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Does ESG-score matter to investors?

- An EU Taxonomy Perspective

By

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Abstract

Since the introduction of the EU Taxonomy, it is still unclear how it affects investors' perception and actions towards high ESG-scoring firms, and whether it effectively promotes sustainable investing. The implications of the EU Taxonomy on finance and the environment are significant and must be addressed. Hence, by conducting an event study, this thesis analyzes the market reaction to the introduction of the EU Taxonomy to determine its impact on investors' perception and actions towards high ESG-scoring firms. We investigate whether the taxonomy is effectively promoting a transition to a sustainable economy and evaluate whether the market rewards or penalizes firms based on their ESG performance as well as if the aim of the EU Taxonomy is reachable. Our results show that the introduction of the EU Taxonomy has changed investors' perception and actions towards high ESG-scoring firms, leading to decreased actions and a deteriorated perception, as we find that high ESG-scoring firms earned negative 66-basis point CAAR under our primary event window for the introduction of the EU Taxonomy. Based on this, our results indicate that the EU Taxonomy is not effectively promoting the transition towards a sustainable economy in the short-term and hence the market seems to penalize firms based on their ESG performance. This study contributes to the literature by providing contradictory evidence to the findings of prior research, and to a better understanding of the role of the EU Taxonomy in promoting sustainable investing and highlights implications for policymakers and the financial industry.

Keywords: ESG, EU Taxonomy, Efficient Market Hypothesis, Behavioral finance, Investor behavior, Event study

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Abbreviations

AAR	Average Abnormal Return
AR	Abnormal Return
CAAR	Cumulative Average Abnormal Return
CAR	Cumulative Abnormal Return
E	Environmental
EMH	Efficient Market Hypothesis
ESG	Environmental, Social, and Governance
EU	European Union
G	Governance
GSIA	Global Sustainable Investment Alliance
NFRD	Non-Financial Reporting Directive
OLS	Ordinary Least Squares
S	Social
UNEP FI	United Nations Environment Programme Finance Initiative
UNDP	United Nations Development Programme

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1. Introduction

In this chapter, we provide an overview of the topic and context for our study. We then delve into a discussion of the problem motivating our research and identifying the gaps in previous academic literature that led us to formulate the purpose and research question for our study.

1.1 Background

Climate change is a global emergency which requires international cooperation. Therefore, the United Nations reached two important global agreements in 2015, the Paris Agreement and the 2030 Agenda. The main objectives of the former are to strengthen the ability of countries to deal with the impacts of climate change by substantially reducing greenhouse gas emissions to limit the global temperature increase in this century to 2 degrees Celsius while pursuing efforts to limit the increase even further to 1.5 degrees (United Nations, 2022). The 2030 Agenda consists of 17 goals to be achieved by 2030, aiming to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity (UNDP, 2023). To reach the objectives for both aforementioned agreements, sustainable investments play a crucial role, as investors have the power to finance this transition and contribute to mitigating the effects of climate change (Eurosif, 2021). According to a report by Global Sustainable Investment Alliance (2021), sustainable investments reached $35.3 trillion globally in 2020, a 165% increase from 2012 while the total managed assets globally increased by 64% during the same period, we show this development between 2012-2020 in *Figure 1*. This demonstrates the increasing awareness of environmental issues as well as the growing demand for and importance of investments that align with the sustainable development goals and helps mitigate the effects of climate change (GSIA, 2021). However, between 2018 and 2020 sustainable investments increased by 15 % while the total managed assets increased by 26.5% (see the kink in “total” trendline), indicating the growth and interest in sustainable investments have slowed down the last few years.

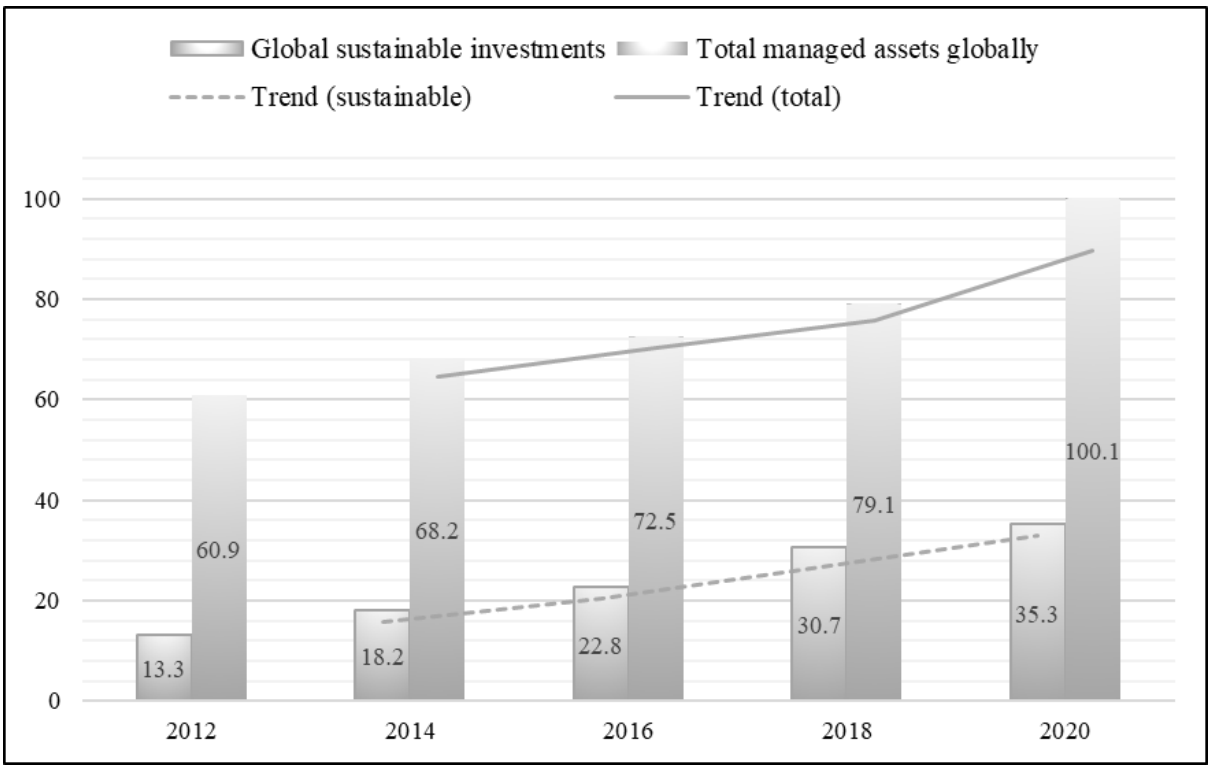

Figure 1. Shift in allocation of capital from 2012-2020 ($ trillions)

Despite the declining increase in sustainable investments the last few years, the financial industry has gradually embraced Environmental, Social and Governance (hereafter, "ESG") principles (Eurosif, 2021), providing more opportunities for investors to make a positive impact on the environment and support the transition to a sustainable future (UNEP FI, 2019). Thus, ESG-score is a common way of measuring firms' sustainable performance. There are several agencies providing ESG-scores or ratings for investors to use as a basis to facilitate green investment decisions (Lovas, 2021; Tayan, 2022; Armanino, 2022).

As the overall demand for sustainable investments has increased (165% from 2012-2020), the risk of greenwashing has increased as well. Therefore, investors need updated and relevant information to make sustainable investments and to reduce the risk of being deluded by greenwashing (Cunha et al., 2020). Additionally, in order for sustainable investments to reflect the same increase as the total managed assets again, the need for updated and relevant information is just as relevant in this regard as well. To provide investors with this information, clear legal definitions and greater transparency is necessary. The European Union (hereafter "EU"), a world leader in promoting a vision of sustainable finance, therefore introduced its Action Plan on Financing Sustainable Growth in 2018 which will contribute to

the achievement of the 2030 Agenda (Eurosif, 2021). One part of this strategy to connect finance with sustainability, was to establish a clear and detailed EU Taxonomy which will serve as a classification system for sustainable activities (European Commission, 2023a).

The EU Taxonomy was officially published in June 2020 with the purpose to help investors, companies and other stakeholders to make informed investment decisions and to support the EU's objective of redirecting financial flows toward sustainable investments. The taxonomy is a classification system that intends to provide a common language and framework for understanding and measuring the environmental impact of economic activities by setting out criterias that economic activities must meet to be considered environmentally sustainable. It also provides a framework for assessing and reporting on the environmental performance of investment products (European Commission, 2023b). The taxonomy applies to 1) Financial market participants, including occupational pension providers, that offer and distribute financial products in the EU and 2) Firms of public interest with over 500 employees in the EU (KPMG, 2020). The latter meaning public firms, banks, insurance companies and occupational pension firms (Bolagsverket, 2023).

