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Is Materiality Key to Profit on Sustainability?

An empirical analysis of material sustainability and its effect on stock performance on Oslo Stock Exchange

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Acknowledgement

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Abstract

In this thesis, we examine whether the companies' focus and prioritization of material sustainability issues have value implications for companies listed in Norway. Material sustainability issues are those issues that are likely to influence the decision making of stakeholders (Jørgensen, Mjøs, & Pedersen, 2022). We classify an investment as material or immaterial by cross-checking MSCI's key sustainability issues with SASB's industry-specific material issues. We construct portfolios based on i) companies with high (low) investments in material and immaterial sustainability, and ii) based on relative sustainability performance. The excess returns are then measured against the Fama French four-factor model. The methodology is inspired by Khan, Serafeim & Yoon (2016).

When considering sustainability investments, we find that no significant abnormal returns are present, regardless of the investments being material or immaterial. When examining the effect of relative sustainability performance on stock performance, our results indicate that the relative material sustainability performance does not create value for shareholders. However, the results implies that a strong performance on immaterial sustainability is associated with a negative annualized abnormal return of 1.2% compared to the low performers. Furthermore, we argue that the five biggest sectors on Oslo Stock Exchange are affected differently by sustainability factors, because of varying stakeholder pressure and different material issues. The sector portfolios achieve a difference in annualized abnormal return ranging from -2.40% for the Extractives & Mineral Processing sector to 3.60% for the Financial sector. To conclude, we argue that materiality matters in the sense that continuous investments in immateriality, and thus becoming a sector-leader, is value-destroying. The results suggests that the non-financial accounting standards used in Norway are successful in separating material and immaterial issues for investments purposes, and thereby highlight the importance of knowing which sustainability issues to prioritize in the mission of aligning sustainability and profitability.

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1. Introduction

In the field of sustainable business and especially sustainability reporting, it seems to be widely agreed upon that materiality matters. Materiality is the concept that defines what and how certain issues are important for a company or a business sector (Datamaran, n.d.). Practitioners, scholars, and now even regulators argue that companies should conduct a materiality analysis and integrate it in both their sustainability strategy and reporting (Khan et al., 2016; Jørgensen et al., 2021; Ransome & Taylor, 2022). Material sustainability issues are those issues that are likely to influence the decision making of stakeholders (Jørgensen et al., 2021). Whereas a materiality assessment is a method of prioritizing a company's sustainability efforts and enables the company to focus on the sustainability issues that matters the most for stakeholders.

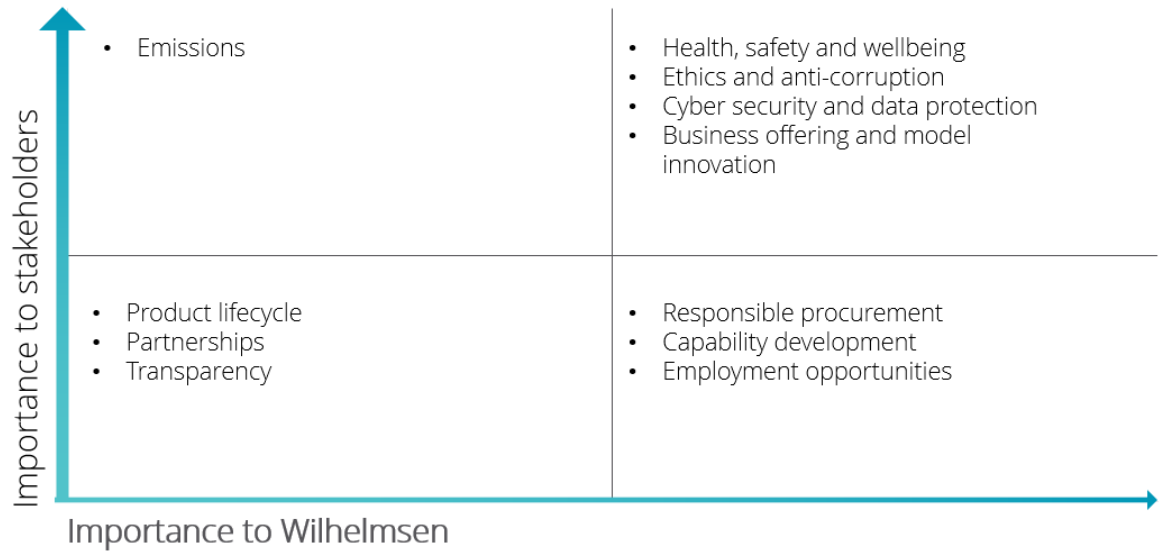
The largest single owner in the world's stock markets, the Government Pension Fund Global (the Norwegian oil fund), claim to predominantly focus on financially material environmental issues when incorporating sustainability in their investment decisions (NBIM, n.d.; NBIM, 2022). The reason being that they believe sustainability and financial return go hand in hand. In 2021, the fund return was 0.74 percentage points higher than the fund's benchmark index from the Ministry of Finance. Because such a significant market participant successfully uses this investment strategy abroad, we find it interesting to research the concept of materiality on Oslo Stock Exchange (OSE).

Materiality indicates that various sustainability issues are weighted differently by different companies, sectors, and industries. This is a result of different prioritizations and pressure from stakeholders (Jørgensen et al., 2021). The variation can be illustrated in Wilhelmsen's and DNB's materiality matrices. The matrices present the companies' material issues, whereas the most important issues are placed in the top right corner. The classification does not mean that the issues not categorized as material are not important, but as a consequence of limited resources, they are viewed as less important. The immaterial issues are not presented in the matrices. Examples of immaterial issues are selling practices and product labelling for Wilhelmsen and ecological impacts for DNB (SASB, n.d.,b).

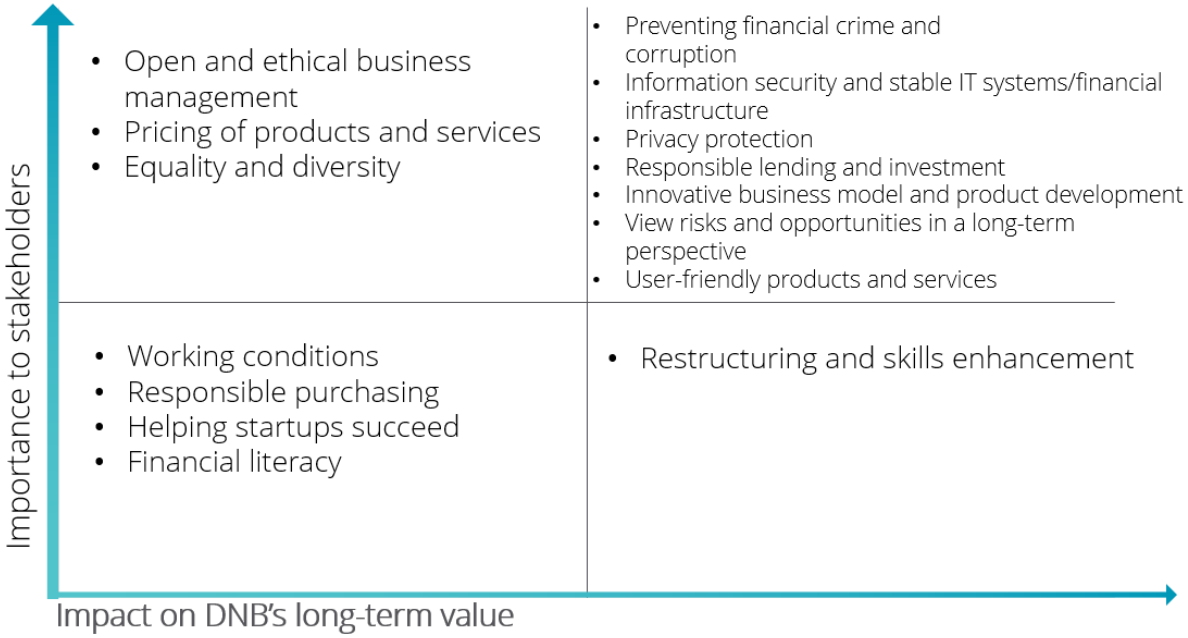
Figure 1: Materiality Matrix

Figure 1 shows the materiality matrix for Wilhelmsen and DNB, in panel A and B, respectively. A materiality matrix illustrates the prioritization of different sustainability issues in a two-dimensional diagram.

Panel A: Materiality Matrix for Wilhelmsen (Wilh. Wilhelmsen Holding ASA, 2021).



Panel B: Materiality Matrix for DNB (DNB Public Affairs & Sustainability, 2021).



Wilhelmsen, a global maritime group have classified health, safety and wellbeing as one of the most important material issues and product lifecycle and responsible procurement as less important material issues. As a commercial bank, DNB have in contrast evaluated user-friendly products and services and responsible lending and investment as the most important material issues. while working conditions are less important material issues. Further, both companies claim that prevention of financial crime and corruption is a material sustainability issue. As illustrated by the matrices, the concept of materiality helps companies to prioritize the material issues to contribute with efficient use of resources. In addition, it allows companies to avoid immaterial issues. However, voluntary sustainability reporting enables companies to take advantage of the freedom to assess what is material, in order to improve their appearance to stakeholders (Pelja, 2022).

The interest in ESG and sustainability has grown more and more over the recent years. Khan et al. (2016) show that the number of investors who consider sustainability issues in their asset allocation decisions have increased. This is supported by The Forum for Sustainable and Responsible Investments who finds that the number of US assets under active management where ESG strategies are used grew from $12 trillion at the start of 2018 to $17.1 trillion at the beginning of 2020, which is an increase of 42%. This represents a total of 33% of the US assets under professional management (The Forum for Sustainable and Responsible Investments, 2020). Today, most companies' sustainability efforts concern mitigation of risk tied to sustainability issues. Based on conventional financial theory, risk mitigation lowers the cost of capital (Pástor, Stambaugh & Taylor, 2022). According to Pástor et al. (2022), German green bonds and US green stocks significantly outperformed their brown counterparts, despite the green bonds and green stocks having a lower expected return as a result of their lower cost of capital. They argue that the outperformance reflects an unanticipated increase in environmental concerns.

In order to incorporate sustainability in investment decisions, we are reliant on companies disclosing sustainability information. Up until now, the majority of all ESG reporting has been voluntary. ESG reporting is non-financial reporting that provides valuable environmental, social, and governance information for relevant and interested financial, and non-financial, decision makers (Position Green, 2022). From 1 January 2024, companies that fall under the

Non-Financial Reporting Directive (NFRD)[1] and financial market participants must comply with the Corporate Sustainability Reporting Directive (CSRD), which requires the companies to report based on material issues (PwC, 2022). Nonetheless, 80% of the 100 largest publicly listed companies on OSE already disclose sufficiently on material issues (Position Green, 2022). This confirms that materiality is highly prioritized by the companies already.

Due to the increase in environmental concerns, increased focus on materiality from both stakeholders and regulators, and previous outperformance of sustainable stocks, we find it interesting to dig deeper into the concept of sustainability. We divide sustainability into material and immaterial issues, in order to examine if the focus of sustainability strategies and companies' prioritization of sustainability issues have value implications for companies listed in Norway between 2013 and 2021. The main research question of this thesis is:

Are material sustainable investments value-enhancing for the shareholders of the companies listed on Oslo Stock Exchange?

