st of December of each year, the treatment effect can is shown in 2018, since the NFRD became mandatory for the annual reports of 2017. Therefore, investors were only able to evaluate the degree of disclosed ESG information in 2018 (taking the annual report of 2017 as the basis for their decision-making).
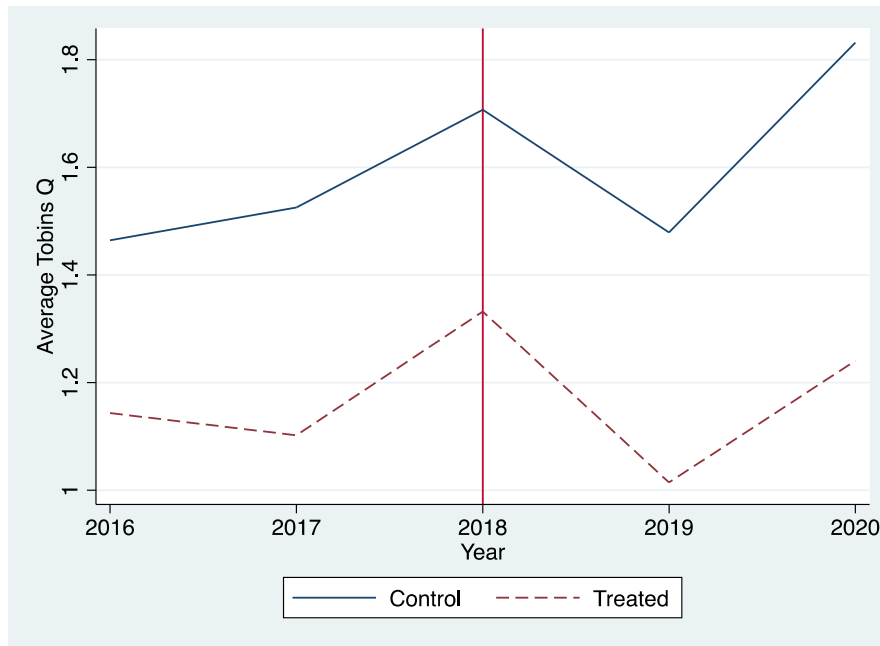
Figure 3. Visual Representation of the Effect of the NFRD Implementation

It is evident that both groups – control and treated groups – experience a decrease in Tobin's Q after the NFRD became mandatory. However, in 2019 this decrease has been offset by a drastic increase in Tobin's Q for the control group while it increases less steeply for the treated group. This increase from 2019 to 2020 in the treated group is not able to offset the drastic decrease in Tobin's Q directly after the implementation of the NFRD. The decrease in Tobin's Q for the control group could be due to investors anticipating value destructing ESG information to be disclosed for any company after the implementation of the NFRD. However, assumingly investors are satisfied by the information that the control group discloses, firm value increases again above the "before" level in 2019 for the control group, while it does not recover in the same manner for the treated group.

5.4 Robustness Tests

In order to validate the empirical results provided in the previous sub chapters, they must be tested for their robustness. Therefore, the same models as previously specified are run again with a different dependent variable. To explore the impact of different measures of financial performance, an accounting-based measure is now used as the dependent variable in exchange for the market-based measure Tobin's Q. In more detail, the Return on Assets (ROA) is used to follow the approach of Chen and Xie (2022) and Velte (2017). The aim of this is to support the hypothesis that ESG disclosure impacts firm performance. Furthermore, the data used for the models might be subject to selection bias, as described in chapter 3.3. Therefore, they are adjusted for potential selection bias using Propensity Score Matching and Heckman correction in order to validate their explanatory power.

As there is substantial skewness, especially in the control as well as the dependent variables included in the dataset (see table 4), all the data is winsorized at the 1% and 99% percentile as frequently used in financial studies and followed by Fatemi et al. (2018). After running the previous models (table 5-8) with the winsorized dataset again, no substantial changes are found. Therefore, removing the outliers does not lead to differing results and the dataset used for the hypothesis tests in chapter 5.1 to 5.3 is continued to be used.

5.4.1   ROA as the Dependent Variable

In this chapter, each model outlined in Chapter 3.3 is run again, with the main variation being that the dependent variable is now ROA rather than Tobin's Q to provide insights into the effect of ESG on accounting-based measurements. The models are run in the same order as described in chapters 5.1 to 5.3.

Table 9 provides the results for hypothesis 1a. When using ROA as the dependent variable, the coefficient remains statistically insignificant. Therefore, there is no difference to the previous results in section 5.1 since when testing the extensive margins with either dependent variable (Tobin's Q or ROA), the results are insignificant, providing robustness to the previous identified results.

Table 9 – Panel Regression Results for Hypothesis 1a with ROA

Table 9 contains the regression coefficients, test statistics, number of observations and robust standard errors of the model used to test hypothesis 1a as part of the robustness test. It is intended to be tested if the results for the test of hypothesis 1a hold when ROA as an accounting-based measure is considered. This aims to test whether firms which disclose ESG information have a higher ROA compared to firms which do not disclose ESG information. All fixed effects are included in the model. The dependent variable used in this model is ROA and the main variable of interest is the ESG Dummy. The robust standard errors are stated in parentheses and statistical significance at 10%, 5% and 1% levels are labelled by *,** and ***.

| | (1) |
VARIABLES	Hypothesis 1a - ROA
ESG Dummy	**0.631**
	(0.760)
Log Firm Size	-3.118***
	(0.156)
Financial Leverage	-0.00361
	(0.00500)
Log Cash	0.304***
	(0.0218)
MOM	38.21***
	(7.775)
Constant	33.29***
	(1.833)
Observations	6,954
R-squared	0.216
Fixed Effects	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Therefore, it is also of interest to determine, whether there is an impact on ROA depending on the degree of ESG information disclosed. As shown by table 10, the sign of the coefficient for the ESG disclosure score is positive and statistically significant for a 1% significance level. This provides a similar result as when the model is tested with Tobin's Q as the dependent variable in section 5.1. Looking at the magnitude of the result, it appears that the coefficient of the ESG disclosure score has a much higher absolute value. This is due to the ROA being used as the dependent variable, as its standard deviation is much higher than for Tobin's Q. To be

more precise, a one standard deviation increase in the ESG disclosure score leads to an 8% increase in ROA which is 3% higher than when tested with Tobin's Q as the dependent variable.