1.2 Problem discussion

The pressing issue of climate change has led to an increased focus on ESG criterias for investors (UNEP FI, 2019). Investors are becoming more aware of the need to integrate ESG considerations into their investments, not only to mitigate risk but also to enhance long-term returns (Eurosif, 2021). Despite the increased integration of ESG criterias into investment decisions, there seems to be no real shift towards more sustainable business practices, in accordance with the declined increase in sustainable investments (Busch, Bauer, & Orlitzky, 2016; GSIA, 2021). One of the biggest challenges in promoting sustainable investments is the lack of trustworthiness in ESG data (Busch et al., 2016). Thus, the access to updated and relevant information is a vital factor to facilitate the integration of ESG criterias into investments but also to mitigate the risk of being deluded by greenwashing (Camilleri, 2020; Cunha et al., 2020). This is where the EU Taxonomy comes into play, as it provides a clear and detailed classification system for sustainable activities (European Commission, 2023b).

The EU Taxonomy represents a significant step towards aligning finance with sustainability, as it sets out clear criterias for what constitutes environmentally sustainable economic

activities (European Commission, 2023b). This increased information, transparency and standardization is expected to increase the trustworthiness of the information and drive a shift towards more sustainable investments and help to overcome the barriers that have traditionally hindered the growth of sustainable finance (UNEP FI, 2019). However, despite both the overall growing interest in sustainable investing as well as the increased information, in terms of the EU Taxonomy, there still remains a gap between investors' intentions and actual investment behaviors (Scholtens, Lützkendorf, & Boudier, 2016), and the impact of the EU Taxonomy on investors' perception and actions towards high ESG-scoring firms is not yet clear. This is an important issue to address, as the effectiveness of the EU Taxonomy in promoting sustainable investing will have far-reaching consequences for the future of finance as well as the environment.

Hence, there is a need for research to determine the impact of the EU Taxonomy on investors' perception and behavior towards firms with high ESG performance as this can help to bridge the gap between investors' intentions and actual investment behaviors. Additionally, such a study can provide clarity about whether the EU Taxonomy can promote a real shift towards more sustainable business practices and thus potentially avoid the declining increase in sustainable investments from continuing, by increasing the trustworthiness of ESG information.

1.3 Study motivation, purpose and research question

Based on the problem discussion, it is important to contribute to a better understanding of the role that a clear and detailed classification system can play in promoting sustainable investing as it can have important implications for policymakers and the financial industry. This topic has been touched upon before in a prior study by Bassen et al. (2022), in which they argue that their study is the first to examine the impact of the EU Taxonomy on the stock performance of green assets. However, they found no evidence that investors' preferences for firms with high ESG performance increased or decreased when the EU Taxonomy was introduced, indicating that further research within the area is necessary and that a gap is evident. Especially since ESG as an independent variable historically has shown mixed relationships with its dependent variables, e.g., the relationship between ESG and financial performance as well as market performance (Peloza, 2009; Alareeni & Hamdan, 2020; Buallay, 2019; Aydoğmuş, Gülay, & Ergun, 2022).

Consequently, we want to extend the research about investors' perception of ESG performance to gain insight into the effectiveness of the EU Taxonomy in promoting sustainable investing and the role it plays in shaping investors' perception and actions towards firms with high ESG-scores. Additionally, this study can help evaluate and understand if the aim of the EU Taxonomy is reachable. By understanding the market reaction to the taxonomy, policymakers and stakeholders can gain insights into whether the taxonomy is effectively promoting the transition to a sustainable economy. This information can be used to refine and improve the EU Taxonomy in the future, in order to better align it with the needs and expectations of investors and businesses.

Conclusively, the purpose of this study is to examine the impact of the EU Taxonomy on investors' perception and behavior towards firms with high ESG performance (i.e., high ESG-score). Specifically, the study seeks to determine if there are differences in the market response to firms with high ESG-scores, when the EU Taxonomy was introduced, to better understand the relationship between a firm's ESG-score and its effect on investors' behavior and thus shed a light on whether the market rewards or penalizes firms based on their ESG performance.

In agreement with the preceding discussion, the following research question, which this study aims to answer, has been formulated:

How did the introduction of the EU Taxonomy affect investors' perception and action towards high ESG-scoring firms?

2. Literature Review

In this chapter, the underlying theories laying the foundation for the study are presented with the Efficient Market Hypothesis (hereafter "EMH") as the basis for the theoretical

framework. Furthermore, the definitions of key terms are presented together with a discussion of the empirical evidence from relevant prior research.

2.1 Theoretical framework

The EMH is a theoretical framework proposed by Fama (1970), which posits that financial markets are perfectly efficient and that it is impossible to consistently achieve returns that are higher than the market average by using any information that is publicly available. According to the EMH, investors should be able to identify and invest in companies that are more sustainable, as this information should be reflected in their stock prices. However, there are several criticisms of the EMH suggesting that it may not hold true in practice (Lo & MacKinlay, 1990; Shleifer & Vishny, 1997; Nickerson, 1998; Thaler, 1999). The concept of bounded rationality, as discussed in behavioral finance, suggests that investors may be limited in their ability to process and evaluate all available information when making decisions (Simon, 2000). For example, investors may rely on shortcuts or heuristics, such as a firm's ESG-score, to simplify the decision-making process. This could affect how investors perceive the importance of ESG considerations in investment decisions, and how they react to the introduction of the EU Taxonomy. Understanding the role of bounded rationality in investor behavior, as well as other behavioral biases such as herding, mental accounting, and confirmation bias, could provide valuable insights into the market's response to the EU Taxonomy and its impact on high ESG-scoring firms. To give an example, research has shown that investors may exhibit herding behavior, where they follow the actions of others in the market rather than conducting their own independent analysis (Bikhchandani, Hirshleifer, & Welch, 1992). This could lead to a situation where high ESG-scoring firms are disproportionately favored or avoided by investors, based on their perception of the market consensus. Hence, by incorporating insights from behavioral finance, the theoretical framework can provide a more nuanced understanding of the factors that influence investors' perceptions and actions towards high ESG-scoring firms, and how the introduction of the EU Taxonomy may impact these dynamics.

2.1.1 Efficient Market Hypothesis

The EMH is based on the assumption that all market participants have access to the same information and that prices adjust instantaneously to new information, making it impossible

for investors to consistently outperform the market through the use of any information that is available to them. The EMH is typically divided into three forms: weak, semi-strong, and strong. The weak form of the EMH suggests that all historical prices and trading volumes are reflected in current stock prices and that technical analysis is futile. The semi-strong form of the EMH suggests that not only is all historical data reflected in current prices, but also that all publicly available information is already reflected in the current stock prices, making fundamental analysis futile. The strong form of the EMH suggests that all information, both public and private, is already reflected in the current stock prices, making insider trading futile (Fama, 1970).

Empirical evidence on the validity of the EMH is mixed, with some studies providing support for the hypothesis, while others contradict it. For example, Lo and MacKinlay (1990) have provided evidence that returns exhibit predictable patterns, suggesting that markets are not perfectly efficient. Additionally, Shleifer and Vishny (1997) argue that the EMH is only valid under a limited set of conditions and that market inefficiencies arise as a result of the presence of insider trading, short-termism, and herding behavior. According to Simon (2000), bounded rationality refers to the concept that the decisions people make are influenced not only by their overall goals and the characteristics of the external environment, but also by their knowledge and understanding of the world, their ability to access and utilize this knowledge when necessary, to consider the potential consequences of their actions, to generate potential courses of action, to deal with uncertainty (including uncertainty caused by the actions of other individuals), and to prioritize their various desires. Rationality is bounded because these abilities are limited. As a result, rational behavior in the real world is influenced both by the internal mental environment of an individual, including their memory and cognitive processes, as well as the external environment in which they act and are impacted by. Consequently, bounded rationality is another example contradicting the EMH.

2.1.2 Behavioral finance

Behavioral finance is a field of study that attempts to understand the influence of cognitive and emotional factors on financial decision-making. It recognizes that individuals are not always rational and objective when making financial decisions, as traditional financial theory would suggest. Instead, behavioral finance incorporates insights from psychology and

sociology to explain why individuals often behave in ways that seem irrational and inconsistent with their own best interests (Kahneman & Tversky, 1979). The concept of behavioral finance emerged in the 1980s and 1990s, in response to growing recognition that traditional financial models did not always accurately describe real-world financial behavior. Researchers such as Daniel Kahneman and Amos Tversky demonstrated that individuals often make decisions based on heuristics or mental shortcuts, rather than fully analyzing all available information. This can lead to biases and errors, such as overconfidence and herding behavior.

The field of behavioral finance encompasses a range of theories and concepts, including mental accounting, herding and confirmation bias. Mental accounting refers to the tendency to categorize and evaluate financial decisions based on non-financial factors, such as the source of the funds or the intended use of the money (Thaler, 1999). Herding behavior refers to the tendency of individuals to follow the actions of a larger group, rather than making independent decisions based on their own analysis (Bikhchandani et al., 1992). Confirmation bias, on the other hand, is the tendency to seek out information that confirms one's pre-existing beliefs or assumptions, while ignoring information that contradicts them (Nickerson, 1998). These biases have significant implications for financial decision-making, as they can lead to inefficient markets and suboptimal investment decisions. For example, investors may follow the herd and invest in a particular stock or asset class, even if it is overvalued or does not align with their investment objectives. Alternatively, investors may be overly confident in their own investment decisions and ignore information that suggests they should reconsider.