The incorporation of ESG in the financial market in recent years, is both driven by stakeholders' expectations and regulations. As a result, publicly traded companies are being ESG-rated to a greater extent, and the implications of these ratings for investment decisions and stock performance are increasingly examined (Shanaev & Ghimire, 2021). It can be challenging to compare the ESG ratings, and thereby performance, of a bank with an oil and gas company because there are substantial differences in the foundation of their business. Hence, we find it interesting to see whether the relationship between materiality and financial performance vary between the sectors on OSE. To investigate this claim, we formulated the following support research question:

Does the relationship between material sustainable investment and financial performance vary between the different sectors on Oslo Stock Exchange?

In Norway today, there are several companies that stand out with regards to their sustainability performance (Position Green, 2022). However, there are still numerous companies lagging behind. Therefore, we want to investigate the relationship between stock performance and the

[1] NFRD requires public-interest companies in EU and EEA Member states with more than 500 employees to disclose on environmental, social and employee matters, anti-bribery and anti-corruption, diversity, and human rights. This is also incorporated in Norway through the Accounting Act §3-3c from July 2021 (Revisorforeningen, 2021).

companies' sustainability performance relative to the sector average. By comparing the results of the effect of sustainability investments and relative sustainability performance on stock performance, we want to examine if all companies can make profitable sustainability investments or if relative performance is key to obtaining abnormal return with regards to sustainability. Therefore, the second support research question for this thesis is:

Is the abnormal return obtained dependent on the sustainability performance relative to the sector average?

In the field of sustainable business, there are several different terms used interchangeably. In business, sustainability includes addressing how their activities impact society and the environment, and incorporate a goal to balance financial, environmental, and social outcomes by running their operations according to the principle of a triple bottom line (Position Green, 2022). ESG is a term that primarily describes how a business deals with environmental, social and governance issues, but it is also used as a synonym for "green" or "sustainable" businesses. Further, corporate social responsibility (CSR) covers the same concepts as sustainability and ESG, although it originally focused on social issues. In this thesis we use the terms interchangeably depending on the terminology used in the relevant research and theories.

2. Sustainability and the Concept of Materiality

2.1 Sustainability and stock performance

An important explanation to why sustainable investments have become increasingly popular is the fact that they have outperformed unsustainable investments (Morgan Stanley, 2020). However, a meta-study[2] conducted by Margolis, Elfenbein & Walsh (2009) find that there are neither financial penalties, nor considerable financial benefits for investing in sustainability. Additionally, research conducted in more recent years also shows contradictory results (Khan et al. 2016; Cornell, 2021; Cornell & Shapiro, 2021; Nardi, Zenger, Lazzarini & Cabral, 2021).

Kumar, Ashwin, Badis, Wang, Ambrosy, Tavares & Rodrigo (2016) considers ESG and non-ESG companies and their research challenge the conventional thinking because it shows that with lower risk, an investment can achieve a higher equity return[3]. In addition, the positive effect on equity returns in total is 6.12% on top of an average reduced risk of 28.67% for ESG companies. These effects are calculated based on the annualized weekly returns and the annualized volatility over two years for ESG and non-ESG companies. The reduced risk within an industry ranges from 6.10% to 50.75%. Further, Kumar et al. (2016) finds that the differences in volatilities are much more pronounced in the group of non-ESG companies than in the ESG companies, across all 12 industries in the study. A common way to measure ESG performance is by using ESG ratings. The ratings are often risk-based, meaning that issues are considered material if they are integral for ESG risk assessment or value assessment of the company. Hence, good sustainability performers manage their risk better.

2.2 Materiality

Material sustainability issues are those issues that are likely to influence the decision making of stakeholders, and it appears to be a widespread agreement that materiality matters in the field of sustainable business (Jørgensen et al., 2021). Characterizing an issue as "material" enables the company to focus their attention. Moreover, it triggers the need for performance

[2] A meta-study combines data from several studies to find common results and overall trends

[3] The ESG companies are selected from the Dow Jones Sustainability Index (DJSI). A company listed on the DJSI is at the very top of ESG performers compared to its industry's benchmark (Kumar et al., 2016).

data, internal controls, disclosure of information to shareholders, acknowledgement by the CEO and CFO, as well as allocation of resources to manage the issue (Freiberg, Rogers, & Serafeim, 2020).

Based on Adams, Druckman & Picot (2020), material sustainability information is any information that can make a difference to the conclusions drawn by stakeholders and providers of financing. The conclusions of the stakeholders are concerning the positive and negative impacts of the organizations on the global achievement of the Sustainable Development Goals, while the conclusions of the finance providers are concerning the ability of the organization to create long-term value for the organization and society. These two definitions are often associated with the use of the Global Reporting Initiative (GRI) and the Sustainability Accounting Standards Board (SASB), the two most common sustainability reporting standards (Jørgensen et al., 2021).

Companies' sustainability efforts are subject to continuous prioritization, and materiality assessments are a key tool in these prioritizations. The materiality assessments are often visualized in a materiality matrix which illustrates the prioritization of different sustainability issues in a two-dimensional diagram. The two axes represent the interest of different stakeholder groups. The concept of materiality is used based on two different approaches that corresponds with the use of GRI and SASB, and the two reporting standards define materiality in fundamentally different ways (Jørgensen et al., 2021). SASB uses a risk-based approach, while GRI uses an impact-based approach. The two different definitions can be illustrated in two different materiality matrices (Appendix A). A combination of these two approaches equals the double materiality perspective.

The SASB standards identify industry-specific sustainability factors (ESG) that are material to short, medium, and long-term enterprise value (SASB, n.d.,c). The GRI standards, on the other hand, prioritize reporting on issues that reflects the company's most significant impacts on the economy, environment, and people, including human rights (Adams, et al., 2021). In other words, GRI offers a global language for communicating the companies' impact on people and planet that responds to the needs of all stakeholders, while SASB focuses on the connection between businesses and investors and how sustainability issues can enhance or erode enterprise value (GRI; SASB, n.d).

For the purpose of this study, which is to determine how material (immaterial) sustainable investments and relative performance affect the companies' stock price, it is most appropriate to use the financial materiality approach. The SASB reporting standards identify the industry-specific financially material issues that affects the companies' financial condition, and therefore the issues most relevant to investors (Christensen, Hail, & Leuz, 2021). The financial materiality approach indicates that the companies' impact on the environment and society are not presently borne by the company and therefore may not necessarily be material to investors. Hence the financial aspect is more prominent.

2.2.1 Pathways to materiality

Freiberg et al. (2020) explain how materiality is dynamic and that new issues can become financially material over time. Their framework explains the "Pathways to Materiality" through 5 steps: the status quo, catalyst event, stakeholder reaction, company and industry reaction, and regulatory reaction and innovation. They argue that misalignment of corporate behaviour with societal objectives, meaning that their values and interests are diverging, is a critical condition of materiality.

The first step is the *Status quo*, and at this point the issue is financially immaterial. The degree of misalignment between business and societal interests is tolerated and, in some cases, the stakeholders are not even aware of it. The misalignment is accepted either because of societal norms or due to a lack of information. For example, in the early 20th century there were little knowledge of the harmful effects of the burning of fossil fuels on the climate. This implies that the perception of the misalignment is more fundamental for materiality, than the true level of misalignment.

The second step is the *Catalyst*. The issue is still financially immaterial; however, the misalignment is increasing. Freiberg et al. (2020) observe two distinct types of catalysts. Either there is a change in corporate behaviour away from what is considered socially acceptable, or new information on corporate behaviour causes the societal norms to move away from current practices. Some companies diverge from the equilibrium seeking to capture rents, increasing the business and social misalignment.

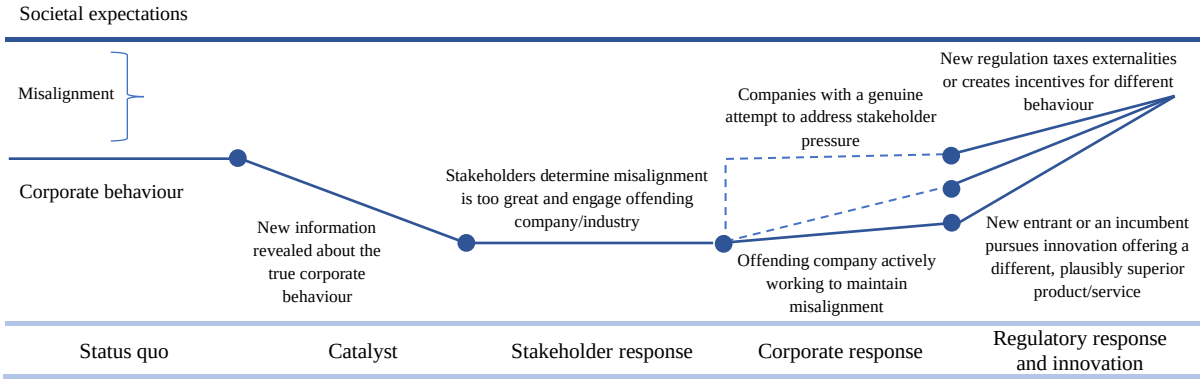
At some point, NGOs, media, and other stakeholders react to the increasing misalignment between the societal and business interests. This step is called the *Stakeholder response*, and the issue is becoming financially material for some companies. Stakeholders take action, which can cause reputational and brand damage from bad publicity. However, the focus is on the offending companies, not the practices of the industry. The companies performing significantly worse than the industry average are usually the ones targeted by the public. Those companies can experience *negative price reactions*, as investors re-evaluate risk and expectation of future growth.

In the aftermath of stakeholder reaction, companies attempt to regain public trust by taking action to address the underlying misalignment. This fourth step is called the *Company and Industry response* and is the first sign that the issue could become financially material for the entire industry. Company reactions vary between two extremes, either by genuine attempts to correct the misalignment or by actively working to maintain the misalignment by dismissing stakeholder concerns. According to Freiberg et al. (2020), the latter group may begin to experience negative price reactions, while the companies with relatively better performance may escape the negative price reactions and could even experience *positive price reactions*. The misalignment is still greater than it would be in the presence of new regulation or disruptive innovation.

The last step is *Regulatory response and innovation*. The issue is financially material for the entire industry, and new regulations force companies to decrease misalignment. Additionally, disruptive innovations could lead the industry to a new equilibrium. The issue is integrated into the competitive landscape of the industry and the performance on the issue affects the companies' market valuation. The companies compete on *relative performance* on the material issue.

Figure 2: The Dynamic Nature of Financial Materiality

Figure 2 shows an issue's pathway to materiality across the five stages described above (Freiberg et al., 2020). It describes the misalignment between corporate behavior as understood by society and societal expectations of corporate behavior. In this example corporate behavior intensifies the degree of misalignment, and the societal expectations are constant.



This theory explains how sustainability issues become financially material over time. It emphasizes how materiality is dynamic and highlights why it is important for organizations to revise their materiality assessments regularly. By being updated on misalignment between stakeholders and the organization, organizations can respond early and enable them to obtain positive price reactions.

2.3 Effects of ESG reporting

As the demand for information and corporate disclosures have increased, several organizations now offer voluntary reporting standards for ESG activities. These standards aim to improve the reporting practices, the two most common being SASB and GRI (Christensen et al., 2021). ESG reporting is non-financial reporting that provides valuable environmental, social, and governance information for relevant and interested financial and non-financial decision makers (Position Green, 2022). One may conclude that in many cases, large enterprises create sustainability reports only to comply with the increasing number of regulations. However, this is not the only reason, which is confirmed by the fact that companies publish information on unregulated issues (Bashir, 2022).