Table 10 – Panel Regression Results for Hypothesis 1b with ROA

Table 10 contains the regression coefficients, test statistics, number of observations and robust standard errors of the model used to test hypothesis 1b as part of the robustness test. It is intended to be tested if the results for the test of hypothesis 1b hold when ROA as an accounting-based measure is considered. This aims to test whether increasing ESG Disclosure results in a higher firm performance, measured as ROA. All fixed effects are included in the model. The dependent variable used in this model is ROA and the main variable of interest is the ESG Disclosure Score. The robust standard errors are stated in parentheses and statistical significance at 10%, 5% and 1% levels are labelled by *,** and ***.

VARIABLES	(1) Hypothesis 1b - ROA
ESG Disclosure Score	**4.340*****
	(0.681)
Log Firm Size	-3.455***
	(0.167)
Financial Leverage	-0.00151
	(0.00338)
Log Cash	0.299***
	(0.0219)
MOM	25.67***
	(8.253)
Constant	35.70***
	(1.905)
Observations	6,954
R-squared	0.219
Fixed Effects	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

When testing hypothesis 2 with ROA as the dependent variable, the results are all statistically significant for a 1% significance level. This is interesting to see, because when tested in section 5.2 with Tobin's Q as the dependent variable, the coefficient for the social disclosure score is not statistically significant. This indicates that disclosing a higher degree of information for any of the three ESG determinants results in a higher ROA, either by having a

positive effect on the net income (nominator) or a negative effect on the denominator (Total Assets). Again, it appears, that the magnitude of the coefficients is much higher for the ROA compared to the previous results where Tobin's Q is the dependent variable. However, ROA has a very high standard deviation (as shown in table 3) and therefore the magnitude of the coefficients must be expressed in terms of their standard deviation to provide comparability. A one standard deviation increase in the environmental disclosure score leads to a 6.67% increase in ROA, which is about the same magnitude as for the Tobin's Q, where the increase is 6.62%. Corresponding numbers for the social disclosure score and governance disclosure score are 6.1% and 3.3%. As the magnitudes for the environmental disclosure score and for the governance disclosure score is very similar to the results in chapter 5.2, the main difference lies in the significance of the social disclosure score. These results for the accounting-based measures are aligned with the results provided by academic researchers and described in chapter 2.3.

Table 11 – Panel Regression Results for Hypothesis 1b with ROA

*Table 11 contains the regression coefficients, test statistics, number of observations and robust standard errors of the model used to test hypothesis 2 as part of the robustness test. It is intended to be tested if the results for the test of hypothesis 2 hold when ROA as an accounting-based measure is considered. This aims to test whether increasing disclosure in one of the three ESG pillars (E, S, G) results in a higher firm performance, measured as ROA. All fixed effects are included in the model. The dependent variable used in this model is ROA and the main variable of interests are the Environmental Disclosure Score, Social Disclosure Score and Governance Disclosure Score. The robust standard errors are stated in parentheses and statistical significance at 10%, 5% and 1% levels are labelled by *,** and ***.*

	(1)	(2)	(3)
VARIABLES	Environmental Disclosure Score	Social Disclosure Score	Governance Disclosure Score
Env Disclosure Score	**2.275***		
	(0.445)		
Social Disclosure Score		**3.047***	
		(0.660)	
Gov Disclosure Score			**1.378***
			(0.422)
Log Firm Size	-3.407***	-3.311***	-3.175***
	(0.170)	(0.165)	(0.156)
Financial Leverage	-0.00134	-0.00183	-0.00113
	(0.00341)	(0.00352)	(0.00337)
Log Cash	0.306***	0.304***	0.299***
	(0.0218)	(0.0218)	(0.0219)
MOM	29.22***	28.01***	33.36***
	(8.141)	(8.332)	(8.142)
Constant	36.34***	35.11***	33.03***
	(1.992)	(1.920)	(1.833)
Observations	6,954	6,954	6,954
R-squared	0.218	0.218	0.216
Fixed Effects	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

As a last step it is also of interest to see what happens to the ROA after the NFRD has been introduced in 2017. To recall from chapter 5.3, the coefficient of the interaction dummy was negative and statistically significant for a 1% significance level (-0.209). When running the same model, with the ROA as the dependent variable, table 12 shows that the interaction dummy becomes statistically insignificant. Therefore, the results illustrated in table 12 indicate that there is no impact on firm performance after mandatory reporting standards are introduced.