The implications of behavioral finance are far-reaching, as they challenge many traditional assumptions about financial decision-making. For example, behavioral finance suggests that markets may not always be efficient, as investors can be influenced by emotions and cognitive biases. It also suggests that financial advisors should be aware of these biases when making recommendations to clients, and that individuals should take steps to mitigate their own biases when making financial decisions.

2.2 Sustainable investments

Sustainability has become an increasingly important topic across nearly all industries and actors. In recent years, the financial markets have also begun to acknowledge the importance of sustainability (Jeucken, 2005), leading to a growing research interest in the intersection of sustainability and finance, particularly in sustainable investments. Investors increasingly seek investments that align with their values and address global issues. This is the core of value-based and sustainable investing, and Schueth (2003) refers to these investors as "feel-good" investors, and categorizes them into two groups based on their approach to sustainability: investors who invest in alignment with personal values, and investors who invest in projects and firms that improve the quality of life and support society. However, investors also strive for attractive returns, making it important to understand how sustainable investments compare to regular investments. While some studies suggest that sustainable and value-based investing outperforms regular investments (Friede, Busch, & Bassen, 2015), other studies argue that such claims are not reliable, particularly when the research period is limited to 10 years or less, whereas investors in sustainable funds generally invest over a longer period (Talan & Sharma, 2019).

The beliefs within the research field are evidently scattered and there is a lack of research in many areas. Busch et al. (2016) suggest that the current researchers' time frame is too short and that there needs to be a reorientation to a long-term paradigm for sustainable investments. Evidence supporting the claim that sustainable investments perform in line with non-sustainable investments in the long term is relatively scarce. This could potentially slow down the growth and interest in sustainable investments. Investors are driven by information about equal returns, which is a major driver for sustainable investments, and the lack of evidence may restrain them from making long-term sustainable investments (Schueth, 2003). The scope of sustainable investments cover a broad range of topics, although financial performance tends to be the most extensively researched area (Widyawati, 2019; Talan & Sharma, 2019). While questions concerning the financial performance of sustainable investments are undoubtedly relevant, it is crucial to broaden the focus beyond this aspect. Therefore, there is a pressing need for more conceptual and theoretical research, particularly on the perceptions and aspirations of investors, the interplay between sustainability and regulation, and the evaluation of ratings and frameworks.

With the overall increased interest in sustainable investments, the financial system, as the provider of capital, has been assigned a central role in the sustainable transformation of the global economy. In light of the growing trend among investors to incorporate sustainability aspects in their decision-making process, access to information concerning firms' sustainability performance is becoming increasingly important. One prominent source of such external information is ESG ratings, which have become widely adopted, making them a vital factor in enabling sustainable investments (Dumrose, Rink & Eckert, 2022). The concept of ESG-score or rating has gained prominence as a metric to evaluate a firm's perceived risk or overall performance in relation to environmental, social, and governance factors. These scores are utilized by investors seeking to gain insight into a firm's long-term risk profile, as well as by consumers seeking to make more informed purchasing decisions. Typically, an ESG-score or rating is determined by comparing a firm's performance to that of its peers within the same industry. The score takes into account various aspects of a firm's operations, including, but not limited to, its management of environmental risks and its emphasis on workplace diversity (Armanino, 2022).

Unlike traditional financial metrics, ESG-scores are not set by any central governing body and are instead determined by third-party organizations (Huber & Comstock, 2017). It is important to note that the criteria used for determining the score or rating may vary depending on the rating agency conducting the assessment. Each agency may have their own methodologies and criteria for determining the score (Armanino, 2022). The overall score is determined by evaluating the three pillars of the ESG framework: the environmental pillar (E), social pillar (S), and governance pillar (G). The weighting of these pillars may vary depending on the agency calculating the score and the industry in which the firm operates and thus minimal correlation between ESG-ratings from different agencies (Huber & Comstock, 2017; Dimson, Marsh & Staunton, 2020). Nevertheless, obtaining and analyzing data is crucial for making informed investment decisions, and many investors still rely, to varying degrees, on external providers for ESG data (Dimson et al., 2020). There are several providers (agencies) for ESG-ratings, where the largest and most prevalent appear to be; Bloomberg, Sustainalystics, MSCI, Refinitv, and S&P Global to mention a few (Lovas, 2021; Tayan, 2022; Armanino, 2022).

As ESG-score is a good metric to determine a firm's ESG performance, it has been widely used among researchers when investigating the market response to ESG performance. Prior research has extensively examined the correlation between market performance, measured by Tobin's Q, and ESG performance. These studies often differ between the E, S and G components of ESG and analyze them separately as well. There is a body of evidence suggesting that ESG and ESG disclosure have a positive impact on market performance (Alareeni & Hamdan, 2020; Aydoğmuş et al., 2022). However, other research, such as that conducted by Velte (2017), has found no significant correlation between ESG and market performance.

The literature on the relationship between market performance and the environmental aspect of ESG is mixed, some studies are finding a positive correlation (Buallay, 2019; Alareeni & Hamdan, 2020), while others find no relationship (Aydoğmuş et al., 2022). The findings regarding the relationship between market performance and the social aspect of ESG are also inconsistent, with some studies, such as those conducted by Alareeni and Hamdan (2020) and Aydoğmuş et al. (2022), finding a positive correlation between Corporate Social Responsibility (CSR) disclosure and market performance, while others, such as Buallay (2019) have found a negative relationship. In contrast, the literature on the governance aspect of ESG seems to be more consistent, with studies conducted by Alareeni and Hamdan (2020), Buallay (2019), and Aydoğmuş et al. (2022), all finding a positive correlation with market performance.

2.3 Regulations and market performance

Prior to the EU's Action Plan on Financing Sustainable Growth and the EU Taxonomy, the EU has made other strides to promote sustainable growth and investments. In 2014, the EU introduced the Non-Financial Reporting Directive (hereafter "NFRD"), also known as directive 2014/95/EU, which from 2018 requires firms to include non-financial information in their annual reporting or in a separate report. This means that firms must report information on environmental protection, social responsibility and treatment of employees, respect for human rights, anti-corruption and bribery, and diversity on company boards. The directive applies to companies of public interest with more than 500 employees in the EU (Green Finance, 2021). Literature on the directive is extensive, especially in terms of

improved quantity and quality of non-financial disclosure. However, studies examining the market reaction to the directive are more limited, although it has been previously investigated (Abay, 2021; Grewal, Riedl & Serafeim, 2019).

Abay (2021), examined the stock market reaction to the NFRD by using the cumulative abnormal returns. Despite the size-based nature of the directive he examined both the affected and unaffected firms (i.e., both firms with less than and more than 500 employees) and found a significant negative stock market reaction for both of them. The affected firms showed a significant negative 17-basis point median cumulative abnormal return while the unaffected firms showed a significant negative 15-basis point median abnormal cumulative return. However, the difference in these negative stock price reactions between the affected and unaffected firms was not significant. Unlike this study, Grewal et al. (2019) differ between the ESG performance and disclosure level of the firms when examining the stock market reaction to the directive, additionally, they only examine the affected firms. They found an average market reaction of negative 79-basis point of market value across all firms (i.e., regardless of the ESG performance and disclosure level). Furthermore, they found that the market reaction was less negative for firms with high ESG performance and disclosure levels before the directive and thus, the market reaction was more negative for firms with low predirective ESG performance and disclosure levels. Overall, they conclude that the stock market perceives that the directive will lead to net costs for firms with weak ESG performance and disclosure and benefits for firms with strong ESG performance and disclosure.

In response to the growing need for sustainable finance and reporting, the EU has developed a series of initiatives to encourage the integration of environmental and social considerations into financial decision-making. In 2018, the same year as the NFRD came into effect, the EU introduced its Action Plan on Financing Sustainable Growth. The aim of this Action Plan was to connect finance with sustainability, which is essential to meeting the EU's ambitious goals for reducing greenhouse gas emission emissions and increasing the use of renewable energy by 2030 (Eurosif, 2021). To achieve this, it is imperative to establish a consistent definition of what constitutes "sustainable" in order to provide a common language for sustainable investments. This is why the European Commission's Action Plan on Financing Sustainable Growth calls for the creation of a common classification system for sustainable economic

activities, known as the "EU Taxonomy". This taxonomy aims to provide a clear and consistent framework for identifying and integrating sustainable activities into financial products and services (European Commission, 2023a).

On June 22, 2020, the idea became reality as the Taxonomy Regulation was published in the Official Journal of the European Union. The Taxonomy Regulation is the legislative framework that establishes the foundation for the EU Taxonomy by outlining the rules and criterias for determining which economic activities can be considered sustainable under the EU Taxonomy. With the publication of the Taxonomy Regulation, The EU Taxonomy which is the actual classification system also became reality. The classification system aims to establish a common language and framework for sustainable finance in the EU. It defines which economic activities can be considered environmentally sustainable, by providing a set of technical criteria that businesses and investors can use to assess whether their activities contribute to environmental objectives. By providing businesses, investors, and policymakers with clear and appropriate definitions for environmentally sustainable economic activities, the EU Taxonomy can create a level of security for investors, reduce the risk of greenwashing, encourage companies to become more environmentally friendly, decrease market fragmentation, and redirect investments to where they are most needed. The EU Taxonomy applies to companies of public interest in the EU which includes asset managers, insurers, pension funds, banks, and other financial institutions operating in the EU as well as listed firms (European Commission, 2023b).