Up until 2021, the majority of ESG reporting in Norway have been done voluntarily, which also applies to the sample in this study. The new audit regulation entered into force in Norway

in July 2021, and the transparency act[4] in July 2022 (Regjeringen 2020; Forbrukertilsynet 2022). As a result, only the ESG data from 2021 are affected by regulations. A possible consequence of voluntary sustainability reporting is strategic reporting, or greenwashing. This implies that the companies omit issues they underperform on, report excessively on irrelevant issues where they perform well, and take advantage of the freedom to assess what is material (Pelja, 2022).

Most academic studies show that companies tend to expand and adjust corporate social responsibility activities that is subject to disclosure requirements (Christensen et al., 2021). A possible explanation is potential benchmarking with other companies to avoid doing worse that their competitors. Nevertheless, CSR improvements often come at a cost in form of lower productivity, profitability or market share. It is expected that companies increase CSR activities that are covered by a reporting mandate and reduce activities that are viewed as problematic.

Possible consequences of corporate disclosure on ESG factors are reduction in information asymmetry, reduction in agency costs, and the company's stakeholders learn new information, which again can lead to real effects (Leuz & Wysocki, 2016). Real effects are those effects that have an impact on the real economy. Hence, the changes in company valuation examined in this study are not real effects, but it could lead to real effects. Additionally, reporting on ESG factors can influence a company's sustainability impact. Christensen et al. (2021) argue that the sustainability impact is strengthened by mechanisms such as improved monitoring and governance of managers' CSR activities, and increased market and societal pressure due to the availability of the CSR information.

On the other hand, a sustainability report represents the starting point of an information asymmetry between the company and the recipient regarding whether the report contains the full truth or not. From the viewpoint of stakeholders, a credibility gap describes a lack of confidence in the abilities and intentions of a publishing company. From the company's

[4] The Transparency Act requires enterprises to conduct a due diligence assessment where they investigate whether there are any actual, or risks of, adverse impacts on human rights or decent working conditions in their own operations, their supply chain and other business relationships (Forbrukertilsynet, 2022).

perspective there is temptation to achieve advantages from communicating positive sustainability activities without carrying out the necessary effort, and this is called greenwashing (Wanner & Janiesch, 2019).

In our research, we use the MSCI ESG Rating which objectively measures ESG performance based on information primarily disclosed by the company itself. Hence, a possible consequence is unreliable input data caused by strategic reporting. As the concept greenwashing has become more well-known, users of sustainability reports have become more sceptical towards the information provided (Sheldon & Jenkins, 2020). In fact, an experiment conducted by Sheldon & Jenkins (2020) has shown that reports displaying negative performance are perceived as more believable than positive when the report is not assured.

3. Literature Review

Previous research conducted by Khan et al. (2016) shows that the number of investors who consider sustainability issues in their asset allocation decisions have increased. A report issued by Morgan Stanley in 2020, which included financial institutions, insurers, and pension funds in North America, Europe, and Asia Pacific, reveals that 80% of asset owners actively integrated sustainability in their investments in 2019. The report identifies return potential as a key driver for the sustainability integration, and the majority of investors believe that companies with ESG-aligned practices can be better long-term investments (Morgan Stanley, 2020). Thus, an important catalyst for the growth of sustainable investments can be that many ESG investments have outperformed their counterparts.

When examining the field of sustainable investments, studies in the recent years have also taken materiality into consideration. Khan et al. (2016) was the first to show that investments in material sustainability issues can be value-enhancing for shareholder value, while investments in immaterial sustainability issues have negative or little positive value implications, if any at all. By hand-mapping sustainability issues as either material or immaterial they create a materiality index based on SASB and the ESG information from MSCI KLD. This way, Khan et al. (2016) determines that material sustainable investments lead to better future financial performance. Consequently, materiality has been widely incorporated in studies regarding sustainable investments and studies regarding the relationship between ESG performance and financial performance in recent years (e.g., Kumar et al., 2016; Alda, 2020; Consolandi, Eccles & Gabbi, 2020; Nardi et al., 2021).

Furthermore, Kumar et al. (2016) designs a model to establish the link between ESG performance and volatility of stock returns by analysing the annualized weekly returns and the annualized volatility over a period of two years (1 January 2014 to 31 December 2015) from the largest companies worldwide. The equity stocks are divided into 12 sectors because the materiality of the ESG factors vary across sectors when measuring the return in conjunction with ESG performance. Out of all the 12 sectors studied, 8 results in better returns for ESG companies than their peers. The positive effect on equity returns in total is 6.12% on top of an average reduced risk of 28.67% for ESG companies. This implies that different industries are affected differently by ESG factors (See 2.1 above for a more detailed explanation).

An additional concept that is undoubtedly relevant when examining the relation between material sustainable investments and financial performance is how the value-creating potential of a CSR strategy is likely to be elevated when a company can attain a unique and valuable position within its industry (Nardi et al., 2021). CSR uniqueness is described by Nardi et al. (2021) as to which extent the CSR strategy is unique compared to an industry benchmark. The data is collected through several sources, including ASSET4, Compustat/CRSP and SASB, over a 16-year period (2002-2017). Nardi et al. (2021) find that market returns in accordance with CSR uniqueness are substantially reduced for companies with a greater number of material CSR categories. These categories are measured according to SASB standards. Consolandi et al. (2020) arrive at a similar conclusion, specifically that the market does not believe that having too many material issues is credible.

Because the companies that are listed on OSE, especially the larger ones, have detailed sustainability reports it is also interesting to add the perspective of unique CSR strategies from Nardi et al. (2021). Position Green published the ESG100 report for the fifth time in 2021 where they analyse and rate the 100 largest publicly listed companies in Norway, Denmark, and Sweden. The companies receive a character from A to F based on how accurate, clear, and relevant ESG data the company provides. One third of the companies on OSE receive character A+, A or A- and 36 companies receive character B+ or B, which implies that 69 percentage of the 100 largest publicly listed companies in Norway provides good sustainability reporting that covers important issues (Position Green, 2022). As Position Green does not differentiate between material and immaterial issues it is necessary for the companies to report on all issues to receive the best scores. This means a great portion of the largest companies on OSE are reporting broadly on both material and immaterial issues, which makes it significantly harder to stand out.

Our thesis adds to the literature on the relation between material sustainable investments and financial performance by combining insights, ideas, and methodologies from Khan et al., (2016), Kumar et al. (2016) and Nardi et al. (2021). Our methodology is inspired by Khan et al. (2016), and we expand it by also including a sector-based analysis inspired by Kumar et al. (2016) as well as the possibility of a unique sustainability strategy in each sector inspired by Nardi et al. (2021). As of today, most of the research conducted on sustainability and stock performance is based on US companies. Norway, and the rest of the Nordic countries, are frontrunners when it comes to sustainability (Acciona, 2021). According to RobecoSAM, their leadership in governance, innovation, human capital and environmental indicators puts the

Nordic countries at the top of the sustainability rankings. Therefore, we want to use these methodologies to investigate the relationship between materiality and the stock performance for companies listed in Norway. Consequently, this research is more purposeful for Norwegian companies and market participants.

4. Data and Methodology

The methodology used to analyse the effect of materiality is inspired by Khan et. al (2016), in which sustainability investments are hand-mapped as either material or immaterial to provide new evidence of the value implications of sustainability investments (Khan, Serafeim, & Yoon, 2016). To be able to classify each of the MSCI key sustainability issues as material or immaterial, we cross-check the key issues with the material issues in each of the 77 industries classified by the SASB reporting standards.

4.1 Population and sample

In this sub-chapter we will present the pathway to our sample selection and the sample criteria. To be able to conduct our analysis, we are dependent on MSCI ESG scores, financial data, and historical stock prices. Thus, these requirements are indicative of our final sample.

Since we want to investigate whether the effects of materiality found in Khan et al. (2016), Kumar et al. (2016) and Nardi et al. (2020) also applies to Norway, our starting point is Norwegian companies. Because historical stock prices are necessary, our sample can only include publicly listed companies. Hence, the total population in this thesis are all companies listed on OSE. Out of the 215 publicly listed companies, 109 are not covered by MSCI and can therefore not be included. Further, since we will be examining the change in the Materiality score, we must exclude companies with MSCI ESG data from the last year only (2021). This applies to 16 companies.

As a result, our sample consists of 93 companies, which constitutes for 43% of the companies listed on OSE. This provides us with a solid foundation for generalization to the population (Wooldridge, 2012). The companies listed on Euronext Growth are naturally excluded due to the unavailability on MSCI. The selection process is illustrated in Figure 3 and the number of companies in our sample each year and the sector distribution are shown in Table 1.

Figure 3: Sample Construction

Figure 3 shows the path to our sample. First considering all companies on OSE, before removing companies not covered by MSCI and companies with data for only one year. It leads to a final sample size of 93 companies listed on OSE.

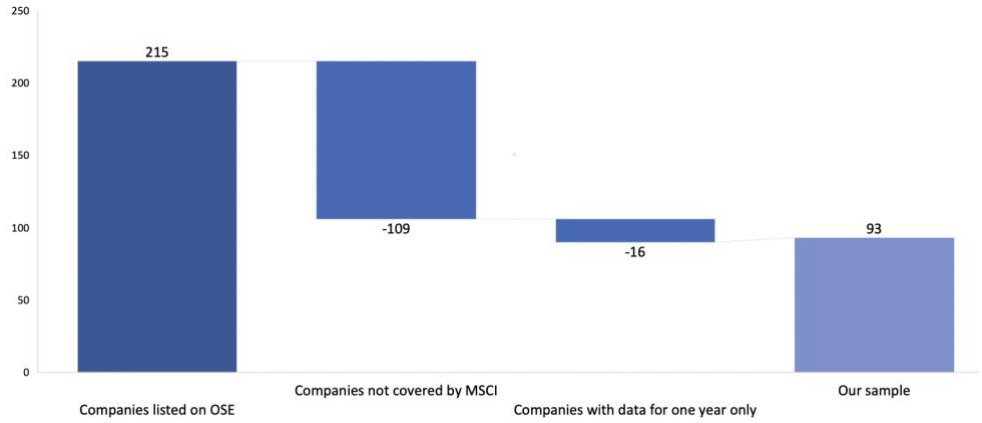


Table 1: Sample Information

Table 1 shows more detailed information regarding the sample size. Panel A shows the number of companies represented in each year and Panel B shows the number of companies in each sector as classified by SASBs Sustainability Industry Classification System (SICS). The number of companies from 2020 to 2021 decrease because some companies had not yet published their sustainability report for 2021.

Panel A: Frequency by Year

Year	# of firms
2013	27
2014	35
2015	43
2016	59
2017	60
2018	66
2019	81
2020	89
2021	74

Panel B: Frequency by Sector

Sector	# of firms
Consumer Goods	3
Extractives & Mineral Processing	16
Financials	15
Food & Beverage	10
Health Care	5
Infrastructure	9
Renewable Resources and Alternative Energy	4
Resource Transformation	9
Services	3
Technology & Communication	13
Transportation	18

4.2 Sustainability data

We used the Bloomberg Terminal to access MSCI, which is a leading provider of critical decision support tools and other support services for global investments. (MSCI, n.d.,a). MSCI has over 40 years of experience in objectively measuring ESG performance and offer ratings from more than 8 500 companies (Bloomberg, 2020). Further, MSCI covers more companies than other ESG ratings such as Asset4, KLD, RobecoSAM, RepRisk and Sustainalytics (Pástor et al., 2022). Out of the data MSCI uses to conduct the ESG ratings, 45% are coming from alternative data sources such as government, regulatory and NGO datasets (MSCI, n.d.,c). The remaining data is collected mainly through company disclosure documents and media sources. In addition, MSCI utilizes artificial intelligence technology to extract and verify unstructured data (MSCI, n.d.,b). As a result, MSCI's ESG scores are one of the least noisy among the different ESG rating providers (Pástor et al., 2022).