Table 12 – Panel Regression Results for Hypothesis 3 with ROA

*Table 12 contains the difference-in-difference regression coefficients, test statistics, number of observations and robust standard errors of the model used to test hypothesis 3 as part of the robustness test. It is intended to be tested if the results for the test of hypothesis 3 hold when ROA as an accounting-based measure is considered. The results show how financial performance (ROA) is affected by the implementation of mandatory ESG disclosure standards such as the NFRD. All fixed effects are included in the model. The dependent variable used in this model is ROA and the main variable of interest is the Interaction Dummy The Treatment dummy is 1 for all companies falling under the NFRD and 0 otherwise. The After Dummy equals 1 for all data points after 2017 and 0 otherwise. The Interaction Dummy is the product of the Treatment and After Dummy. The robust standard errors are stated in parentheses and statistical significance at 10%, 5% and 1% levels are labelled by *,** and ***.*

VARIABLES	(1) Hypothesis 3 - ROA
Treatment Dummy	-1.947
	(1.936)
After Dummy	0.0686
	(0.481)
Interaction Dummy	**0.578**
	(0.373)
Log Firm Size	-4.751
	(3.371)
Financial Leverage	-0.00339
	(0.00394)
Log Cash	0.120***
	(0.0396)
MOM	2.866
	(4.889)
Constant	54.54*
	(32.69)
Observations	3,146
R-squared	0.630
Fixed Effects	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

5.4.2   Selection Bias

Recalling from chapter 3.4, selection bias can be an issue for hypothesis 1 and 2. Since the treatment variable for hypothesis 3 are European firms with more than 500 employees, selection bias does not pose a serious issue for this model and is therefore not considered. Accordingly, the following subchapters modify the data set to mitigate potential selection bias and provide either more reasonable results for hypothesis 1 and 2 or support the findings provided in the previous chapters.

5.4.2.1 Propensity Score Matching – Hypothesis 1a

In order to create a more balanced dataset and check for selection bias in the data used for the models, propensity score matching is carried out for hypothesis 1a. Therefore, the approach of Leuven & Sianesi (2018) is followed in Stata 17 using the command psmatch2. The outcome variable is specified as Tobin's Q and the treatment variable is the ESG Dummy. The following covariates are used to run the propensity score matching:
- Natural Logarithm of Firm Size
- Market Cap

After specifying the probit model, the propensity scores are calculated, and the matching is done according to the nearest neighbour matching. Appendix 3 shows the results of the Probit Regression Model. After the propensity scores are calculated and the ESG Dummy is matched accordingly, it is tested whether there still exist significant differences between the matched and unmatched group. The respective results are presented in Appendix 4. All t-stat values of the covariates are between -2 and 2 (for the general 5% significance level), which means that there are no more significant differences between the matched and unmatched group (Appendix 4). Therefore, the matching is deemed to be successful, and the matched dataset can be used to test hypothesis 1a.

After decreasing the selection bias in the dataset, hypothesis 1a, with the matched ESG Dummy[3] as the main explanatory variable can be run and the results are presented in the following table (table 13).

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[3] In Stata the matched dummy is referred to as _treated under the Stata Comman „psmatch2".

Table 13 – Panel Regression for Testing Hypothesis 1a – Matched Data

Table 13 contains the regression coefficients, test statistics, number of observations and robust standard errors of the model used to test hypothesis 1a after propensity score matching has been conducted in the dataset. It is determined whether companies which disclose any ESG information have a higher firm value compared to companies which do not disclose any ESG information. All fixed effects are included in the model. The dependent variable used in this model is Tobin's Q and the main variable of interest is the ESG Dummy_matched. In the Stata command PSmatch2, a new variable is created for the dummy variable, called "_treated". This variable is used to conduct the analysis. The robust standard errors are stated in parentheses and statistical significance at 10%, 5% and 1% levels are labelled by *,** and ***.

VARIABLES	(1) Hypothesis 1a - matched
ESG Dummy_matched	**0.162**
	(0.116)
Log Firm Size	-0.926***
	(0.0327)
Financial Leverage	0.000519
	(0.000617)
Log Cash	0.0455***
	(0.00330)
MOM	10.01***
	(1.285)
Constant	10.30***
	(0.382)
Observations	6,602
R-squared	0.356
Fixed Effects	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

As shown in table 13, the total number of observations used in the regression decreased from 6,954 to 6,602 due to the propensity score matching. As initially expected, the coefficient remains insignificant, however, with a lower magnitude than in section 5.1. This indicates that the data might be biased in the form of selection issues. However, this is difficult to determine based on this model since the coefficient of interest has been insignificant initially. Therefore, the following chapters provide more insights into the existence of selection bias in the dataset.

As described in chapter 3.4, the data for hypothesis 1b and 2 must be adjusted for potential selection bias. However, the method of propensity score matching is not applicable for this due to the nature of the independent variable being continuous instead of binary.

Following the approach of Khan et al. (2021) and Wang et al. (2023), Heckman Correction is an appropriate method to adjust data with continuous variables for selection bias. Following this approach, a two-step Heckman correction model is applied. The first step is to run a probit regression by constructing the selection equation and calculating the inverse mills ratio (imr). As a second step, an OLS regression (outcome equation) is analyzed based on the first-stage binary probit model by including the imr as a control variable.

Since a binary variable is needed to run the probit model, the continuous independent variables for each hypothesis must be transformed into such a variable type. For this, the continuous variables for the ESG disclosure score, Environmental disclosure score, Social disclosure score and Governance disclosure score are transformed into binary variables by first calculating the median of these data columns. The medians of each variable are the following:

- ESG Disclosure Score Median: 0.45
- Environmental Disclosure Score Median: 0.29
- Social Disclosure Score Median: 0.25
- Governance Disclosure Score Median: 0.83

Every firm in the panel data with a score below the median receives a score of 0, while the firms with a score above the median receive a score of 1. Then, the two-step Heckman Correction is carried out and the following tables show the regression results, adjusted for selection bias.

First, the results for hypothesis 1b are analyzed as provided by table 14 – again with robust standard errors and all fixed effects included. As shown in column (1), the variable of interest (ESG disclosure score) is still significant on a 1% significance level. Moreover, the magnitude of the coefficient is similar to the results shown in section 5.1 (column (2)). The imr is significant, indicating that some selection bias applies to this data sample.