Literature on the EU Taxonomy is still scarce, and especially regarding the market reaction. Perhaps due to its quite recent implementation and publication, and therefore, mostly draft reports are available. One of these draft reports is a study by Bassen et al. (2022), which examines the evolution of the stock price premium paid for green assets that are aligned with the Taxonomy Regulation. They argue that their article provides first evidence on the capital market effects of the EU Taxonomy Regulation and that their study is the first to examine the impact of the taxonomy on the stock performance of green assets. The authors differ between ESG-score and taxonomy alignment where they argue that a low ESG-scoring firm can have high taxonomy-aligned revenues and thus should benefit from higher returns when the taxonomy was implemented. In their study, they found that stock returns for firms with high taxonomy-aligned revenues was significantly higher, suggesting that investors increased their

capital allocations towards these firms. Additionally, they found no evidence that investors' preferences for firms with high ESG-score increased or decreased. Therefore, they suggest that investors started to use the taxonomy to identify sustainable investments instead of ESG-scores when the taxonomy was introduced.

2.4 Hypothesis development

As seen in the preceding discussion, the increasing interest in sustainable investments has slowed down in the last few years, possibly because evidence supporting the claim that sustainable investments perform in line with non-sustainable investments in the long term is relatively scarce but also due to the lack of relevant, trustworthy and updated information (Schueth, 2003; Busch et al., 2016; Cunha et al., 2020). Additionally, despite the increasing overall interest, a real shift towards sustainable investments in terms of organizational reality is not evident and to overcome this problem, more trustworthy ESG information is necessary (Busch et al., 2016). The EU Taxonomy could provide this information with its clear and detailed classification system. Therefore, a positive market reaction of high ESG-scoring firms would be reasonable.

However, the EMH challenges this assumption as it implies that it is impossible to consistently achieve higher return than the market average by using any information that is publicly available (Fama, 1970). On the other hand, EMH has been challenged by a number of alternative theories such as behavioral finance (Bikhchandani et al., 1992; Nickerson, 1998), including mental accounting, suggesting that investors may rely on non-financial factors, such as ESG-score (Thaler, 1999). One could interpret the EU Taxonomy's objective as suggesting that non-financial factors (e.g., ESG-score) can have a material impact on the long-term performance of a company and should therefore be considered by investors, implying that there is information which is not currently taken into account by the market, but is relevant for the long-term performance of a firm.

Additionally, prior research about the NFRD has found evidence that the market encountered negative reactions under the implementation of the directive. However, the reaction was less negative for firms with high ESG performance before the implementation (Grewal et al., 2019). This could indicate that a similar reaction will be evident under the introduction of the EU Taxonomy as the two legislation both concern EU countries and sustainability. This is

further supported by the draft report by Bassen et al. (2022), as they found that stock returns for firms with high taxonomy-aligned revenues was significantly higher than those without. Accordingly, we will test the hypothesis: High ESG-scoring firms earn abnormal returns under the introduction of the EU Taxonomy.

3. Methodology and Data

In this chapter, we explain and justify the research design and methods used to evaluate the returns for high ESG-scoring firms at the introduction of the EU Taxonomy. We also explain the statistical models used to test the relationships between ESG performance and our chosen variables. Additionally, we provide details on the data and selection process used to gather the sample for our study, as well as the steps taken to clean and prepare the data for analysis.

3.1 Methodology

To examine the market reaction to the introduction of the EU Taxonomy in order to answer our research question, an event study is conducted. This study contains one event under the implementation of the EU Taxonomy: When the taxonomy was officially published by the EU on the 22th of June 2020 (the introduction). More exactly, the event study is testing if high ESG-scoring firms earned abnormal returns during an event window. In addition to this, in accordance with MacKinlay (1997), a regression analysis is conducted to control for other variables, to see if the potential relationship is caused by the ESG-score or other factors.

Fama, Fisher, Jensen and Roll (1969) introduced the event study methodology as we know it today, which has become the standard method of measuring the market reaction to business events and announcements (Binder, 1998). The method involves analyzing the changes in the price of a security over a brief period of time surrounding the event in question, known as the event window. As it was introduced in the late 60s, the methodology has undergone minor modifications since its creation. It is a widely-used approach for examining the impact of specific events on the value of a stock (Grewal et al., 2019; Abay, 2021; Bassen et al., 2022), and there are several different models for conducting an event study. For this study we apply the market model described by MacKinlay (1997) due to its ability to provide a more accurate representation of abnormal returns by accounting for market fluctuations.

3.1.1 Event study

The model by MacKinlay (1997) relates the return of a particular asset to the return of the overall market in order to determine whether the asset exhibits abnormal returns. By considering the market's effect on the asset's return, the variance of abnormal return is reduced compared to models such as the constant mean return model. In accordance with

MacKinlay (1997), an estimation window of 120 days is used as well as a five-day event window [-2:2] (i.e., the event date and two days prior and after). However, since this study examines an announcement reaction, it is of high relevance to be able to capture the "first-reaction". The EU has early indicated an eventual establishment of a taxonomy, thus increasing the risk of early speculations from investors. Consequently, we have, in addition to the main event window, also investigated a broader event window [-4:4] in order to capture potential deviations as a result of the risk of early speculations. This approach is further supported by prior research within the field of EU regulations (Zhang, 2007; Armstrong, Barth, Jagolinzer, & Riedl, 2010; Grewal et al., 2019).

During the event window, the expected returns of the firms are estimated by predicting normal stock returns prior to the event. The normal returns surrounding the event window are then subtracted from the expected returns to obtain the abnormal returns from the event. Thus, in order to determine the impact of the event, we first compute the normal returns as follows:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{1}$$

R_{it} = Normal return for firm *i* under period *t*

R_{mt} = Market return under period *t*

ε_{it} = Zero mean error term

α_i & β_i = Market model parameters (intercept and volatility respectively)

Furthermore, we compute the expected return during the event window under the assumption that no event occurred at date *t*, as follows:

$$\hat{R}_{it} = \hat{\alpha}_i + \hat{\beta}_i R_{mt} \tag{2}$$

Abnormal return is then computed using normal and expected returns, as follows:

$$AR_{it} = R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{mt} \tag{3}$$

AR_{it} = Abnormal return for firm *i* at date *t*

Since abnormal return refers to a specific date we need to aggregate the abnormal returns into cumulative abnormal returns to be able to draw inferences for the event:

$$CAR_i(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{it} \tag{4}$$

CAR = Cumulative abnormal return

t_1 = First day of the event window

t_2 = Last day of the event window

In order to investigate the effect on the same type of event on multiple firms, we are using the cumulative average abnormal return:

$$CAAR = \frac{1}{N}\sum_{i=1}^{N} CAR_i(\, t_1, t_2) \tag{5}$$

$CAAR$ = Cumulative average abnormal return

To be able to understand and interpret our results better, we are investigating each date during the event window separately as well. Therefore we also compute the average abnormal return in order to investigate the effect on the same type of event on multiple firms:

$$AAR = \frac{1}{N}\sum_{i=1}^{N} AR_{i,t} \tag{6}$$

AAR = Average abnormal return

The event study is conducted using two different approaches, the first one (investigating *CAAR*) during different periods under the event window (between [-1:1] to [-4:4]), and the second one (investigating *AAR*) for each date (between [-4:-4] to [4:4]) during the event. Furthemore, in both approaches we conduct three different event studies, one for firms with ESG-score ≥ 75 (225 firms), one for firms with ESG-score < 75 (653 firms) and one for all firms (878 firms).

3.1.2 Alternative regression

In order to test the hypothesis for this study and to ensure that no other variables can explain the results better than the ESG-score, a regression model with control variables is conducted. We have conducted the regression model for the full sample as well as the high ESG-scoring firms and non-high ESG-scoring firms separately. Additionally, a high ESG dummy is included in one model specification with the full sample. In order to facilitate the referral to the different model specifications, they are referred to as regression (a)-(d). The regression model used is as follows:

$$CAAR = \alpha_i + \beta_1 High\ ESG\ Dummy + \beta_n Controls + \varepsilon \quad (7)$$

We have CAAR as the dependent variable in all regressions since it is a valid metric to measure the market reaction to an announcement, which in turn is used as a proxy to investigate investors' perception and actions. The control (independent) variables of choice are based on Abay (2021), with some modifications due to data retrieving issues, and consist of Total Assets, Asset Turnover, Leverage, Employees, and Volatility which could all affect the CAAR of firms and are thus used to control for the firm-specific characteristics that could drive the outcome variable (Fama & French, 1992; Manchiraju & Rajgopal, 2017; Grewal et al., 2019). The control variables could be divided into subcategories explaining different types of firm-specific characteristics and is a threefold. Firstly, the variables Total Assets and Employees are simple metrics mainly representing the size of a firm. Secondly, the variables Asset Turnover and Leverage are instead ratios of simple metrics, thus rather explaining the performance, in terms of efficiency, of a firm than its size. Finally, the variable Volatility is an equation rather than a simple metric that computes a firm's financial performance and relationship towards its market, i.e., measuring the degree of variation of a firm's financial performance over a period of time, thus explaining its level of risk and uncertainty. Conclusively, the chosen control variables all together capture vital elements that could affect a firm's CAAR. The variable "High ESG Dummy" is the one explaining the effect firms with high ESG-score has on the CAAR, which is crucial for testing our hypothesis of the study and is thus not categorized as a control variable.