The MSCI ESG Rating data is a successor to MSCI KLD which has been extensively used in many academic studies examining the relationship between sustainability and financial performance (e.g., Khan et al., 2016; Ioannu & Serafeim, 2012; Giese, Lee, Melas, Nagy, & Nishikawa, 2019) (Pástor et al., 2022)). Further, MSCI offers historical ESG rating information for a range of companies. The rating represents a snapshot of the company's profile at the end of the year (MSCI, 2022). Thus, there are several benefits of using the MSCI ESG data for the purpose of this study.

Firstly, the MSCI ESG rating model focuses on the material issues for each industry. A risk is material to an industry when it is likely that companies in a given industry will suffer significant costs in connection with it, e.g., a regulatory ban (MSCI, 2022). An opportunity is material to an industry when it is likely that companies in a given industry could benefit from it for profit. The historical ESG data from MSCI comprises both opportunities and risks. MSCI marks every opportunity and risk for each company with "yes" indicating the presence of that particular key issue, and "no" indicating its absence.

Secondly, a significant advantage is the industry-unadjusted detailed data available. MSCI's composite ESG rating, ranging from AAA to CCC, is industry-adjusted meaning that a heavily polluting company is classified as green if it pollutes less than its competitors in a heavily polluting industry (Pástor et al., 2022). However, with the unadjusted detailed data it is also possible to compute a measure of sustainability that is not industry adjusted. We conduct our

analysis using this industry-unadjusted detailed data, as it provides more in-depth information of sustainability issues.

Thirdly, the detailed historical data is presented based on the three pillars E, S and G (MSCI, 2022). The three pillars are divided into ten themes: 1) climate change, 2) natural capital, 3) pollution and waste, 4) environmental opportunities, 5) human capital, 6) product liability, 7) stakeholder opposition, 8) social opportunities, 9) corporate governance, and 10) corporate behaviour. Within each of these themes there are multiple key issues, 35 in total. Carbon emissions, climate change vulnerability and product carbon footprint are examples of key issues withing the climate change theme. When conducting the materiality index, this is a substantial benefit because it makes it easier to link the MSCI key issues to the SASB material issues without discretionary assessments.

Table 2: MSCI Key Issues Hierarchy

Table 2 shows the structure MSCI uses to conduct their sustainability analysis, consisting of 3 pillars, 10 themes, and 35 key issues. Retrieved from MSCI ESG Rating Methodology (https://www.msci.com/documents/1296102/21901542/ESG-Ratings-Methodology-Exec-Summary.pdf)

3 Pillars	10 Themes	35 ESG Key Issues	
Environment	**Climate Change**	Carbon Emissions	Financing Environmental Impact
		Product Carbon Footprint	Climate Change Vulnerability
	Natural Capital	Water Stress	Raw Material Sourcing
		Biodiversity & Land Use	
	Pollution & Waste	Toxic Emissions & Waste	Electronic Waste
		Packaging Material & Waste	
	Environmental Opportunities	Opportunities in Clean Tech	Opportunities in Renewable Energy
		Opportunities in Green Building	
Social	**Human Capital**	Labor Management	Human Capital Development
		Health & Safety	Supply Chain Labor Standards
	Product Liability	Product Safety & Quality	Privacy & Data Security
		Chemical Safety	Responsible Investment
		Consumer Financial Protection	Health & Demographic Risk
	Stakeholder Opposition	Controversial Sourcing	
		Community Relations	
	Social Opportunities	Access to Communications	Access to Health Care
		Access to Finance	Opportunities in Nutrition & Health
Governance	**Corporate Governance**	Ownership & Control	Pay
		Board	Accounting
	Corporate Behavior	Business Ethics	
		Tax Transparency	

4.3 Materiality data

SASB was founded to help businesses and investors develop a common language about the financial impacts of sustainability (SASB, n.d.,a). The standards are set through a thorough and transparent process that consists of evidence-based research, participation from companies, investors and subject matter experts, and oversight and approval from an independent Standards Board. By September 2022, SASB has produced guidance for 11 sectors that include 77 industries. These sectors are consumer goods, extractives and minerals processing, financials, food and beverage, health care, infrastructure, renewable resources and alternative energy, resource transformation, services, technology and communication, and transportation (SASB, n.d.,b).

The word sustainability is defined as the corporate activities that maintain or enhance the ability of a company to create long-term shareholder value (SASB, n.d.,e). These activities are divided into five sustainability dimensions: 1) environment, 2) human capital, 3) social capital, 4) business model and innovation, and 5) leadership and governance. The activities that drive the long-term value creation will naturally vary from an industry to another, and between companies. Thus, identifying the activities each company should disclose on requires thorough consideration of key issues within the company's context, and the SASB standards is envisioned to be a guide in this process (SASB, n.d.,e).

SASB provides a "materiality finder" where it is possible to search for publicly listed companies to find the sector, industry, and financial material issues (see Appendix B for SASB's materiality map). SASB categorises each company within the one industry they deem to be most fitting (SASB, n.d.,e). To avoid discretionary categorisation, we rely on SASB's categorisation even though some companies may fit into several industries. The sample in this study is dependent on the availability of materiality guidance provided by SASB, and despite the sample consisting of companies listed on OSE, the need for a discretionary categorisation occurred in three cases. This concerned Aker Carbon Capture ASA, IDEX Biometrics ASA and Nykode Therapeutics ASA. As a result of a thorough assessment, the best suited industry for Aker Carbon Capture ASA is waste management, and biotechnology and pharmaceuticals for both IDEX Biometrics ASA and Nykode Therapeutics ASA.

Based on the SASB sector classification, Oslo Stock Exchange consists of five main sectors which all together constitutes for most of the stock exchange. These five sectors are extractions

& mineral processing, financials, food & beverage, transportation, and technology & communication.[5]

4.4 Materiality index

To be able to classify each of the MSCI key issues as material or immaterial, we cross-check the key issues with the material issues in the 77 industries from the SASB reporting standards. Each topic identified by SASB as material, is linked to a key issue from MSCI when one is available (marked "yes"). The key issues from MSCI that are linked to a SASB topic are classified as material. The remaining key issues are classified as immaterial. The process is outlined in Table 3.

Table 3: Materiality Index

Table 3 shows how material and immaterial issues are categorized. Carbon emissions, electronic waste, labour management, data security and business ethics are examples of MSCI's key issues. The issues with a check mark in the MSCI column illustrates the presence of the issue (marked "yes"), meaning it is an opportunity. The issues without a check mark illustrates the absence of the issue, meaning it is a risk. The issues with a check mark in the SASB column illustrates it is considered a material topic within the industry by SASB.

	Yes/No MSCI	Yes/No SASB	Classification
Carbon Emissions	✓	✓	Material Opportunity
Electronic Waste	✓		Immaterial Opportunity
Labor Management		✓	Material Risk
Data Security			Immaterial Risk
Business Ethics	✓	✓	Material Opportunity

[5] In the Norwegian market the Extraction & Mineral processing sector mainly consists of Oil & Gas – Exploration & Production and Oil & Gas – Services. The Food & Beverage sector is mainly seafood companies, while Transportation consists mainly of Marine transportation.

To construct a materiality and immateriality index for company *i* in year *t*, we subtract the risks from the opportunities to arrive at a single net score.

$$Material_{it} = \sum MSCI\ Opportunity_{it}, SASB - \sum MSCI\ Risk_{it}, SASB$$
$$= material\ opportunity - material\ risk$$

$$Immaterial_{it} = \sum MSCI\ Opportunity_{it}, Non - SASB - \sum MSCI\ Risk_{it}, Non - SASB$$
$$= immaterial\ opportunity - immaterial\ risk$$

From Figure 4, we can see that there is a substantial change in both the average materiality and immateriality score of the sample between 2015 and 2016. The materiality score increases considerably, while in contrast, there is a comparable decrease in the immateriality score.

Figure 5 displays the evolution of the average materiality and immateriality score on OSE divided by sector. The two figures demonstrates that there has been a shift in the priorities of material and immaterial sustainability issues, and that there are differences between the different sectors on OSE. In general, the sectors' development follows the same path as the average score of the total sample, however, there are distinct differences between sectors that are interesting to examine further.

Figure 4: Development of the average (im)materiality scores

Figure 4 shows the average materiality and immateriality score for our sample between 2013 and 2021. It illustrates a shift in the priorities from immaterial to material sustainability issues. The materiality score increases considerably, while there is a comparable decrease in the immateriality score.