When accounting for selection bias, a one standard deviation increase in the ESG disclosure score results in a 4.74% increase in Tobin's Q. Without accounting for selection bias, a one standard unit increase in the ESG disclosure score leads to an increase in Tobin's Q of 5.32% which is only slightly higher. The change in control variables needed to offset a one standard deviation increase in the ESG disclosure score is calculated one more time to compare the effect of selection bias to the previous result presented in chapter 5.1. Again, the control variable "Log Cash" is chosen. In order to offset a one standard deviation increase in the ESG disclosure score on Tobin's Q, the firm's liquidity must increase by approximately 61% (to recall, without accounting for selection bias, this offset amounted to an increase of 72%). Therefore, this is a good indication that when accounting for selection bias, the results do not change drastically, it simply reduces the effect of the ESG disclosure score.

Since the magnitude of the coefficient for ESG disclosure standard has not drastically decreased and provides a similar result, selection bias is not considered a serious issue in this thesis. Still, for the discussion of the results and to draw a final conclusion, the results adjusted for selection bias are used.

Table 14 – Panel Regression Result for Hypothesis 1b – Heckman correction

Table 14 contains the regression coefficients, test statistics, number of observations and robust standard errors of the model used to test hypothesis 1b after accounting for selection bias. It is determined whether increasing ESG disclosure results in a higher firm value. All fixed effects are included in the model. The results for the Heckman correction regression are shown in column (1) and the results from table 6 are shown in column (2) to make the comparison of the different results easier. The dependent variable used in this model is Tobin's Q and the main variable of interest is the ESG Disclosure score. The robust standard errors are stated in parentheses and statistical significance at 10%, 5% and 1% levels are labelled by *,** and ***.

VARIABLES	(1) Hypothesis 1b – Heckman Correction	(2) Hypothesis 1b – without selection bias
ESG Disclosure Score	**0.504*****	**0.566*****
	(0.132)	(0.132)
Log Firm Size	-1.608***	-0.938***
	(0.104)	(0.0336)
Financial Leverage	0.00107*	0.000928*
	(0.000602)	(0.000550)
Log Cash	0.0397***	0.0416***
	(0.00308)	(0.00307)
MOM	-14.41***	7.478***
	(3.215)	(1.293)
imr	-4.595***	
	(0.625)	
Constant	21.28***	10.28***
	(1.622)	(0.377)
Observations	6,954	6,954
R-squared	0.362	0.353
Fixed Effects	YES	YES

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Looking at each ESG determinant individually and running the same steps for the Heckman correction as before, it can be highlighted that there is a significant change in the results compared to the results presented in chapter 5.2. Table 15 does not show the imr's as the table is adapted to fit the layout of this thesis. The full table can be found in Appendix 5. The results

for the model for hypothesis 2 adjusted for selection bias are shown in table 15. Previously, the coefficients for the environmental and governance disclosure score were positive and statistically significant on a 1% significance level. Table 15 shows that, adjusted for selection bias, only the coefficient for the environmental score remains statistically significant on a 1 % significance level while now additionally the governance disclosure score becomes statistically insignificant. However, it is important to note that also before, the magnitude of the coefficient for the governance disclosure score was rather small (2.81%) and therefore it is not surprising that it becomes statistically zero after adjusting for selection bias since the previous results have shown that the magnitude of the coefficients decreases.

Looking at the magnitude of the coefficients, table 15 shows, that the environmental disclosure score slightly decreases from 0.443 in section 5.2 to 0.421 in table 15. In terms of standard deviations, this means that a one standard deviation increase in the environmental disclosure score is associated with a 6.29% increase in Tobin's Q while without accounting for selection bias the increase amounts to 6.62%. In other words, when accounting for selection bias, only a higher environmental disclosure score (with a slightly lower magnitude than before) positively impacts firm value while the other two determinants do not have a statistically significant effect. Looking at the control variables, the coefficients magnitudes and significance levels are similar as in section 5.1, except for the F&F MOM being negative when the dataset is adjusted for selection bias. As mentioned before, the adjusted results will be used in the further context.

Table 15 – Panel Regression Results for Hypothesis 2 – Heckman Correction

*Table 15 contains the regression coefficients, test statistics, number of observations and robust standard errors of the model used to test hypothesis 2 after accounting for selection bias. It is determined whether increasing the extent to which companies disclose information on the individual ESG determinants has a positive impact on firm value. All fixed effects are included in the model. The dependent variable used in this model is Tobin's Q and the main variable of interest are the environmental disclosure score, social disclosure score and governance disclosure score. The robust standard errors are stated in parentheses and statistical significance at 10%, 5% and 1% levels are labelled by *,** and ***.*

VARIABLES	(1) Environmental Disclosure Score	(2) Social Disclosure Score	(3) Governance Disclosure Score
Env Disclosure Score	**0.421***		
	(0.0835)		
Social Disclosure Score		**0.0590**	
		(0.114)	
Gov Disclosure Score			**-0.00813**
			(0.0740)
Log Firm Size	-1.383***	-1.674***	-2.215***
	(0.123)	(0.0928)	(0.0700)
Financial Leverage	0.000914*	0.00130**	0.00317**
	(0.000537)	(0.000650)	(0.00138)
Log Cash	0.0418***	0.0393***	0.0201***
	(0.00309)	(0.00310)	(0.00297)
MOM	-4.003	-29.57***	-64.02***
	(3.184)	(4.101)	(3.130)
			(0.804)
Constant	17.47***	24.65***	37.23***
	(1.895)	(1.648)	(1.269)
Observations	6,954	6,954	6,954
R-squared	0.357	0.365	0.448
Fixed Effects	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Further Robustness checks are carried out by regressing the models with ROA as the dependent variable and adjusted for selection bias. The detailed results are presented in Appendix 6. As before, most regression coefficients decrease in size but remain significant. Only when testing hypothesis 2 with ROA and adjusting it for selection bias, the regression coefficient for the governance disclosure score becomes insignificant. As the magnitude of the Governance disclosure score has been low (3.3%) and adjusting for selection bias decreases the magnitude of the regression coefficients, it is not unexpected that the Governance disclosure score turns to become statistically insignificant.