Finally, we have winsorized the control variables at the 1% and 99% level, in line with Grewal et al. (2019) and Abay (2021), to deal with potential outliers. By setting outliers equal to less extreme values, we could reduce the potential effect outliers might cause. However, we are aware that by replacing extreme outliers with less extreme values, we might inadvertently alter the distributional properties of the data. This could lead to a distortion of the relationships between the control variables and the outcome variable, ultimately affecting the validity of our findings. Furthermore, winsorization may also result in a loss of information, as extreme values hold valuable insights and might carry important contextual meaning. As some control variables (Total Assets and Employees) are significantly larger than our dependent variable CAAR, we further transformed these using the natural logarithm (Ln) in order to make them closer to the normal distribution.

Before drawing conclusions from the regression results obtained using Ordinary Least Squares (hereafter "OLS"), we need to test if the statistical assumptions of linear regression have been violated and adjust for them if necessary. Our OLS data is cross-sectional, unlike the data for the event study, as each control variable has one observation per year, not per day. Therefore, we must test four OLS assumptions: Linearity, No Multicollinearity, Homoscedasticity, and Normality (Wooldridge, 2010).

Linearity is a fundamental principle of OLS regression, determining the functional form of the model. Non-linear relationships between dependent and independent variables can distort the true relationship (Berry, 1993). The Ramsey RESET test detects non-linearity and reveals that all four regressions violate the linearity assumption (see *Appendix B-1*). To address this, we include squared terms to capture non-linear relationships and improve the model fit (Wooldridge, 2015). Individual tests (Ramsey RESET) show non-linearity in all control variables except Ln Total Assets in regression (a) and Volatility in regression (b). The inclusion of squared terms substantially changes the coefficients, improving the fit and accuracy of the model (see *Appendix C-1-2*). We also test for multicollinearity, ensuring no independent variable perfectly linearly depends on others (Poole & Farrell, 1971). Although no correlation above 0.7 was present, we check for potential multicollinearity using the variance inflation factor (VIF). None of our regressions exhibit multicollinearity issues as the VIF values are below both 5 and 10 (see *Appendix B-2*). The assumption of homoscedasticity states that the error term has constant variance and is tested using the Breusch-Pagan test

(Breusch & Pagan, 1979). Our regression shows heteroscedasticity, rejecting the assumption of constant variance. To address this, we use robust standard errors instead of regular standard errors. Finally, we test the assumption of normality, which requires residuals to be normally distributed, using the Shapiro-Wilk test (Berry, 1993; Razali & Wah, 2011). The results (see *Appendix B-4*) indicate that none of the residuals follow a normal distribution. However, with a large sample size, small deviations from normality may appear statistically significant but have minimal practical significance or affect the validity of the analysis (Wilcox, 2012). The histograms of the residuals (see *Appendix D-1-4*) suggest mild deviations from normality, with slightly positive skewness and somewhat leptokurtic distribution. These deviations are unlikely to significantly bias our results (Royston, 1992).

3.2 Data sample

There is no official ESG-scoring and therefore we had to select one of the available scores (Huber & Comstock, 2017; Armanino, 2022), thus opening up for bias. To counter this bias, a careful examination and analysis of the available scores was necessary. Naturally, the most suitable is from one of the largest and most prevalent providers. Refinitiv Eikon is a leading provider of critical decision support tools, including all types of data and ESG-rating for thousands of firms, and is thus a reasonable candidate of use (Lovas, 2021; Tayan, 2022; Armanino, 2022). After a careful evaluation of the available providers of ESG-scores, we ended up using Refinitiv Eikon. As they also provide other financial data, it was natural to collect all primary data from this database, thus contributing to high validity and reliability. The scoring system for ESG from Refinitiv Eikon consists of a range between 0-100 (from lowest to highest), which is a combined score derived from three individual pillars environmental (E), social (S), and governance (G), where a firm can score from 0-100 on each pillar (Refinitiv, 2022). In order to determine which firms are considered high-scoring, we have chosen the 75th percentile of ESG-score (i.e., ≥ 75) as representative.

For our sample we have collected the daily closing price, Revenue, Total Assets, Total Debt, Employees and ESG-score for a period of three years, i.e., 2019-2021. However, in *3.1.2* additional control variables of use are presented, i.e., Asset Turnover, Leverage and Volatility, which were not retrieved from any database, thus we calculated them ourselves as follows:

Asset Turnover was computed by dividing the retrieved Revenue by the retrieved Total Assets:

$$Asset\ Turnover = \frac{Revenue}{Total\ Assets} \tag{8}$$

Leverage was computed by dividing the retrieved Total Debt by the retrieved Total Assets:

$$Leverage = \frac{Total\ Debt}{Total\ Assets} \tag{9}$$

Volatility was computed yearly as the standard deviation of the returns:

$$Volatility = \sqrt{\frac{\sum_i^n (x_i - \bar{x})^2}{n-1}} \tag{10}$$

x_i = Each firm's return

n = The size of the population (yearly)

$\bar{x}$ = The mean of the returns

Furthermore, a screening has been made as the EU Taxonomy only applies to firms of public interest within the EU with over 500 employees, only data from firms that meet these criterias is collected. However, to facilitate the data collection we have chosen to only target public firms. Consequently, our initial screening (EU-members, employees ≥ 500, ESG-score available, public firm) generated 1089 firms. However, since the screening filters on Refinitiv Eikon only applied to FY2021, some firms had less than 500 or missing data on employees as well as ESG-score the remaining years (2019-2020). Hence, we removed those firms, resulting in 878 firms left for our final sample.

3.3 Descriptive statistics

As the two most important variables for our study are the dependent variable CAAR and the independent variable ESG-score (see *Table 1*), we will explain these in depth and compare them with similar prior research. On average, the CAAR in our sample was zero, however, with significant variance ranging from -0.51 to 0.37. The mean and maximum value in our sample is thus similar, but somewhat higher, than prior researchers. For example, Bassen et al. (2022) reported a mean CAAR and maximum CAAR of zero and 0.31 respectively. However, in our sample, the minimum CAAR is remarkably lower than reported in Bassen et al. (2022), as their sample generated a minimum CAAR of -0.17. Since the mean and maximum CAAR in both samples are basically the same, the difference in the minimum values indicates presence of negative outliers affecting our sample.

VARIABLES	N	Min	p25	Mean	p75	Max	Sd
CAAR	688,352	-0.51	-0.03	-0.00	0.04	0.37	0.07
ESG Score	688,352	3.61	49.44	61.31	75.06	95.49	17.90
Ln Total Assets	688,352	18.94	21.00	22.35	23.41	27.43	1.79
Asset Turnover	620,928	0.05	0.45	0.75	0.96	2.44	0.45
Leverage	688,352	0.00	0.15	0.28	0.38	0.81	0.17
Ln Employees	686,780	6.39	8.00	9.06	10.01	12.62	1.45
Volatility	687,308	0.01	0.02	0.02	0.03	0.06	0.01

Table 1. Descriptive statistics

Table 1. presents the descriptive statistics for the variables included in this study, i.e., the dependent variable CAAR, the control variables as well as the variable ESG-score as it is of relevance for the study too. For each variable, the table provides the number of observations (N), minimum (Min), maximum (Max) and average values (Mean), the first and third quartile (p25, p75), and the standard deviation (Sd).

Regarding the ESG-score, the variance in our sample is noteworthy, ranging from minimum 3.61 to maximum 95.49 (out of 0-100). This is in line with Bassen et al. (2022) as they reported ESG-score ranging from minimum 3.25 to maximum 93.77. However, the ESG-score mean of 61.31 in our sample is rather high, in contrast to the ESG-score mean of

54.16 reported by Bassen et al. (2019), indicating our sample's ESG-scores consist of more high values than low values (i.e., more concentrated towards the upper span). This could be derived from different samples, where Bassen et al. (2019) include more than only European countries. In the paper by De Lucia et al. (2020), the sample is more similar to ours (limited to European countries), and thus more comparable. They report ESG-scores ranging from minimum 8.25 to maximum 95.94, with a mean of 62.02. Clearly, both the maximum and the mean are quite the same as in our sample, yet with a ~2.3x higher minimum value. Hence, the ESG-scores between 3.61-8.25 in our sample must be few, as they appear to not affect the mean that much. All in all, our descriptive statistics seem relatively in line with prior research within the field, thus making them fair to use for further analysis.