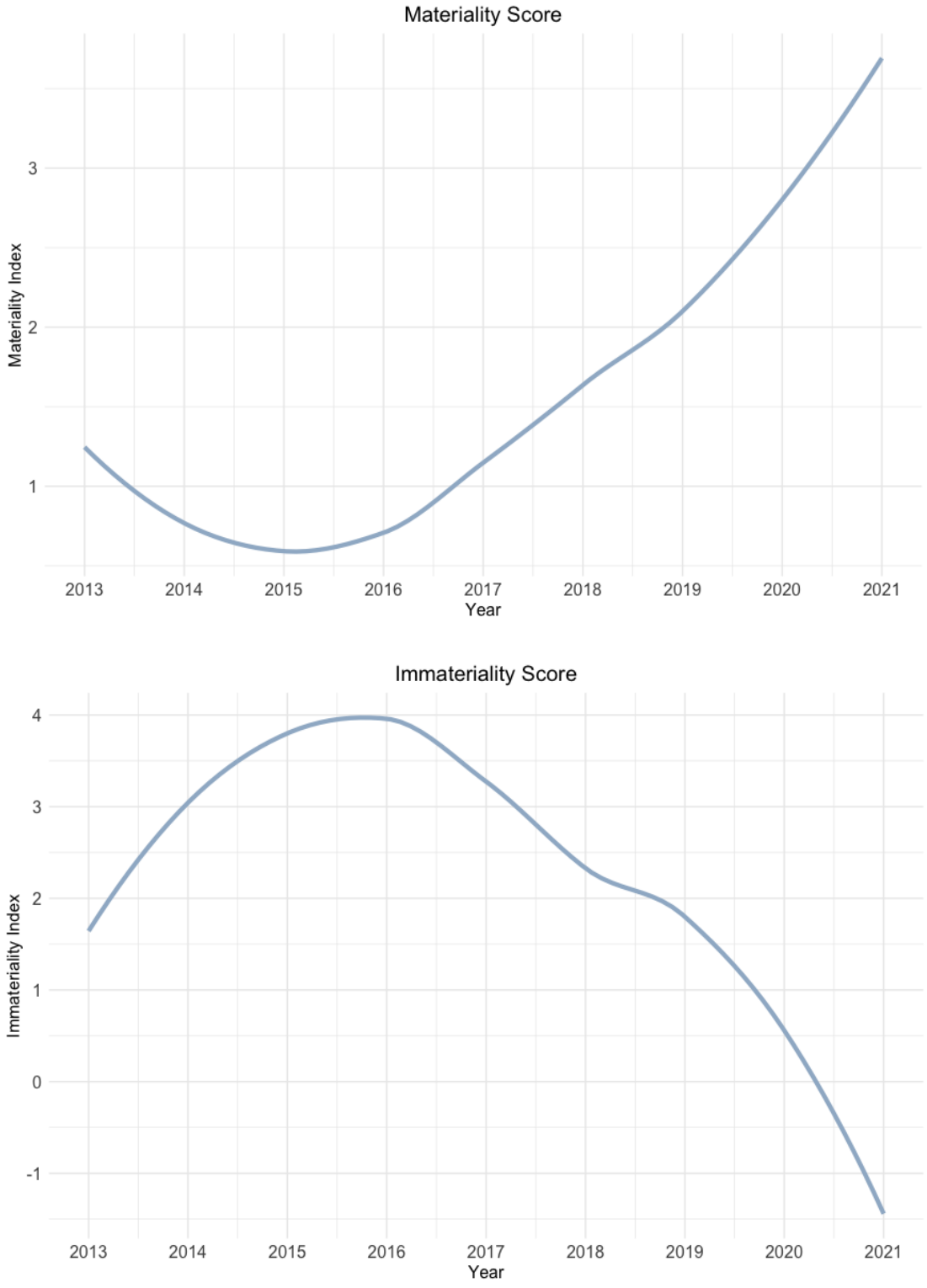
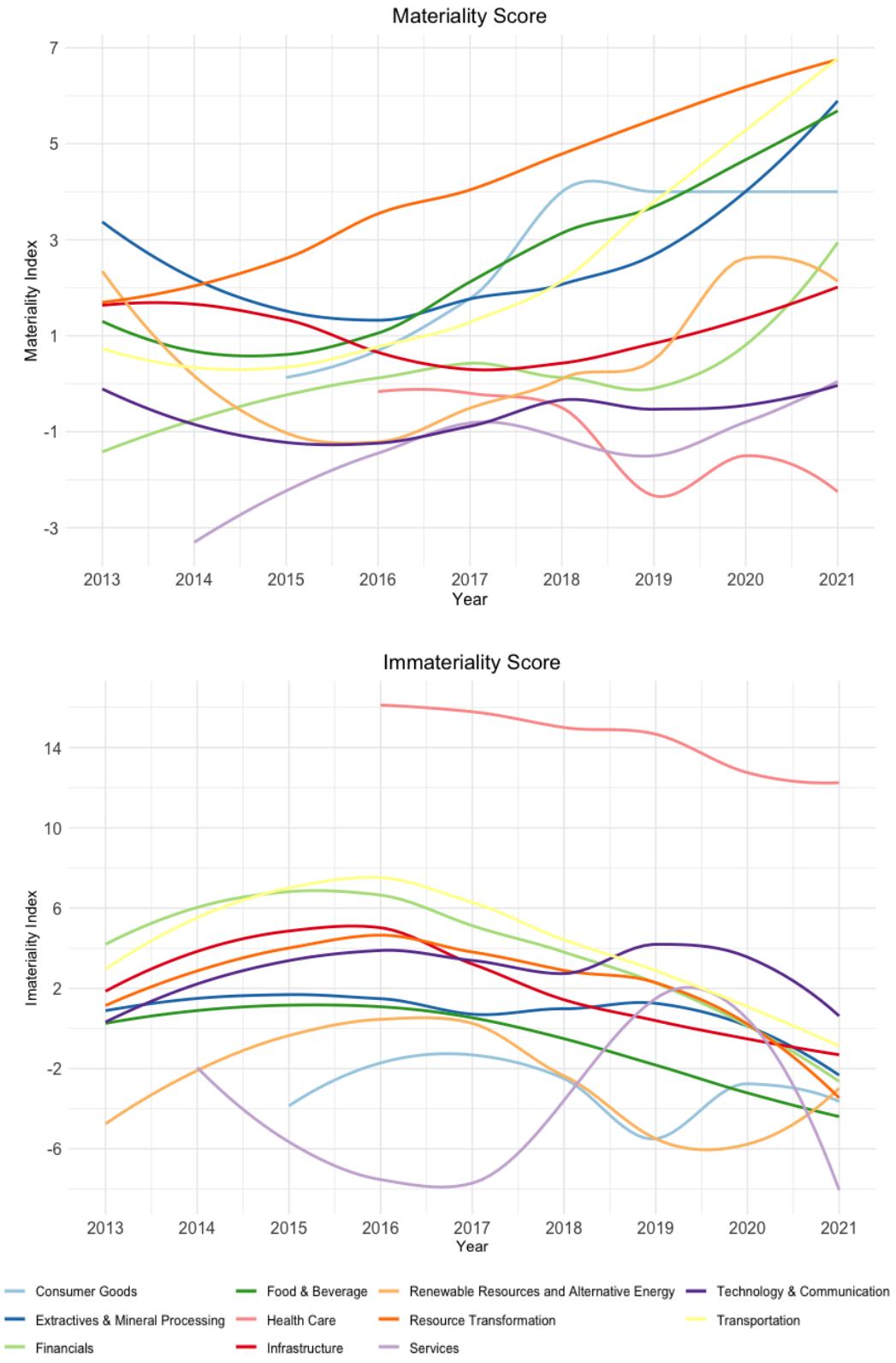


Figure 5: Development of the average (im)materiality scores on sector level

Figure 5 shows the average materiality and immateriality score for our sample between 2013 and 2021. It illustrates that the sectors' development follows the same path as the average score of the total sample, however, there are distinct differences between sectors.



4.5 Portfolio construction

To test the stock performance implications of the companies' sustainability investments, we construct portfolios based on high (low) investments on Materiality and Immateriality each year. To mitigate concerns regarding correlated sector and firm characteristics potentially confounding inferences about the Materiality and Immateriality score, we regress the changes in the scores with respect to changes in market capitalization, financial leverage, price-to-book, return on assets, and sector-specific fixed effects cross-sectionally each year. Those variables are the variables initially used by Khan et al. (2016) and they are fundamental characteristics of a firm in terms of size, growth opportunities, valuation, financial structure, and profitability. These firm characteristics also impact what regulations and norms the firm needs to comply with regarding sustainability.

$$\Delta Materiality = \alpha + \beta_1 \Delta M\_Cap_{it} + \beta_2 \Delta PB_{it} + \beta_3 \Delta Leverage_{it} + \beta_4 \Delta ROA_{it} + f_s + e_{it} \quad [3]$$

$$\Delta Immateriality = \alpha + \beta_1 \Delta M\_Cap_{it} + \beta_2 \Delta PB_{it} + \beta_3 \Delta Leverage_{it} + \beta_4 \Delta ROA_{it} + f_s + e_{it} \quad [4]$$

Due to Norwegian regulations and sector norms, some level of sustainability investments is expected. We want to isolate the investments in excess of what is expected based on the firm characteristics. By using the change in the Materiality and Immateriality score, we attempt to isolate the unexpected level of sustainability investments.

The portfolios are constructed based on the residuals from equations [3] and [4], which represent unexplained changes in the Materiality and Immateriality score. The companies with a Materiality score at the high (low) quintile in that year, is assigned to the high (low) portfolio. The Immateriality portfolios are constructed the same way.

To investigate whether the abnormal return obtained is dependent on the sustainability performance relative to the sector average, we create portfolios based on the companies' relative performance only. Due to the small sample size, we use sectors instead of industries.

$$Relative\ materiality\ performance_{it} = Materiality_{it} - \frac{1}{n_s} \sum Materiality_{it,s} \quad [5]$$

$$Relative\ immateriality\ performance_{it} = Immateriality_{it} - \frac{1}{n_s} \sum Immateriality_{it,s} \quad [6]$$

[6] $s = sector$

Equal-weighted and value-weighted portfolios are held from January to December each year. The MSCI data and financial data needed for estimation of equation [3] and [4] are published annually, consequently the portfolios are rebalanced annually. This allows the portfolio composition to change over time. Moreover, the number of companies in our sample increase over time, thus the portfolio size increase over time.

4.5.1 Portfolio construction on sector level

To shed more light on the excess return of material versus immaterial sustainability issues, we have created sector-specific sustainability portfolios. Material sustainability issues are highly related to the sector the company is operating in, and different sectors are affected differently by ESG factors (Kumar, et al., 2016). To maintain a reasonable sample size, we will consider the five largest sectors from our sample. Based on the Sustainable Industrial Classification System (SICS), these five sectors are Extractives & Mineral Processing (E&MP), Transportation, Financials, Food & Beverage (F&B), and Technology & Communication (T&C).

To address whether differences in the effect of material sustainability performance on stock performance within the sectors, we use the same approach as discussed above. The portfolios are constructed based on the residuals from equations [5] and [6], which represent unexplained changes in the Materiality and Immateriality score for each sector (s) separately.

$$\Delta Materiality_s = \alpha + \beta_1 \Delta M\_Cap_{it} + \beta_2 \Delta PB_{it} + \beta_3 \Delta Leverage_{it} + \beta_4 \Delta ROA_{it} + e_{it} \quad [7]$$

$$\Delta Immateriality_s = \alpha + \beta_1 \Delta M\_Cap_{it} + \beta_2 \Delta PB_{it} + \beta_3 \Delta Leverage_{it} + \beta_4 \Delta ROA_{it} + e_{it} \quad [8]$$

When considering the five major sectors by themselves, we rely on equal-weighted portfolios. Due to large differences in market capitalization, value-weighted portfolios will be dominated by one company over the entire sample period. E.g., in the E&MP Sector, the portfolio consisting of companies with high investments on material sustainability issues will consist of between 85% and 97% of Equinor's shares. This can have a major impact on the value-weighted portfolios. Moreover, due to the limited sample size we only consider top and bottom tercile portfolios to maintain a reasonable sample size.

4.6 Fama French Four-Factor Model

To estimate the abnormal stock returns of the portfolios, the Fama French Three-factor (Fama & French, 1993) model plus momentum (Carhart, 1997) is used. The Fama French model is an extension of the Capital Asset Pricing Model (CAPM) and attempt to explain variations in stock return by combining the market risk premium with two pricing factors: SMB ("Small minus Big") and HML ("High minus Low") (Bodie, Kane, & Marcus, 2018). Jegadeesh and Titman (1993) discovered a tendency for good or bad performance of stocks to persist over several months. Carhart (1997) formally extended the three-factor model by adding momentum as a fourth factor.

The Fama French four-factor model is given by:

$$r_i - r_F = \alpha + \beta_1 MKT + \beta_2 SMB + \beta_3 HML + \beta_4 UMD + e$$

Where $r_i - r_F$ is the return of portfolio *i* less the risk-free rate, i.e., the risk premium of the portfolio. MKT $(r_m - r_F)$ is the market risk premium and captures the additional return an investor is expected to receive when holding a risky market portfolio (Corporate Finance Institute, 2022). We use the Oslo Stock Exchange All Share Index (OSEAX) retrieved from the webpage of Professor Bernt Arne Ødegaard (Ødegaard, 2022).

The SMB pricing factor captures the relationship between size (market capitalization) and return of the stocks (Fama & French, 1993). SMB is the historic excess return of a portfolio with small-cap firms over large-cap firms. A positive SMB coefficient suggests that the portfolio is attributable to a size premium for small-cap firms.

The HML pricing factor considers the book-to-price ratio of firms (Fama & French, 1993). It is estimated by taking the historic excess return of high book-to-price ratio stocks (value stocks) and subtracting the historic excess return low book-to-price firms (growth stocks). A positive coefficient suggests the portfolio is attributable to a value premium.

UMD ("Up minus Down") is the return of a portfolio of stocks that performed well in the recent past in excess of return on a portfolio of stocks that performed badly in the recent past (Carhart, 1997).