This analysis once again proofs that selection bias is included in the data and therefore the results adjusted for selection bias are used in the further context.

6. Discussion & Limitations

6.1 Discussion

Table 16 – Summary of the Key Results

Table 16 contains a summary of the key results to provide a holistic overview of the most relevant findings of this thesis. It shows the results of hypothesis 1 to 3 with Tobin's Q as the dependent variable. The results used with Tobin's Q as the dependent variable are taken from the results provided in chapter 5.4, where the models are adjusted for selection bias. It also shows the results of hypothesis 1 to 3 with ROA as the dependent variable to provide an overview of the robustness of the results. The results used with ROA as the dependent variable are taken from Appendix 6. The table reports the main coefficient of interest for each model, the magnitude of the regression coefficient as well as the significance level of the regression coefficients.
Note, "-" in column (4) denotes that the coefficient of interest is statistically insignificant.

	(1)	(2)	(3)	(4)
Dependent variable	Coefficient of Interest	Regression Coefficient	Magnitude of the coefficients in terms of standard deviation (in %)	Significance of the regression coefficient
Tobin's Q	ESG Dummy	0.162	1.08	-
Tobin's Q	ESG Disclosure Score	0.504	4.47	1%
Tobin's Q	Environmental Disclosure Score	0.421	6.29	1%
Tobin's Q	Social Disclosure Score	0.059	0.6	-
Tobin's Q	Governance Disclosure Score	-0.00813	-0.1	-
Tobin's Q	Interaction Dummy	-0.209	-5.94	1%
ROA	ESG Dummy	0.631	0.82	-
ROA	ESG Disclosure Score	4.100	7.56	1%
ROA	Environmental Disclosure Score	2.194	6.44	1%
ROA	Social Disclosure Score	2.918	5.8	1%
ROA	Governance Disclosure Score	0.407	0.98	-
ROA	Interaction Dummy	0.578	3.22	-

This section summarizes and discusses the key findings of this research and puts it in the context of the already existing findings of the academic literature discussed in chapter 2.3. For each hypothesis test, Table 16 provides a summary of the main findings. As highlighted in the results section, the results adjusted for selection bias are used in the further discussion. To compare the impact of ESG disclosure on accounting-based and market-based measures, table 16 contains both the results for the tests where Tobin's Q and ROA is used as the dependent variable. The results with ROA as the dependent variable are taken from Appendix 6 as these are the results adjusted for selection bias. To recall, adjusting the dataset for selection bias provides more reasonable results and therefore these results are used for the discussion.

Overall, the results in this thesis confirm the findings of Yu et al. (2018), Albitar et al. (2020), Wang et al. (2020) and Chen & Xie (2022) who all find that ESG information is value relevant. Interestingly, the mere disclosure of ESG, as measured by the ESG Dummy, does neither impact firm value nor financial performance as measured by ROA. One possible explanation is that market forces are strongly influencing firm's decision on disclosing ESG information as it is required by financial institutions (Raimo et al., 2021). As a result, ESG disclosure has become the "norm," and just comparing broad margins has no effect on firm value because most firms now report ESG information, which investors take for granted. This is also the reason why the ESG dummy is created manually as most firms already publish ESG related information. Overall, a higher degree of ESG disclosure positively enhances a firm's operational (measured as ROA) as well as market performance (measured as Tobin's Q) which is also aligned with the results of the studies mentioned above. Diving deeper into each ESG determinant separately, the only ESG determinant that affects Tobin's Q in a positive way is the environmental disclosure score while both, the social and governance disclosure score, do not impact firm value. This is a surprising finding as it was expected that all three pillars affect firm value. In contrast to most of the previous studies which focus on the overall effect of ESG disclosure on firm performance (accounting- and market-based), this provides valuable insights and contributes to expanding the already existing findings on this topic.

The question remains, why firm value is only affected by the environmental pillar of ESG. One reason could be that investors are more interested in companies that focus on the mitigation of environmental issues because they are intrinsically motivated or because it is increasingly demanded by their customers (when speaking of institutional investors). Due to this higher demand of "E" stocks, firm value rises. Another potential explanation is the existence of the voluntary disclosure standards as described in section 2.4, where most standards focus on

standardizing the reporting of environmental risks and opportunities of a firm. As shown in figure 1 in section 2.4, there exists a whole category of climate reporting standards, including the TCFD, CDP and CDSB, all targeting the "E" in ESG. This makes it easier for investors to evaluate a firm's environmental information and its impact on expected future cashflows and/or the cost of capital determining the overall market value. Another explanation of the strong significance of this regression coefficient could be the presence of the EU (environmental) taxonomy, which provides a common definition on which activities constitute as sustainable activities (European Union, pp.13, 2020). As the dataset used in this thesis entails data from the Stoxx Europe 600, this taxonomy regulation by the EU can be an explanatory factor of this relationship as it contributes to more transparency on the financial market. This means that investors may find it easier to examine the environmental data that firms disclose since they may use the EU Taxonomy as a starting point to determine if a company's operations significantly contribute one of the taxonomy's six objectives. The common definition it provides can be used even if a company does not fall under this mandate, indicating that this is beneficial for the environmental disclosure of the companies in the S&P 500 and not just for European corporations.