4. Results, Analysis and Discussion

This chapter provides an overview of the results obtained from our study, including an analysis and discussion of the findings. We start by analyzing and discussing the results from the event study and regression, and examine how they relate to our hypotheses. Subsequently, we present the results from robustness checks, which involve testing whether the estimated effects of interest are sensitive to changes in model specifications. These findings are discussed in detail to provide a comprehensive understanding of the impact of ESG regulations on market reactions.

4.1 Event study

In *Table 2*, the results from the event study are presented, where we can see results from different event windows as well as different days during the event windows. Additionally, the result is presented for only high ESG-scoring firms i.e., firms scoring above or equal to 75, the remaining firms i.e., firms scoring below 75 and the full sample. It is a clear trend during all event windows, where the high ESG-scoring firms show negative abnormal returns, whereas the non-high ESG-scoring firms show positive abnormal returns. Our primary event windows are [-2:2] as we want to capture the immediate effect. Regarding the high ESG-scoring firms, the event study output shows significant (at the 99% level) abnormal returns for the primary event window, negative 66-basis point CAAR, as well as for the secondary event window [-3:3] showing negative 37-basis point CAAR. Looking at the high ESG-scoring firms' results from the specific days during the event windows we only have three significant abnormal returns, day -4 (positive 24-basis point CAAR at the 90% significance level), day 2 (negative 44-basis point CAAR at the 99% significance level) and day 3 (positive 27-basis point CAAR at the 95% significance level), where we can see a shift towards positive abnormal returns between day 2 and 3. Hence, the negative abnormal return during the primary event window could be derived from the negative abnormal return from day 2 rather than the actual event day as the latter has a lower coefficient as well as non-significance. For the non-high ESG-scoring firms, both the event windows and the specific days during the event windows only resulted in one significant abnormal return each, our primary event window [-2:2] and day 2, where both are positive, the former with 22-basis point CAAR (at the 99% significance level) and the latter with 15-basis point CAAR (at the 90% significance level).

	CAAR				AAR		
Event Window	Full Sample	High ESG Firms	Remaining Firms	Event Window	Full Sample	High ESG Firms	Remaining Firms
[-1:1]	0.0000	-0.0006	0.0002	[-4:-4]	0.0000	0.0024*	0.000
	(0.0006)	(0.0010)	(0.0008)		(0.0007)	(0.0013)	(0.0007)
[-2:2]	0.0000	-0.0066***	0.0022***	[-3:-3]	0.0000	0.0003	-0.0001
	(0.0006)	(0.0010)	(0.0008)		(0.0008)	(0.0014)	(0.0009)
[-3:3]	0.0000	-0.0037***	0.0012	[-2:-2]	0.0000	-0.0015	0.0005
	(0.0007)	(0.0011)	(0.0008)		(0.0008)	(0.0011)	(0.0009)
[-4:4]	0.0000	-0.0014	0.0004	[-1:-1]	0.0000	0.0006	-0.0002
	(0.0007)	(0.0011)	(0.0008)		(0.0006)	(0.0011)	(0.0008)
				[0:0]	0.0000	-0.0005	0.0002
					(0.0007)	(0.0012)	(0.0009)
				[1:1]	0.0000	-0.0008	0.0003
					(0.0007)	(0.0012)	(0.0009)
				[2:2]	0.0000	-0.0044***	0.0015*
					(0.0007)	(0.0010)	(0.0008)
				[3:3]	0.0000	0.0027**	-0.0009
					(0.0007)	(0.0012)	(0.0008)
				[4:4]	0.0000	-0.0001	0.0000
					(0.0007)	(0.0011)	(0.0010)
NoFirms	878	225	653	NoFirms	878	225	653

Robust sd error in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2. Event study output including different event windows

As presented in the background, despite the overall increase in sustainable investments, in the last few years the interest and growth have slowed down (GSIA, 2021), which is interesting as Schueth (2003), already 20 years ago, predicted this might happen in the future. This prediction was based on the lack of evidence supporting the claim that sustainable investments perform in line with non-sustainable investments in the long term. Applying this on our results, it could be an explanation of the negative trend for high ESG-scoring firms, which further can be supported by the nature of herding behavior of investors (Bikhchandani et al., 1992; Shleifer & Vishny, 1997). Accordingly, investors might have realized that sustainability is costly and due to herding behavior, even more investors follow them in reacting negatively towards such firms. Consequently, our results show that ESG-score affects the CAAR and thus showing that investors take non-financial factors into consideration in their investment decision. Hence, another potential factor explaining our results could be mental accounting, which refers to the tendency of investors to categorize and evaluate financial decisions based on non-financial factors (Thaler, 1999).

Unlike Grewal et al. (2019), who found negative abnormal returns for both non-high ESG-scoring firms and high ESG-scoring firms, however, with less negative reaction for the latter than the former, we find positive abnormal returns for non-high ESG-scoring firms and negative for high ESG-scoring firms. The difference in our results could possibly be explained by the aforementioned slowed down interest and growth in sustainable investments which, according to GSIA (2021), was not evident in 2014 when the NFRD, used in the study by Grewal et al (2019), was published. Hence, investors' interest in sustainable investments was still high during the introduction of the NFRD but has slowed down until 2020 when the EU Taxonomy was introduced, resulting in a negative reaction of high ESG-scoring firms under the introduction of the EU Taxonomy but a positive (less negative) reaction of high ESG-scoring firms under the introduction of the NFRD. This would suggest that our results should be similar to Bassen et al (2022). However, this is not the case as their results suggest the opposite than ours, indicating that the aforementioned statement might not explain our negative results after all.

Noteworthy, however, is that Bassen et al. (2022) do not only include EU countries and focus on taxonomy-aligned revenues rather than ESG-score. Despite the latter, they still touched upon ESG-score in their study and found no evidence that investors' preferences, for firms with high ESG-score, increased or decreased. Grewal et al (2019) conclude that the market perceives that the NFRD will lead to net costs for firms with weak ESG performance and benefits for firms with high ESG performance, thus also indicating that investors' preferences lean towards high ESG-scoring firms. However, our results suggest that investors' preference towards high ESG-scoring firms decreased during the introduction of the EU Taxonomy and hence that the market perceives that the EU Taxonomy will lead to benefits for non-high ESG-scoring firms and net costs for high ESG-scoring firms, thus contradicting the findings from both Grewal et al (2019) and Bassen et al (2022). Consequently, one could argue that our findings indicate that the EU Taxonomy is ineffective in promoting sustainable investing, at least in the short-term. On the other hand, as the EU Taxonomy's aim is supposed to contribute to the 2030 Agenda, it is evidently long-term, thus implying that the short-term reaction might not reflect the actual effectiveness of the EU Taxonomy in achieving its objective.

4.2 Alternative regression

In order to check whether the results from the event study are robust, in accordance with MacKinlay (1997), we added control variables to the regression, mainly to see if more than high ESG-score affected CAAR (*(c) and (d)*). We also investigate which variables affect the high ESG-scoring and non-high ESG-scoring firm's CAAR (*(a) and (b)*). Below, *Table 3* presents the four different regression model specifications that test for robustness during the primary event window [-2:2]. In (a)-(c) all control variables are included and are conducted for only high ESG-scoring firms, the remaining firms, i.e., non-high ESG-scoring firms, and the full sample respectively. In (d), in addition to all control variables, the high ESG dummy is included as well and it is conducted for the full sample. Consequently, (d) is the most important to target as it captures both if other variables than ESG-score affects CAAR but also the effect high ESG-score has on CAAR.

	(a)	(b)	(c)	(d)
	High ESG			
	Yes	No		
VARIABLES	CAAR	CAAR	CAAR	CAAR
Ln Total Assets	0.0018	-0.0270*	-0.0339***	-0.0352***
	(1.620)	(-1.661)	(-2.922)	(-3.040)
Asset Turnover	0.0201**	0.0092	0.0093	0.0099
	(2.104)	(1.229)	(1.501)	(1.593)
Leverage	0.0205	-0.0389***	-0.0394***	-0.0355**
	(0.704)	(-2.622)	(-2.768)	(-2.487)
Ln Employees	-0.0132**	0.0326***	0.0151***	0.0148***
	(-1.996)	(4.372)	(2.924)	(2.853)
Volatility	3.3113***	-0.0315	0.3978	0.4002
	(3.230)	(-0.224)	(0.878)	(0.814)
Constant	-0.0324	0.1781	0.3343***	0.3418***
	(-0.775)	(1.041)	(2.621)	(2.684)
High ESG Dummy				-0.0073***
				(-4.975)
Observations	970	2,965	3,935	3,935
F-value	16.79	15.29	16.05	17.91

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3. Regression with control variables to check for robustness

Ln Total Assets and Leverage appear to have a significant negative effect on CAAR in (b)-(d), indicating that they have an negative impact on CAAR if a company does not have a high ESG-score. Regarding the Asset Turnover, (a) shows a significant positive correlation against CAAR, indicating that it has an impact on CAAR if a company has a high ESG-score.