Fama and French argue that these variables may proxy for yet-unknown more fundamental variables (Fama & French, 1993). For example, high book-to-market firms are more likely to

be in financial distress and small stocks may be more sensitive to changes in the business conditions. Thus, these variables may capture sensitivity to macroeconomic risk factors that are not captured by β (Santos, 2021). If the factors capture all the variation in expected returns, the intercept, α, is zero.

The monthly asset pricing factors, market returns, and risk-free rates for the Oslo Stock Exchange is downloaded from the webpage of Professor Bernt Arne Ødegaard (Ødegaard, 2022). The stock price data is downloaded from Refinitiv Eikon.

4.7 Model assumptions and biases

In this thesis multiple linear regression models are used both to construct the portfolios and to estimate abnormal return. There are several assumptions that need to be fulfilled for a multiple linear regression to be robust and for the results to be valid for interpretation. The dependent variables must have a linear relationship to all independent variables, there must be no heteroskedasticity or multicollinearity, and the residuals must be independent (no autocorrelation) and normally distributed (Wooldridge, 2012). The test results are displayed in Appendix E.

4.7.1 Models for portfolio construction

For the regression models used to construct the portfolios, a two-way fixed effects model is employed. With heteroskedasticity and autocorrelation present, *Heteroskedasticity and Autocorrelation-consistent (HAC) standard errors*, which includes clustered standard errors, must be used (Wooldridge, 2012). In the fixed-effects model we have used, standard errors are automatically clustered. Using clustered standard errors allows for heteroskedasticity and autocorrelated errors within an entity but *not* correlation across entities. Furthermore, we have controlled for large outliers in the change in market capitalization and change in price-to-book variables by winsorizing at the one percent level.

Multicollinearity occurs when two or more independent variables are highly correlated, thus they do not provide unique or independent information to the regression analysis (Wooldridge, 2012). To check for multicollinearity, we use the Variance Inflation Factor method (VIF), part of the Car R-package. The VIF measures the correlation and the strength of correlation between the independent variables. The value of the VIF starts at 1 and has no upper limits.

A rule of thumb is that a VIF greater than 10 indicates severe multicollinearity (Rohrer, 2021). For the regression models in this thesis, we get VIFs between 3.1456 and 6.5108. This indicates moderate correlation between the given independent variables; however, it is not considered to be severe enough to require attention. Given the nature of the independent variables (market capitalization, leverage, price-to-book, and ROA), some correlation is expected.

4.7.2 Models for estimating abnormal returns

To estimate abnormal return, we use the Fama French model, i.e., multiple linear regression models. Heteroskedasticity exists when the variances of the residuals are unequal over a range of measured values (Corporate Finance Institute, 2022). To see if there is an issue with heteroskedasticity, we run a Breusch-Pagan test. The null hypothesis of the test is homoskedasticity, i.e., the error variances are all equal, and it is rejected if the p-value is smaller than 0.05. The test statistics approximately follows a chi-square distribution, and a small chi-square value along with an associated small p-value indicates that the null hypothesis is true. In this thesis, the p-value is above 0.05 for most of the regression models, thus, we fail to reject the null hypothesis and there is not sufficient evidence to say that heteroskedasticity is present in those regression models. However, the results suggests that heteroskedasticity is present in a small selection of the regression models (Appendix E, Table 15). Furthermore, checking for multicollinearity in the Fama French models, gives a VIF of between 1.0139 and 1.3942, indicating no multicollinearity[7].

Furthermore, a Breusch-Godfrey test is used to check for autocorrelation, i.e., to check that the residuals are independent of each other. The null hypothesis of the test is no autocorrelation. The test statistics approximately follows a chi-square distribution, and a small chi-square value along with an associated small p-value indicates that the null hypothesis is true. For a small selection of the regression models, the p-value is less than 0.05. For those portfolios, we therefore reject the null hypothesis and conclude that autocorrelation exists (Appendix E, Table 16). To address the heteroskedasticity and autocorrelation problems, we run those regressions with HAC robust standard errors.

[7] See explanation of the Variance Inflation Factor method (VIF) in chapter 4.7.1.

4.7.3 Correlation between Materiality and Immateriality

The correlation between the change in materiality and immateriality scores is negative and moderate (-0.3). The correlation between materiality and immateriality scores is also negative and moderate (-0.4). This suggests that investments in material and immaterial issues and relative materiality and immateriality scores are related, but sufficiently different to allow us to differentiate firms.

5. Results

The results are structured around the three research questions. First, we consider material sustainability investments, before assessing materiality on sector level and lastly relative sustainability performance.

5.1 Material sustainable investments and stock performance on Oslo Stock Exchange

Table 4 shows the estimated coefficients of the four-factor model for the quintile and quartile portfolios of companies with high and low investments on material sustainability. Panel A displays the results for the equal-weighted portfolios while Panel B displays the results for value-weighted portfolios. The estimated alpha is equal and significant for all equal-weighted portfolios. It implies a monthly alpha of -0.10%, suggesting an annualized alpha[8] of -1.20% of all portfolios compared to the Oslo Stock Exchange All Share Index (p-value < 0.01). Considering the equal-weighted portfolios, our results indicate that materiality does not matter, i.e., all sustainability investments yield the same return.

The value weighted portfolios suggests that the quintile portfolio with high investments in materiality have a monthly alpha of -0.01% while the low investment portfolio have a monthly alpha of -0.04%. This implies that the companies with high investments in material sustainability receive a 0.36% higher annualized alpha compared to the bottom quintile, however, the results are not significant. The results for the quartile portfolios point in the same direction, proposing a higher annualized alpha of 0.60% for the companies with high investments, these results are not significant either. Collectively the results in Table 1 indicate that investments in material sustainability issues neither create nor destroys value for shareholders.

The coefficients of the regression models when considering high and low investments in immaterial sustainability issues are presented in Table 5. Similarly to the materiality regression models, the alphas are equal ($\alpha = -0.1\%$) and significant for all equal-weighted portfolios

[8] $Annualized\ Alpha = \frac{Number\ of\ time\ units\ per\ year}{Number\ of\ time\ periods\ per\ sub\ period} \times Alpha = 12 \times Alpha$ (J.P. Morgan, 2022)

and the quartile value-weighted portfolios. It indicates a monthly alpha of -0.10% and an annualized alpha of -1.20% of all portfolios compared to the OSEAX (p-value < 0.05).

The value weighted portfolios suggests that the high investment quintile portfolio have an alpha of -0.04% while the low investment portfolio have an alpha of -0.10%. This implies that the companies with high investments in immaterial sustainability receive a 0.72% higher annualized alpha compared to the bottom quintile, however, the results are not significant. This suggests that, similarly to the material sustainability investments, immaterial sustainability investments do not create value for shareholders.

Table 4: Material Sustainability Investments and Stock Performance

Panel A shows the monthly alpha for the equal-weighted portfolios created based on performance on material sustainability investments, while panel B shows the value-weighted portfolios. The annualized alpha and difference in alphas are marked with one, two or three asterisks, depending on whether it is significant at the 10%, 5% or 1% probability level, respectively.

Panel A: Equal Weighted portfolios

	Quintile				Quartile			
	High performance		Low performance		High performance		Low performance	
Parameter	Estimate	t	Estimate	t	Estimate	t	Estimate	t
Alpha (Intercept)	-0.001	-2.851	-0.001	-2.041	-0.001	-4.332	-0.001	-3.389
Market	0.074	10.448	0.075	10.468	0.065	12.666	0.060	11.746
SMB	0.013	2.500	0.010	2.012	0.013	3.451	0.009	2.520
HML	0.0001	0.015	-0.002	-0.437	-0.003	-0.885	-0.003	-1.043
UMD	-0.001	-0.200	-0.008	-1.313	0.001	0.317	-0.009	-2.000
N	1,224		1,320		1,536		1,620	
Annualized Alpha	**-1.2%*** **		**-1.2%*** **		**-1.2%*** **		**-1.2%*** **	
Difference in Alphas	**0%*** **				**0%*** **			

Panel B: Value Weighted portfolios

	Quintile				Quartile			
	High investments		Low investments		High investments		Low investments	
Parameter	Estimate	t	Estimate	t	Estimate	t	Estimate	t
Alpha (Intercept)	-0.0001	-0.033	-0.0004	-1.217	-0.0005	-1.367	-0.001	-2.101
Market	0.055	5.415	0.057	6.976	0.047	6.232	0.051	8.416
SMB	0.013	1.837	0.02	0.382	0.009	1.606	0.001	0.222
HML	-0.005	-0.741	-0.005	-0.998	-0.004	-0.848	-0.004	-1.207
UMD	-0.002	-0.192	0.004	0.596	0.007	1.116	0.002	0.449
N	1,224		1,320		1,536		1,620	
Annualized Alpha	**-0.12%**		**-0.48%**		**-0.6%**		**-1.2%**	
Difference in Alphas	**0.36%**				**0.6%**			

Table 5: Immaterial Sustainability Investments and Stock Performance

Panel A shows the monthly alpha for the equal-weighted portfolios created based on performance on immaterial sustainability investments, while panel B shows the value-weighted portfolios. The annualized alpha and difference in alphas are marked with one, two or three asterisks, depending on whether it is significant at the 10%, 5% or 1% probability level, respectively.

Panel A: Equal Weighted Portfolios

	Quintile				Quartile			
	High investments		Low investments		High investments		Low investments	
Parameter	Estimate	t	Estimate	t	Estimate	t	Estimate	t
Alpha (Intercept)	-0.001	-3.606	-0.001	-2.942	-0.001	-4.860	-0.001	-4.339
Market	0.068	10.878	0.081	10.562	0.055	11.778	0.064	11.596
SMB	0.009	2.074	0.010	1.772	0.009	2.824	0.008	2.178
HML	-0.003	-0.889	-0.002	-0.528	-0.003	-1.174	-0.005	-1.466
UMD	-0.002	-0.461	0.006	0.891	-0.001	-0.151	-0.002	-0.426
N	1,235		1,224		1,616		1,536	
Annualized Alpha	**-1.2%****		**-1.2%*****		**-1.2%*****		**-1.2%*****	
Difference in Alphas	**0%****				**0%*****			

Panel B: Value Weighted Portfolios

	Quintile				Quartile			
	High investments		Low investments		High investments		Low investments	
Parameter	Estimate	t	Estimate	t	Estimate	t	Estimate	t
Alpha (Intercept)	-0.0004	-1.237	-0.001	-1.336	-0.001	-2.254	-0.001	-2.526
Market	0.052	6.419	0.070	8.206	0.042	7.097	0.054	8.745
SMB	-0.001	-0.174	-0.010	-1.707	0.001	0.145	-0.007	-1.690
HML	-0.001	-0.157	0.008	1.515	-0.003	-0.773	0.003	0.779
UMD	0.004	0.549	0.011	1.565	0.007	1.326	0.005	0.864
N	1,320		1,224		1,616		1,536	
Annualized Alpha	**-0.48%**		**-1.2%**		**-1.2%****		**-1.2%****	
Difference in Alphas	**0.72%**				**0%****			

5.2 Sector level performance

So far, we have compared companies with high investments with companies with low investments on material and immaterial sustainability issues. To shed more light on the excess return of material versus immaterial sustainability issues, we have created sector-specific sustainability portfolios. When estimating the return using the Fama French Four-factor model, all results are insignificant. The results below are estimated using the Fama French three factor model without momentum. Table 6 represents the difference in the annualized alpha for the companies with high and low investments on sustainability issues for the five different sectors, using equal-weighted portfolios.