This sheds light on the lack of a clear definition of social sustainability. As there is no common definition of this (Åhman, 2013), it is not unexpected that the social disclosure score does not affect firm value and remains insignificant. One possible explanation is that it is simply much more difficult to qualitatively interpret the information of the Social Disclosure Score compared to the Environmental disclosure score. However, one remedy could be the extension of the EU (environmental) Taxonomy towards a social taxonomy (European Union, 2022), providing a clear definition on which activities qualify as "socially" sustainable and and simplifying the information that investors must interpret. The same explanation can be applied for the Governance disclosure score. It was anticipated that the Governance disclosure score's regression coefficient would be statistically significant and positive. However, the opposite is the case. This is unexpected since various academic papers suggest that ESG disclosure leads to lower agency costs, implying that the firm acts in the interests of its investors (e.g. Rossi & Harjoto, 2020). Therefore, it was expected that the more information that is disclosed related to the governance of a firm, the higher is the firm value. Contradictingly, Cheng et al. (2013) find that ESG is a result of agency problems, meaning that governance improvements lead to less investments in ESG which implies a lower governance disclosure score. Interestingly, without accounting for selection bias, the governance score is statistically significant, while it becomes

insignificant once selection bias is reduced. These findings draw attention to the debate around the governance disclosure score and recommend further research of this particular ESG factor in order to produce conclusive findings regarding the relationship between ESG, Governance, and firm value.

Having had a closer look on the market perspective of ESG, the accounting perspective is now discussed. As ESG can be financially profitable by reducing costs or increasing revenue, thereby affecting net income (the nominator of ROA), it is reasonable that the overall effect of ESG disclosure on ROA is positive and statistically significant. The environmental disclosure score has the highest impact on ROA, considering its magnitude (Table 16). If customers increasingly demand environmentally friendly products, revenues of "green" firms increase. At the same time, the development of environmentally friendly products can also lead to a cost reduction due to governmental subsidies. Both effects increase net income which results in a higher ROA. Therefore, it is reasonable that the environmental disclosure score is statistically significant as it is not only easier for investors but also for other stakeholders, such as customers and governments, to evaluate this information of a firm. Opposed to the market perspective, also the social disclosure score is significant when using ROA as the dependent variable. This is an interesting finding as, when using a market-based measure such as Tobin's Q, the social disclosure score is statistically insignificant. However, this finding is not unexpected as various academic literature help to explain this finding.

Edmans (2012), i.e., found that the 100 best companies to work for outperform their peers which refers to the "social" aspect of a firm. This highlights that when a company discloses a substantial amount of social information (assumingly value enhancing information), its financial performance increases. Another reason for the significance of this coefficient is that the more social information a firm discloses, the better is its recruitment and retention processes, enhancing the productivity of a firm and thereby affecting net income. This argument is supported by Hedblom et al. (2019), who found that when a firm advertises ESG (which can be equitably considered as when a firm discloses ESG information), the application rate rises and more motivated employees are attracted, affecting the productivity of a firm.

The governance disclosure score, in contrast, does not affect the financial performance of a firm. This is reasonable as a firm's governance primarily focuses on the interaction between shareholders ("investors") and the management or board of a firm. Even if a company releases a considerable amount of information about its governance, ROA is unaffected because it has

no effect on net income or total assets. Especially in light of the fact that the governance disclosure score has no impact on firm value, it is reasonable that it also does not affect ROA.

After discussing the overall effect of ESG and its determinants on Tobin's Q and ROA, the effect of the NFRD is discussed as a last step. After the implementation of the NFRD, firms falling under this mandate experience a substantial decrease in firm value compared to the control group (US firms). This results supports the finding by Chen et al. (2018), that mandatory disclosure has a detrimental impact on firm profitability. As hypothesis 3 states, a positive and statistically significant coefficient was expected. This expectation was driven by the notion that mandatory disclosure rules reduce disagreements between the voluntary information that firms publish, making the disclosed information more reliable, decrease information asymmetry and thus increase firm value. Due to the presence of various ESG disclosure standards (chapter 2.4.1) and also various ESG rating agencies (e.g. MSCI or Sustainalytics), disagreement among the interpretation of the disclosed information can arise. This refers to the findings by Christensen et al. (2022). They initially suggest that mandatory disclosure would be associated with lower disagreement among firms. Interestingly, Christensen et al. (2022) find that mandatory disclosure increases rating disagreement. The findings of this thesis can be explained by this, as higher rating disagreement can increase systematic risk due to the increased uncertainty, and thus firm value decreases.

Another explanation is that firms are now forced to disclose ESG information which they have not previously shared because they considered it as value destroying information. The NFRD therefore forces these companies to share such information, while US firms are still able to hide it due to the lack of mandatory guidelines. As this can increase the systematic risk, cost-of-capital rises and firm value decreases, respectively. As this thesis mostly includes firms which have disclosed ESG information before the introduction of the NFRD, this finding is not unique to "non-reporting" firms who only started to disclose information after the introduction of the NFRD, providing indication that firms like to hide certain information until they are forced to legally do so. This means that firms with value-destroying ESG information may have waited until the actual implementation of the mandate in 2017 to disclose information, while firms with value-enhancing information might have started to disclose it earlier. This could lead to an underestimation of the negative effect of the implementation of mandatory disclosure rules as the *interaction dummy* does not capture the true magnitude of the negative impact. These firms might have masked the true effects by postponing the disclosure.

Interestingly, mandatory disclosure does not seem to affect financial performance as the regression coefficient of the *interaction dummy* is statistically insignificant. This indicates that there are no substantial increases in costs after the NFRD has been implemented, as there is no effect on ROA.

Taking all the results together for a holistic overview, this thesis shows that the effect of ESG disclosure on firm value varies when it is differentiated between general (voluntary) and mandatory ESG disclosure. This means that, in general, firms profit from increased information disclosure since their firm value rises, however, this result may be overestimated and biased to the extent that only firms with value enhancing information disclose ESG information while firms with value destroying information wait until they are legally obliged to do so. When the single effect of mandated ESG disclosure is evaluated, this increase in firm value due to ESG disclosure is potentially impeded due to the factors stated above. The general value-enhancing effect of ESG disclosure is also limited when determining the effect of each ESG determinant individually. These findings, however, include some limitations, which are described in the next chapter.