Ln Employees shows a significant negative correlation with CAAR in (a) and a significant positive correlation in (b)-(d), indicating the market reacts differently towards high ESG-scoring firms. Additionally, we find evidence that the number of employees also affect the CAAR along with ESG-score. In (a), the coefficient for Volatility is remarkably high, implying that the volatility affects CAAR positively in a substantial manner if a firm has a high ESG-score. Higher volatility implies higher risk and investors may demand higher returns as compensation for the additional risk they are taking on. This increased demand for returns may drive up stock prices and lead to higher CAAR. By demanding higher returns as compensation, in combination with integrating ESG criterias into investment decisions, which mitigates the risk (Eurosif, 2021), the former and the latter together could be a sufficient explanation for the substantial effect in (a).

The output in (d) appears to be in line with the results from the event study as the High ESG Dummy has a significant negative impact on CAAR of 73-basis point whereas a significant negative impact of 66-basis point in the event study during the same event window. Hence, the coefficients for both the event study and the alternative regression show a significant difference between high ESG-scoring firms and non-high ESG-scoring firms even though the number of observations for high ESG-scoring firms is considerably lower than the observations for the remaining firms. This means that the significant difference is substantial and thus strengthens the output for both the event study and the alternative regression. Finally, the alternative regression supports our findings from the event study and hence, it strengthens the reliability of the result from the event study, even though there are other variables impacting CAAR along with ESG-score.

5. Conclusion and Final Discussion

In this section, we conclude the primary outcomes of our research, in alignment with the objectives and goals of this study. We link our findings to the theoretical framework, especially the previous research's empirical findings and the hypotheses. Furthermore, we discuss the study's contribution to the ESG- and corporate finance literature, as well as its practical implications. Additionally, based on our contrasting results with prior research, we provide recommendations for further research. Finally, we conclude the chapter by discussing the study's limitations and how they might impact our findings.

5.1 Conclusion and contribution

This study examines the market reaction of the introduction of the EU Taxonomy with the purpose to determine investor's perception and actions towards high ESG-scoring firms. The research within this area is limited due to the recent introduction of the EU Taxonomy, hence the impact of the EU Taxonomy on investor's perception and actions towards high ESG-scoring firms is not yet clear. Additionally, prior research claims that there still remains a gap between investor's intentions and actual behaviors. Consequently, this study examines this gap and gains insight into whether the taxonomy is effectively promoting the transition to a sustainable economy and the role it plays in shaping investors' perception and actions towards high ESG-scoring firms. Accordingly, the study also sheds a light on whether the market rewards or penalizes firms based on their ESG performance. Finally, this study helps evaluate and understand if the aim of the EU Taxonomy is reachable.

After analyzing the results we can conclude that the null hypothesis for this study can be rejected, as our results show that high ESG-scoring firms earned negative 66-basis point CAAR under our primary event window for the introduction of the EU Taxonomy. Hence we can answer our research question by concluding that the introduction of the EU Taxonomy seems to have changed investors' perception and actions towards high ESG-scoring firms, indicating that investors' actions towards high ESG-scoring firms have decreased and thus the perception has deteriorated. Based on this we can further conclude that the gap between investors' intentions and actual behaviors is still evident which could be a result of herding behavior and mental accounting. Additionally, we can conclude that the EU Taxonomy is not effectively promoting a transition towards a sustainable economy in the short-term and hence

the market seems to penalize firms based on their ESG performance. However, this can not explain with certainty whether the aim of the taxonomy is reachable as the aim is long-term and our results only capture a short-term reaction.

To the best of our knowledge, this is the first study exclusively examining investors' perception and actions towards high ESG-scoring firms under the introduction of the EU Taxonomy. Hence, this study contributes to a better understanding of the role that a clear and detailed classification system can play in promoting sustainable investing and it can thus have important implications for policymakers and the financial industry. This study also contributes to the literature by providing contradictory evidence to the findings of prior research within the area (Grewal et al, 2019; Abay, 2021; Bassen et al, 2022). We also contribute to the area of behavioral finance by showing indications that herding behavior and mental accounting could be a possible explanation for our results (Bikhchandani et al., 1992; Shleifer & Vishny, 1997; Thaler, 1999), thus might affect investors' perception and actions towards high ESG-scoring firms.

5.2 Limitations and suggestions for further research

We acknowledge that our study has several minor limitations. Firstly, it is only a limited number of firms having an ESG-score, thus our study might have failed to capture several sustainable firms due to missing ESG-score. Secondly, the ESG-score is retrieved from one of many agencies providing them, thus allowing for bias. Thirdly, we do not capture the real difference between high ESG-scoring firms and non-high ESG-scoring firms as we do not conduct a Difference-in-Difference analysis. However, this is not necessary to fulfill the purpose of the study but it could strengthen the conclusions. Hence, this can be conducted in further research but where the aim rather is to examine the difference between high and non-high ESG-scoring firms. Finally, our study only capture the short-term reaction which is not sufficient to determine whether the aim of the EU Taxonomy is reachable, consequently, further research could examine the long-term effect of the taxonomy when it has been applicable for a longer period in order to draw more accurate conclusions about whether the taxonomy is efficient in promoting a transition to sustainable investing and if its aim is reachable.

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Appendix A. Pairwise Correlation matrix

It is important to check if any of the variables are correlating with each other as this could indicate that multicollinearity is present in our model. Furthermore, an OLS requires that all variables are independent to each other, meaning that highly correlated independent variables constitute a problem. To solve this potential problem, it is most common to remove the independent variables with a correlation above 0.7 (Tabachnick & Fidell, 1996). However, none of the variables used exceeds 0.7, hence, we have not removed any variables.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
(1) CAAR	1.0000					
(2) Total Assets	-0.0728	1.0000				
(3) Asset Turnover	0.0975	-0.3145	1.0000			
(4) Leverage	-0.1435	-0.0804	-0.2419	1.0000		
(5) Employees	-0.0435	0.6564	0.0791	0.0069	1.0000	
(6) Volatility	-0.0030	-0.2150	0.0082	0.1107	-0.1418	1.0000

Appendix B. Diagnostic tests

Appendix B displays the outcomes of the diagnostic tests that were conducted before implementing the regression model to assess whether the statistical assumptions of OLS are valid in our model.

Appendix B-1. Test for linearity

Ramsey RESET test

	(a)		(b)		(c)		(d)	
TEST	*F()=*	*Prob > F*	*F()=*	*Prob > F*	*F()=*	*Prob > F*	*F()=*	*Prob > F*
Ln Total Assets	F(3, 1120) = 2.3	**0.0753**	F(3, 3260) = 10.45	0.0000	F(3, 4385) = 13.89	0.0000	F(3, 4384) = 12.95	0.0000
Asset Turnover	F(3, 975) = 7.34	0.0001	F(3, 2975) = 9.92	0.0000	F(3, 3955) = 12.89	0.0000	F(3, 3954) = 13.75	0.0000
Leverage	F(3, 1120) = 14.84	0.0000	F(3, 3260) = 7.01	0.0001	F(3, 4385) = 5.9	0.0005	F(3, 4384) = 5.44	0.0010
Ln Employees	F(3, 1105) = 3.25	0.0211	F(3, 3245) = 15.9	0.0000	F(3, 4355) = 15.19	0.0000	F(3, 4354) = 13.19	0.0000
Volatility	F(3, 1120) = 18.86	0.0000	F(3, 3260) = 2.21	**0.0846**	F(3, 4385) = 3.69	0.0115	F(3, 4384) = 3.25	0.0210
Full Model	F(15, 949) = 11.21	0.0000	F(15, 2944) = 6.88	0.0000	F(15, 3914) = 7.34	0.0000	F(15, 3913) = 7.09	0.0000

H0: Model has no omitted variables

Notes: Bold values represent the Prob > F values exceeding the significance level of 95 %, thus not rejecting the null hypothesis.

Appendix B-2. Test for multicollinearity

Variance Inflation Factor (VIF)

VARIABLES	(a)	(b)	(c)	(d)
Ln Total Assets	2.42	2.65	3.10	3.27
Asset Turnover	1.66	1.50	1.53	1.53
Leverage	1.29	1.13	1.15	1.15
Ln Employees	2.35	2.30	2.69	2.71
Volatility	1.12	1.16	1.15	1.15
High ESG Dummy	-	-	-	1.28
Mean VIF	**1.77**	**1.75**	**1.92**	**1.85**

Appendix B-3. Test for heteroskedasticity

Breusch-Pagan test

Regression	Chi-squared	Prob > Chi-squared
(a)	151.70	0.0000
(b)	0.97	**0.3243**
(c)	43.97	0.0000
(d)	20.86	0.0000

H0: Constant variance

Notes: Bold values represent the Prob > F values exceeding the significance level of 95 %, thus not rejecting the null hypothesis.

Appendix B-4. Test for normality

Shapiro-Wilk test

Residuals	Obs	W	V	z	Prob > z
(a)	618,574	0.9290	6,314	24.855	0.0000
(b)	618,574	0.9308	6,157	24.784	0.0000
(c)	618,574	0.9291	6,312	24.854	0.0000
(d)	618,574	0.9303	6,200	24.803	0.0000

H0: Data is normally distributed

Appendix C. Regressions adjusting for non-linearity

Appendix C presents one original regression where non-linearity is not adjusted for, and the other where non-linearity is adjusted for, by including squared terms and thus allowing for its effect.