Panel A shows the estimated coefficients and the difference in the annualized alpha for the tercile portfolios of companies with high and low investments in material sustainability issues. The results show that for the E&MP the monthly alpha for the high investment portfolio is -0.60% while the monthly alpha for the low investment portfolio is -0.40% compared to OSEAX (p-value < 0.01). It indicates a difference in annualized alpha of -2.40%, suggesting that for the E&MP sector, investing in material sustainability destroys value for shareholders. On the other side, for the Financial sector, the monthly alpha for the high investment portfolio is 0.60% while the monthly alpha for the low investment portfolio is 0.30% (p-value < 0.01). It indicates a difference in annualized alpha of 3.60%. In contrast to the E&MP sector, this suggests that for the Financial sector, investing in material sustainability creates value for shareholders.

For the F&B, Transportation, and T&C sectors, the high investments portfolios outperform the portfolios of companies with low investments by -1.20%, 8.04%, and 8.40% a year, respectively. However, the results are insignificant, which makes it difficult to draw a justified conclusion. Nonetheless, the results in Table 6 Panel A indicate that the effect of stock performance related to investments in material sustainability issues could be sector dependent.

Panel B presents the results for the tercile portfolios of companies with high and low investments on immaterial sustainability issues. For the E&MP sector, the companies with high investments in immaterial sustainability issues have an annualized alpha of 1.20% less than the companies with low investments (p-value < 0.01). This suggests that for this specific sector, investments in both material and immaterial sustainability issues are value-destroying

for shareholders. For the Transportation, F&B, and T&C sectors, investments in immaterial sustainability issues creates value for shareholders, in contrast to what is implied by the general definition of immaterial sustainability issues (Jørgensen et al., 2021). For the Financials sector investments in immaterial sustainability issues neither creates nor destroys value. However, the results are insignificant for the F&B and T&C sectors.

Collectively, the results suggests that there are differences between sectors both with regards to investments in materiality and immateriality. However, the results are not consistent when using alternative factor-models. 'Industry Risk' refers to the factors that can impact a particular industry, which can in turn affect companies within the sector (Mehta, 2021). Stock performance between sectors also tends to exhibit considerable variation. Therefore, by adding the momentum factor we can account for this variation in stock performance. Additionally, when considering each sector by itself, the sample size decreases considerably. A small sample size increases the risk that the observation is due to chance, and it prevents the findings from being extrapolated (Wooldridge, 2012). These two elements make it difficult to draw a justified conclusion with regards to sector specific performance.

Table 6: Sustainability Investments and Stock Performance by Sector

Panel A shows the monthly alpha and difference in annualized alpha for the equal-weighted portfolios created based on performance on material sustainability issues, while panel B shows the portfolios created based on performance on immaterial sustainability issues. The coefficients are obtained with the Fama French three-factor model using equal-weighted portfolios. The coefficients are marked with one, two or three asterisks, depending on whether it is significant at the 10%, 5% or 1% probability level, respectively.

Panel A: Material Sustainability Investments

	High investments	Low investments	Diff. in annualized alpha
Extractives & Mineral Processing	-0.006***	-0.004***	-2.40%***
Financials	0.006***	0.003***	3.60%***
Transportation	-0.0003	-0.007***	8.04%
Food & Beverage	0.006	0.007***	-1.20%
Technology & Communication	-0.003	-0.010**	8.40%

Panel B: Immaterial Sustainability Investments

	High investments	Low investments	Diff. in annualized alpha
Extractives & Mineral Processing	-0.006***	-0.005***	-1.20%***
Financials	0.003***	0.003**	0.00%**
Transportation	-0.003***	-0.007***	4.80%***
Food & Beverage	0.006***	0.004	2.40%
Technology & Communication	-0.004**	-0.007	3.60%

5.3 Relative material sustainability performance and stock performance on Oslo Stock Exchange

So far, the results indicate that investments in both material and immaterial sustainability issues neither create nor destroys value for shareholders. Table 7 and Table 8 shows the estimated coefficients of the four-factor model for top and bottom quintile and quartile performers on material and immaterial sustainability relative to the sector average, respectively.

Table 7 Panel A shows the results for relative performance on material sustainability issues using equal-weighted portfolios. Similarly to the results when considering material sustainability investments, the estimated alpha is significant (p-value < 0.01) for all equal-weighted portfolios. It implies a monthly alpha of -0.10%, suggesting an annualized alpha of -1.20% of all portfolios compared to OSEAX (p-value < 0.01). Considering the equal-weighted portfolios, our results indicate that relative performance on material sustainability issues neither create nor destroys value for shareholders.

The results from the value-weighted portfolios are shown in Panel B. It indicates that the companies that performs the best on material sustainability issues relative to their sector average have a monthly alpha of -0.03% while the low performers have a monthly alpha of -0.10% for both the quintile and quartile portfolios. This implies that the companies with high performance in material sustainability receive a 0.84% higher annualized alpha compared to the low performers. Although the results are insignificant, the positive annualized alpha indicates that material sustainability performance is value enhancing.

Table 8 shows the coefficients of the model when considering relative performance on immaterial sustainability issues. For the equal-weighted portfolios, the companies that performs the best on immaterial sustainability issues relative to their sector average have a monthly alpha of -0.20% while the low performers have a monthly alpha of -0.10% for both the quintile and quartile portfolios. The difference in the annualized alpha is -1.20% (p-value < 0.01), implying that relative performance on immaterial sustainability issues is negatively correlated with stock performance. For the value-weighted portfolios, the top performers have a monthly alpha of -0.10% while the low performers have a monthly alpha of -0.05% for both the quintile and quartile portfolios. The difference in the annualized alpha is -0.60% (p-value < 0.05), building up under the results from the equal-weighted portfolios. These results are in

line with the general definition of immateriality, i.e., financially immaterial sustainability issues will not have positive effects on the value assessment of the company (Jørgensen et al., 2021). Moreover, the results suggest that continuously investing in immaterial sustainability is value-destroying.

Table 7: Relative Material Sustainability Performance and Stock Performance

Panel A shows the monthly alpha for the value-weighted portfolios created based on performance on material sustainability investments, while panel B shows the value-weighted portfolios. The coefficients are marked with one, two or three asterisks, depending on whether it is significant at the 10%, 5% or 1% probability level, respectively.

Panel A: Equal Weighted Portfolios

	Quintile				Quartile			
	High performance		Low performance		High performance		Low performance	
Parameter	Estimate	t	Estimate	T	Estimate	t	Estimate	t
Alpha (Intercept)	-0.001	-4.599	-0.001	-4.599	-0.001	-2.258	-0.001	-5.444
Market	0.081	11.303	0.083	12.434	0.063	12.456	0.067	13.880
SMB	0.007	1.401	0.012	2.370	0.004	1.094	0.008	2.339
HML	-0.004	-0.951	-0.001	-0.234	-0.003	-0.934	-0.001	-0.448
UMD	-0.008	-1.365	0.012	2.150	0.010	-2.312	0.009	2.198
N	1,235		1,320		1,543		1,629	
Annualized Alpha	**-1.2%****		**-1.2%*****		**-1.2%****		**-1.2%*****	
Difference in Alphas	**0%****				**0%****			

Panel B: Value Weighted Portfolios

	Quintile				Quartile			
	High investments		Low investments		High investments		Low investments	
Parameter	Estimate	t	Estimate	t	Estimate	t	Estimate	t
Alpha (Intercept)	-0.0003	-0.706	-0.001	-1.624	-0.0003	-1.056	-0.001	-2.737
Market	0.086	8.837	0.061	6.954	0.067	9.279	0.050	8.289
SMB	0.001	0.196	0.004	0.561	-0.001	-0.160	0.004	1.032
HML	0.004	0.747	-0.007	-1.227	0.003	0.736	-0.006	-1.678
UMD	-0.001	-0.112	0.019	2.454	-0.003	-0.448	0.009	1.768
N	1,235		1,320		1,543		1,629	
Annualized Alpha	**-0.36%**		**-1.2%**		**-0.36%**		**-1.2%*****	
Difference in Alphas	**0.84%**				**0.84%**			

Table 8: Relative Immaterial Sustainability Performance and Stock Performance

Panel A shows the monthly alpha for the value-weighted portfolios created based on performance on immaterial sustainability investments, while panel B shows the value-weighted portfolios. The coefficients are marked with one, two or three asterisks, depending on whether it is significant at the 10%, 5% or 1% probability level, respectively.

Panel A: Equal Weighted Portfolios

	Quintile				Quartile			
	High investments		Low investments		High investments		Low investments	
Parameter	Estimate	t	Estimate	t	Estimate	t	Estimate	t
Alpha (Intercept)	-0.002	-5.331	-0.001	-3.875	-0.002	-7.035	-0.001	-3.875
Market	0.065	9.364	0.051	15.263	0.052	10.476	0.064	11.778
SMB	0.011	2.274	0.003	1.422	0.012	3.444	0.009	2.824
HML	-0.013	-3.188	0.004	1.883	-0.010	-3.234	-0.003	-1.174
UMD	-0.001	-0.209	0.003	1.184	-0.001	-0.134	-0.001	-0.151
N	1,229		2,115		1,616		1,536	
Annualized Alpha	**-2.4%*** **		**-1.2%*** **		**-2.4%*** **		**-1.2%*** **	
Difference in Alphas	**-1.2%*** **				**-1.2%*** **			

Panel B: Value Weighted Portfolios

	Quintile				Quartile			
	High investments		Low investments		High investments		Low investments	
Parameter	Estimate	t	Estimate	t	Estimate	t	Estimate	t
Alpha (Intercept)	-0.001	-2.628	-0.0005	-3.122	-0.001	-3.536	-0.0005	-2.122
Market	0.036	5.302	0.050	7.283	0.030	5.635	0.053	14.719
SMB	-0.002	-0.364	-0.002	-0.566	-0.001	-0.309	-0.002	-0.506
HML	-0.004	-1.065	0.004	1.382	-0.004	-1.252	0.004	2.320
UMD	0.010	1.660	0.010	2.320	0.007	1.630	0.00	2.320
N	1,229		2,115		1,541		2,115	
Annualized Alpha	**-1.2%*** **		**-0.6%** **		**-1.2%*** **		**-0.6%** **	
Difference in Alphas	**-0.6%** **				**-0.6%** **			

6. Discussion

The discussion is structured similarly to the results. We analyse the in light of available research, as the theory on the subject matter currently is limited.

In sum our results suggest that investments in sustainability do not create value, regardless of whether the investment is material or immaterial. However, being a sector leader in immateriality is associated with negative annualized abnormal return of 1.2% compared to the low performers (p-value < 0.01). Furthermore, the relationship between material sustainability performance and stock performance seems to be sector dependent. The sector portfolios achieve a difference in annualized abnormal return ranging from -2.40% (p-value < 0.01) for the Extractives & Mineral Processing sector to 3.60% (p-value < 0.01) for the Financial sector. A summary of the results is presented in Table 9.

Table 9: Summary of the results

Table 9 presents a summary of the results. The coefficients are marked with one, two or three asterisks, depending on whether it is significant at the 10%, 5% or 1% probability level, respectively.