6.2 Limitations

In general, all data has been extracted from Bloomberg and is therefore limited to the data available on Bloomberg. Furthermore, this thesis only uses the ESG disclosure score to provide insights into the quantitative effect of the available ESG information on firm value. Therefore, in the discussion of the results above, it is assumed that firms only disclose information which is value enhancing. To be more specific, this suggests that a higher ESG disclosure score implies that firms disclose information in which they are well performing. Only with this assumption, the explanation for the results of hypothesis 3 holds as the results show that once mandatory disclosure is introduced, firm value decreases.

In order to get the full picture of the quantitative effect of ESG information (ESG disclosure score) as well as the qualitative effect of ESG information, the ESG performance score could have been an additional useful variable. However, this variable is not available for the full time frame in Bloomberg and even if it was available, it would have been limited to the specific rating agency of one rating provider. Due to the high rating divergence (Christensen et al., 2021), this variable is in theory useful, but in practice limited to various assumptions.

This thesis addresses endogeneity by including fixed effects as well as a difference-in-difference regression. However, it could still be the case that there are omitted variables that bias the results as there are numerous variables that potentially affect firm value/ROA. The choice of the control variables came down to four main variables (Firm Size, Leverage, Liquidity, F&F MOM) in order to mitigate this risk and provide as accurate results as possible. These control variables are consistent with the recommendation of earlier scholars.

To test hypothesis 3, several assumptions had to be made. First, US firms are taken as the benchmark group to EU firms falling under the NFRD as, up to now, there is no mandatory disclosure rule implemented in the US. Nevertheless, this may burry some limitations as these firms do not operate in the same geographical market. Second, also third country firms with a certain amount of revenue generated in the EU fall under this mandate. This has been neglected as it was impossible to retrieve this specific data for every firm in the S&P 500 from Bloomberg. However, the US firms of the S&P 500 were a good proxy for a control group as they are similar in size and market cap. Third, the results of hypothesis 3 are limited to the time window chosen. The 2-year time window (2 years prior the implementation and 2 years after the implementation of the NFRD) was chosen to get a compelling result which really shows the change in firm value without including confounding events. Still, the results are limited to the chosen time period. Changing the time window may change the results. Besides identifying the limitations of the results, it was aimed to make as precise assumptions as possible to increase the explanatory power and reliability of the results.

7. Conclusion and Implications for Further Research

Nowadays, it is nearly unavoidable for firms to neglect the disclosure of ESG-related information as investors as well as broader stakeholders increasingly demand transparency on financial markets in terms of both, financial and non-financial information. Conflicting findings have been reported in earlier works that mainly examined how a firm's ESG performance may affect its financial performance. With an emphasis on the overall ESG effect, some academics have also begun to investigate the impact that the quantity of ESG information (ESG disclosure) might have on a firm's performance. This thesis extends previous research by creating a holistic and cross-sectional overview of the different effects that ESG and its three determinants can have on firm value.

Overall, ESG disclosure has an enhancing effect on firm value, confirming the findings of previous researchers. This suggests that ESG information provides insights to investors which reduces information asymmetry and leads to higher firm value. However, this relationship is mainly driven by the environmental information which firms provide. ESG disclosure enhances firm value if this is done on a voluntary basis and firms may choose whatever information they wish to release. This thesis shows that once firms are legally obliged to disclose ESG information by the introduction of mandatory disclosure regulations, firm value decreases. Importantly, this mandatory ESG disclosure does not seem to affect a firm's financial performance (as measured in ROA) and therefore implies that costs do not increase.

These findings have various implications for researchers and policymakers. Firstly, mandatory disclosure requirements are needed in order to force firms to disclose their entire ESG information available and prevent information asymmetry. The establishment of the VRF by the IFRS Foundation is a good starting point to create a universal set of standards applicable to any company. However, these standards must be made mandatory in order to increase transparency across firms from different industries and geographical locations. Otherwise, it remains difficult for investors to interpret the ESG information a firm discloses in an appropriate manner as certain firms would still be able to hide certain information.

Secondly, as only environmental information is found to affect firm value, policymakers should work on creating a common definition for social sustainability for investors to be able to easier interpret this information. As social and governance disclosure does not seem to affect firm value, it is important for legislators, such as the VRF, to consider this when developing a

universal set of ESG disclosure standards. With these insights, firms could neglect their social and governance information disclosure. Therefore, it is the responsibility of policymakers to legally oblige companies to disclose such information and reduce the information asymmetry between firms and investors.

Thirdly, once more mandatory ESG disclosure regulations become available, further research should be conducted to provide more insights into the effect of ESG disclosure on firm value. For the financial year 2023, the CSRD becomes effective in Europe. Therefore, a similar difference-in-difference regression should be conducted with the exogeneous shock being the CSRD instead of the NFRD. It would be beneficial to see the difference between the NFRD and CSRD, as the CSRD includes a set of universal reporting standards increasing the comparability among firms. Additionally, more firms, including small and medium-sized firms, must comply to the CSRD providing further insights into the effect of mandatory disclosure requirements and extending the used sample. Additionally, it would be beneficial to extend this study to investigate the potential driving mechanisms of each ESG determinant to provide further insights and robustness of the findings of this thesis.

As firms go forward to disclose an increasing amount of ESG information, policymakers must collaborate on making ESG information comparable and thereby promoting transparency on the global market.

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Appendix

Appendix 1. Summary of the variables used in the OLS regression models including definition and data source.