Appendix C-1. Regression without adjustment for non-linearity

	(a)	(b)	(c)	(d)
	High ESG			
	Yes	No		
VARIABLES	CAAR	CAAR	CAAR	CAAR
Ln Total Assets	0.0006	-0.0029***	-0.0031***	-0.0024***
	(0.586)	(-2.956)	(-4.254)	(-3.103)
Asset Turnover	0.0109***	0.0039*	0.0041**	0.0040**
	(3.614)	(1.840)	(2.294)	(2.227)
Leverage	0.0166**	-0.0340***	-0.0268***	-0.0271***
	(2.212)	(-6.932)	(-6.174)	(-6.243)
Ln Employees	0.0011	0.0010	0.0009	0.0012*
	(1.273)	(1.160)	(1.368)	(1.812)
Volatility	-1.5431***	-0.0620	-0.3577***	-0.3530***
	(-8.453)	(-0.464)	(-3.123)	(-3.091)
Constant	0.0019	0.0648***	0.0759***	0.0590***
	(0.102)	(3.352)	(5.299)	(3.892)
High ESG Dummy				-0.0072***
				(-4.861)
Observations	970	2,965	3,935	3,935
F-value	23.26	17.79	24.96	27.74

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix C-2. Regression with adjustment for non-linearity (squared terms included)

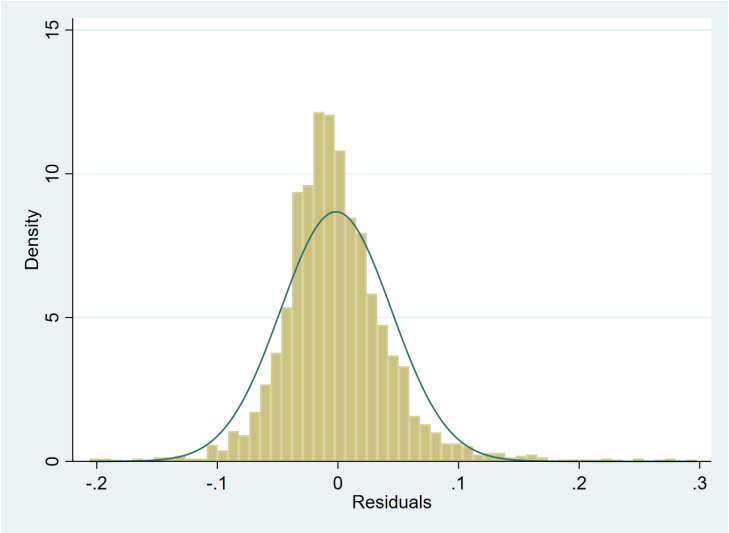
	(a)	(b)	(c)	(d)
	High ESG			
	Yes	No		
VARIABLES	CAAR	CAAR	CAAR	CAAR
Ln Total Assets	0.0018	-0.0270*	-0.0339***	-0.0352***
	(1.620)	(-1.661)	(-2.922)	(-3.040)
Asset Turnover	0.0201**	0.0092	0.0093	0.0099
	(2.104)	(1.229)	(1.501)	(1.593)
Leverage	0.0205	-0.0389***	-0.0394***	-0.0355**
	(0.704)	(-2.622)	(-2.768)	(-2.487)
Ln Employees	-0.0132**	0.0326***	0.0151***	0.0148***
	(-1.996)	(4.372)	(2.924)	(2.853)
Volatility	3.3113***	-0.0315	0.3978	0.4002
	(3.230)	(-0.224)	(0.878)	(0.814)
Constant	-0.0324	0.1781	0.3343***	0.3418***
	(-0.775)	(1.041)	(2.621)	(2.684)
High ESG Dummy				-0.0073***
				(-4.975)
Ln Total Assets^2		*0.0006*	*0.0007****	*0.0008****
		(1.561)	*(2.781)*	*(2.974)*
Asset Turnover^2	*-0.0047*	*-0.0022*	*-0.0022*	*-0.0025*
	(-1.219)	*(-0.788)*	*(-0.953)*	*(-1.086)*
Leverage^2	*0.0027*	*0.0096*	*0.0225*	*0.0168*
	(0.058)	*(0.453)*	*(1.070)*	*(0.796)*
Ln Employees^2	*0.0007***	*-0.0018****	*-0.0008****	*-0.0008****
	(1.993)	*(-4.356)*	*(-2.917)*	*(-2.803)*
Volatility^2	*-72.0180****		*-10.8275*	*-10.7499*
	(-4.280)		*(-1.357)*	*(-1.351)*
Observations	970	2,965	3,935	3,935
F-value	16.79	15.29	16.05	17.91

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

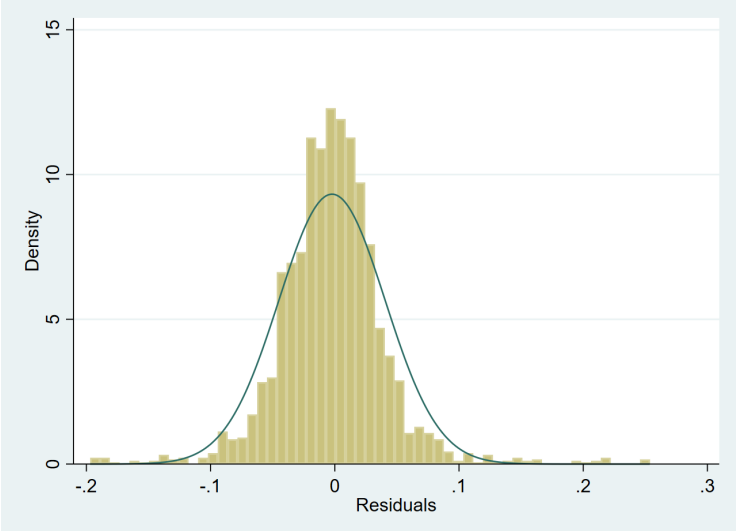
Appendix D. Histograms of residuals

Appendix D shows the histogram of residuals in the regression model used, in order to get visuals of the shape of the distribution.

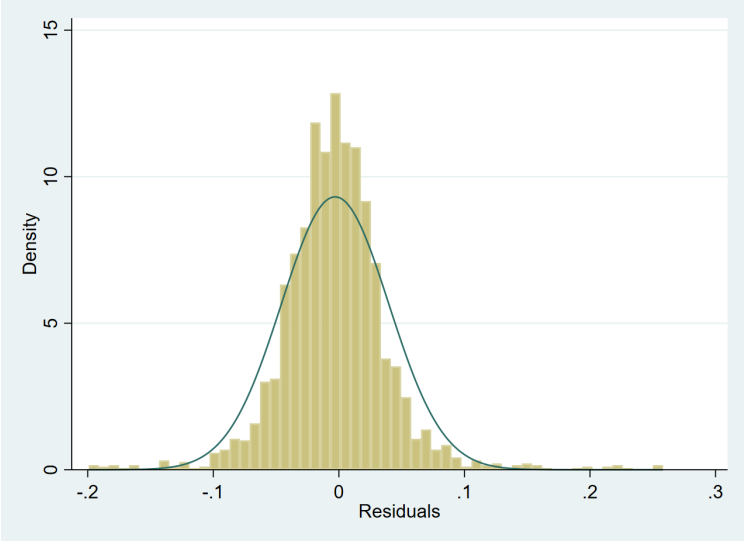
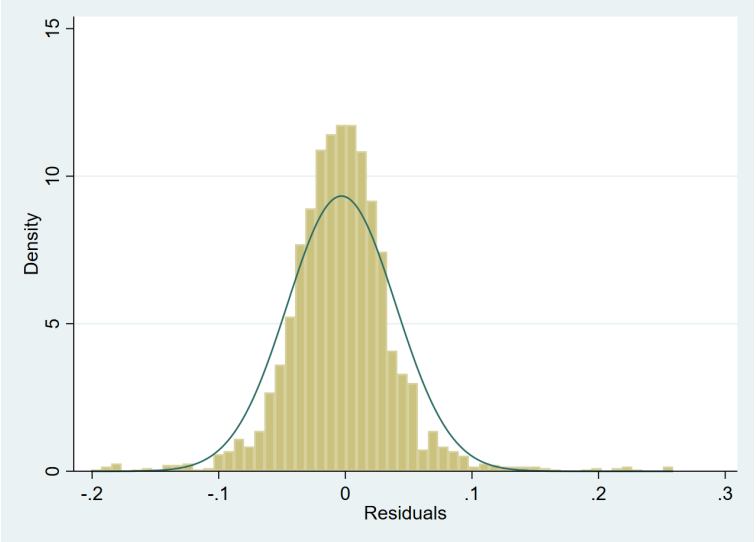
Appendix D-1. Histogram of residual of regression (a)



Appendix D-2. Histogram of residual of regression (b)



Appendix D-3. Histogram of residual of regression (c)



Appendix D-4. Histogram of residual of regression (d)