Variable Name	Definition	Data Source
Tobin's Q	$= \dfrac{\text{Market value of Assets and Liabilities}}{\text{Book Value of Assets and Liabilities}}$	Bloomberg
ESG Dummy	0 = Company does not disclose any ESG information 1 = Company discloses ESG information	Bloomberg
ESG Disclosure	Number between 0-100 depending on the quantity of ESG information which is disclosed	Bloomberg
Environmental Disclosure	Number between 0-100 depending on the quantity of environmental information which is disclosed	Bloomberg
Social Disclosure	Number between 0-100 depending on the quantity of social information which is disclosed	Bloomberg
Governance Disclosure	Number between 0-100 depending on the quantity of governance information which is disclosed	Bloomberg
Log Firm Size	Natural Logarithm of book value of total assets	Bloomberg
Financial Leverage	$= \dfrac{\text{Average Total Assets}}{\text{Average Total Common Equity}}$	Bloomberg
Log Free Cash Flow	Natural Logarithm of the Free Cash Flow	Bloomberg
F&F MOM	Tendency for rising/falling asset prices	WRDS
Year Fixed Effects	Dummy variable for Year	-
Industry Fixed Effects	Dummy variable for Industry	-

Appendix 2. Results of the Hausman Specification Test

Hausman (1978) specification test

	Coef.
Chi-square test value	20.138
P-value	0

Appendix 3. Results of the Probit Model for the Propensity Score Matching

	(1)
VARIABLES	Probit Coef
Tobin's Q	
_treated	0.884***
	(0.0270)
Constant	1.065***
	(0.0258)
Observations	6,602
R-squared	0.002

seEform in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix 4. PSTest Results

PSTest Results

This table lists all the covariates used to carry out the matching and their significance after the matching has been done. The t-stats are highlighted in bold.

Variable	Mean		t-test			V(T)/
	Treated	Control	%bias	**t**	p>t	V(C)
Log Firm Size	11.055	11.079	-3.200	**-0.140**	0.887	0.760
Market Cap	3.00e+10	3.30e+10	-5.800	**-0.450**	0.655	1.510

* if variance ratio outside [0.59; 1.68]

Extensive Table 15b - Panel Regression for Testing Hypothesis 2 adjusted for Selection Bias

Table 15 contains the regression coefficients, test statistics, number of observations and robust standard errors of the model used to test hypothesis 2 after accounting for selection bias. It is determined whether increasing the extent to which companies disclose information on the individual ESG determinants has a positive impact on firm value. All fixed effects are included in the model. The dependent variable used in this model is Tobin's Q and the main variable of interest are the 3 pillars of ESG. The robust standard errors are stated in parentheses and statistical significance at 10%, 5% and 1% levels are labelled by *,** and ***.

VARIABLES	(1) Environmental Disclosure Score	(2) Social Disclosure Score	(3) Governance Disclosure Score
Env Disclosure Score	**0.421*****		
	(0.0835)		
Social Disclosure Score		**0.0590**	
		(0.114)	
Gov Disclosure Score			**-0.00813**
			(0.0740)
Log Firm Size	-1.383***	-1.674***	-2.215***
	(0.123)	(0.0928)	(0.0700)
Financial Leverage	0.000914*	0.00130**	0.00317**
	(0.000537)	(0.000650)	(0.00138)
Log Cash	0.0418***	0.0393***	0.0201***
	(0.00309)	(0.00310)	(0.00297)
MOM	-4.003	-29.57***	-64.02***
	(3.184)	(4.101)	(3.130)
imr2	-2.860***		
	(0.730)		
imr3		-8.061***	
		(0.848)	
imr4			-20.07***
			(0.804)
Constant	17.47***	24.65***	37.23***
	(1.895)	(1.648)	(1.269)
Observations	6,954	6,954	6,954
R-squared	0.357	0.365	0.448
Fixed Effects	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix 6. Further Robustness Tests

Hypothesis 1b with ROA and Heckman Correction

This table shows the regression results of hypothesis 1b with an adjusted data sample (due to the Heckman correction) and ROA as the dependent variable. The coefficient of the variable of interest (ESG disclosure Score) is insignificant.

VARIABLES	(1) Heckman Correction
ESG Disclosure Score	4.100***
	(0.677)
Log Firm Size	-6.064***
	(0.574)
Financial Leverage	-0.000968
	(0.00333)
Log Cash	0.291***
	(0.0219)
MOM	-59.58***
	(18.27)
imr	-17.90***
	(3.530)
Constant	78.54***
	(9.057)
Observations	6,954
R-squared	0.224
Fixed Effects	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Hypothesis 2 with ROA and Heckman Correction

This table shows the regression results of hypothesis 2 with an adjusted data sample (due to the Heckman correction) and ROA as the dependent variable. The coefficient of the variable of interest (ESG disclosure Score) is insignificant.

VARIABLES	(1) Environmental Disclosure Score	(2) Social Disclosure Score	(3) Governance Disclosure Score
Env Disclosure Score	2.194***		
	(0.444)		
Social Disclosure Score		2.918***	
		(0.651)	
Governance Disclosure Score			0.407
			(0.406)
Log Firm Size	-5.047***	-6.110***	-8.520***
	(0.694)	(0.509)	(0.324)
Financial Leverage	-0.00143	-0.000596	0.00781**
	(0.00343)	(0.00334)	(0.00367)
Log Cash	0.303***	0.293***	0.212***
	(0.0218)	(0.0218)	(0.0220)
MOM	-13.87	-110.7***	-261.3***
	(18.24)	(23.87)	(15.74)
imr2	-10.84***		
	(4.156)		
imr3		-29.15***	
		(4.694)	
imr4			-81.76***
			(3.852)
Constant	62.52***	88.01***	144.3***
	(10.74)	(9.099)	(5.933)
Observations	6,954	6,954	6,954
R-squared	0.220	0.225	0.278
Fixed Effects	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1