Panel A: Difference in annualized alpha for the equal-weighted portfolios

	Sustainability Investments		Relative Performance	
	Quintile	Quartile	Quintile	Quartile
Materiality	0%***	0%***	0%**	0%**
Immateriality	0%***	0%***	-1.20%***	-1.20%***

Panel B: Difference in annualized alpha for the value-weighted portfolios

	Sustainability Investments		Relative Performance	
	Quintile	Quartile	Quintile	Quartile
Materiality	0%***	0%***	0.84%	0.84%
Immateriality	0%***	0%***	-0.60%**	-0.60%**

Panel C: Difference in annualized alpha for the sector specific results

	Extractives & Mineral Processing	Financial	Transportation	Food & Beverage	Technology & Communication
Materiality	-2.40%***	3.60%***	8.04%	-1.20%	8.40%
Immateriality	-1.2%***	0%**	4.80%***	2.40%	3.60%

6.1 Are material sustainable investments value-enhancing for the shareholders of the companies listed on Oslo Stock Exchange?

The results differ from the research conducted by Khan et al. (2016), which found that investments in materiality lead to abnormal return regardless of sector. They were the first researchers to address materiality and argue that the abnormal returns resulted from the concept of materiality not being available to investors yet. In the aftermath of this study, the concept has received more attention and it is plausible that it has been implemented in investment strategies to a greater extent. This argument is strengthened when examining the average materiality and immateriality score for the sample in this thesis, shown in Figure 4. It presents a clear turning point for both the materiality and the immateriality scores between 2015 and 2016, suggesting a shift in focus from immaterial to material sustainability issues across all sectors. The increasing trend in materiality is persistent through the years after 2016, even though there are no regulations in place. This indicates that all sectors in our sample are self-regulating their sustainability efforts.

Furthermore, there has been an increase in the availability and use of material ESG metrics in recent years. More information regarding sustainability allows the market to correctly price the stock (Bodie et al., 2018). Uthaug and Kårstad (2022) investigated the relationship between material ESG performance and stock performance on OSE using textual analysis, and their results show negative abnormal returns for top performers before 2014, and no significant abnormal returns after 2014. They argue that the market has mispriced ESG companies, and that a learning effect has led to ESG companies being correctly priced in recent years. This coincides with our results and indicate that it is not possible to attain abnormal returns by investing in sustainability anymore, regardless of the investments being financially material or not. However, it is important to emphasize that the investments do not destroy the companies' value either. It is argued that sustainable investments and innovation are crucial for companies to be able to be profitable in the future, because companies that do not adapt to the change towards sustainability will not survive in the long-term (Jørgensen et al., 2021).

6.2 *Does the relationship between material sustainable investment and financial performance vary between the different sectors on Oslo Stock Exchange?*

Studying the sector-specific sustainability portfolios, our results suggests that the relationship between material sustainability performance and stock performance differs greatly between sectors. For the Extractives & Mineral Processing sector, investments in material sustainability issues are associated with a difference in annualized abnormal return of -2.40% (p-value < 0.01), while in the Financial sector it is associated with a difference in annualized abnormal return of 3.6% (p-value < 0.01). These results coincide with Shanaev & Ghimire (2021) and Kumar et al. (2016), who both find that different industries are affected differently by ESG factors.

Kumar et al. (2016) argues that the ESG companies have a lower average volatility than non-ESG companies. Additionally, Shanaev & Ghimire (2021) argue that the difference between industries is related to the differences in stakeholder pressure and demand for transparency and compliance, which causes some industries to face more public scrutiny. By using SASB's materiality finder for the different industries, we base the sustainability performance of the companies only on the issues considered relevant to investors. The number of material issues for the sectors used in this thesis, distributed on environmental (E), social (S) and governance (G) issues, is displayed in Table 9. The number of material social issues is mostly the same for most of the sectors, while the number of material environmental issues vary a lot between the sectors. Governance issues are regulated and considered to a similar extent by all companies on OSE (Regnskapsloven, 2022). Furthermore, considering that we only study Norwegian companies, the social issues are not as critical as it would be in some other countries. In Norway we are barely exposed to human right violations in domestic operations, and all companies need to comply with The Working Environment Act[9] and the Transparency Act which ensures reasonable performance on many social aspects for most companies. Furthermore, the Transparency Act requires companies to report on decent working conditions

[9] The Working Environment Act's ("Arbeidsmiljøloven") purpose is to ensure safe working conditions and equal treatment among workers, and to ensure that the working environment forms a basis for a health-promoting and meaningful work situation (Regjeringen.no, 2008). The Working Environment Act applies to all employees, with the exception of seafaring and fisheries, which are regulated by separate regulations.

in their own operations, their supply chain and other business relationships (Forbrukertilsynet, 2022).

Thus, we argue that the environmental issues are the issues most likely to impact the perception of how sustainable a company is. Based on the two sectors with significant results, E&MP have the most material environmental issues and experience a negative annualized alpha. In contrast, the Financial sector do not have any material environmental issues and experience a positive annualized alpha. We argue that this difference is due to the stakeholder pressure being more apparent in industries with great environmental concerns, e.g., greater concerns for global warming than for labour rights. Therefore, some industries are not perceived as sustainable, regardless of their efforts. E.g., it is difficult for an oil and gas company to be perceived as fully sustainable.

Table 9: Number of Material Issues

Table 9 shows the number of material issues for the sectors used in this thesis, distributed on environmental (E), social (S) and governance (G) and the difference in the annualized alpha for the top and bottom performers on materiality in the different sectors.

Sector	# Material issues[10]				Diff. in annualized alpha
	Total	E	S	G	
Extractives & Mineral Processing	10	5	2	3	-2.40%***
Food & Beverage	10	5	3	2	-1.20%
Technology & Communication	6	2	2	2	8.40%
Transportation	6	3	1	2	8.04%
Financials	5	0	2	3	3.60%***

Furthermore, both Nardi et al. (2021) and Consolandi et al. (2020) claim that having too many material issues is not credible. The E&MP sector have an average of 10 material issues, according to SASB, while the Financial sector only have 5 out of the total 26 issues. The number of material issues and the difference in the annualized alpha for the top and bottom performers on materiality in the different sectors are displayed in Table 9. F&B and E&MP are the two sectors with the highest number of material issues, and the results show that

[10] SASB disclose industry-based standards. Since this thesis considers sectors, we use the average of each industry within a sector to calculate the material issues in each sector.

material sustainability investments for these two sectors is associated with a negative annualized alpha. We argue that a higher number of material issues increases the complexity of a company's sustainability efforts and can decrease the credibility of the sustainability information. However, increased regulation and understanding of materiality can limit these effects in the future.

6.3 *Is the abnormal return obtained dependent on the sustainability performance relative to the sector average?*

When examining the effect of relative sustainability performance on stock performance, our results indicate that the relative material sustainability performance does not create value for shareholders. However, the results implies that a strong performance on immaterial sustainability issues destroys value for shareholders.

Nardi et al. (2021) find that the value-creating potential of a sustainability strategy increases when a company is able to attain a unique and valuable position within its industry. This implies that the abnormal return obtained by investing in sustainability is dependent on the sustainability performance relative to the sector average. In contrast, our results indicate that the relative material sustainability performance neither creates nor destroys value for shareholders, while a strong performance on immaterial sustainability issues destroys value for shareholders. In our sample most companies perform well on sustainability and therefore achieve a similar sustainability score based on our materiality index. Furthermore, we consider Norwegian companies, which are frontrunners when it comes to sustainability (Acciona, 2021). We claim that the strong focus on sustainability in Norway creates higher expectations from stakeholders. With such a solid overall performance, we argue that companies are not rewarded for superior performance, but rather penalized for bad performance.

Correspondingly, considering the Pathway to Materiality framework by Freiberg et al. (2020), our results show a contrary effect of what is described in the framework. The material issues examined in this thesis have either reached the Company and Industry Response or the Regulatory Response and Innovation step. At this point the issues are of significance to all stakeholders in the industry but not necessarily regulated. According to the theory, the companies either have to capture the benefit before the issue becomes material for the whole industry or outperform everyone else after, in order for the companies to see positive price reactions based on sustainability performance. However, both scenarios are difficult to achieve

in Norway because most companies have already taken materiality into consideration to a certain extent (Position Green, 2022). We find that companies outperforming on material issues are not able to obtain positive price reactions. However, our results indicate that companies who invest broader in sustainability issues and also prioritise immaterial issues, i.e., non-relevant issues, may experience negative price reactions.

6.4 Future implications

For the time period considered in this thesis, sustainability reporting is mostly voluntary. Thus, there is a risk for strategic reporting. According to Position Green's assessment of sustainability reporting on OSE, 80% of the top 100 companies have meaningful reporting on materiality (Position Green, 2022). When all companies are good at reporting and report only what they find relevant, it will become difficult for investors to differentiate between companies. This is further strengthened by the divergence of different ESG rating providers. This can make it problematic to obtain financial gains based on sustainability performance. However, from the financial year 2024 the Corporate Sustainability Reporting Directive (CSRD) will take effect, which includes a requirement of ESG assurance (PwC, 2022). We argue that the future sustainability reporting regulations and ESG assurance will increase the credibility of the sustainability information. This could help investors distinguish between superior and inferior sustainability performers and lead the market to correctly price companies' sustainability efforts.

7. Conclusion

We investigate whether companies that perform well on material sustainability issues in the period between 2013 - 2021 have outperformed in terms of abnormal returns. The portfolios are constructed based on companies with high (low) investments on materiality and immateriality each year and consider both yearly investments on OSE and sector level, as well as relative performance. We perform the analysis with the main research question being:

Are material sustainable investments value-enhancing for the shareholders

of the companies listed on Oslo Stock Exchange?

The portfolios are created based on the residuals from regression models regressing the changes in (im)materiality scores based on several financial measures, and sector and year specific fixed effects in an attempt to isolate the unexpected level of sustainability investments. To address whether the abnormal return is dependent on the relative sustainability performance, we create portfolios based on the companies' relative performance only. We measure the excess return against the Fama French four-factor model to see if the portfolios achieve abnormal returns that cannot be explained by the risk factors.

The results suggests that for sustainability investments, no significant abnormal returns are present in the period 2013 - 2021, regardless of the investments being material or immaterial. When considering the effect of relative sustainability performance on stock performance, our results indicate that the relative material sustainability performance does not create value for shareholders. However, the results implies that a strong performance on immaterial sustainability issues is associated with negative abnormal return. We therefore argue that materiality matters in the sense that continuous investments in immateriality is value-destroying. Furthermore, our results suggests that the relationship between material sustainability performance and stock performance differs greatly between sectors. We argue that sectors are affected differently by sustainability factors, due to varying stakeholder pressure and a difference in material issues.

To summarize, we claim that sustainability investment neither create nor destroys value, while being a sector leader in the immaterial issues could have considerable negative value implications. The results suggests that the non-financial accounting standards used in Norway are successful in separating material and immaterial issues for investments purposes, and thereby emphasize the importance of knowing which sustainability issues to prioritize.

8. Limitations and Extentions

We constructed a materiality index based on the framework developed by Khan et al. (2016). To categorize all companies in different sectors and industries we used the SASB materiality finder. By using this approach we avoided discretionary assessments as much as possible. Out of the 93 companies in our sample, only three do not belong to a SASB category. Further, the portfolios we constructed are based on the materiality and immateriality score that we calculated in accordance with the same characteristics as relevant literature. As a quality measure, each researcher assesses every sector and all the belonging industries individually before the two assessments are compared. This is done to avoid any bias that occurs as a result of the discretionary assessments. As mentioned earlier, several subsequent studies replicated the materiality index and portfolio construction of the renowned research by Khan et al. (2016).

8.1 Limitations

An evident weakness in the thesis is the relatively limited sample obtained. However, we argue it is reasonable considering the size of the population. To be able to collect ESG data from MSCI, public information regarding ESG performance must be available for the given company. ESG reporting is still evolving, and many of the smaller publicly listed companies on OSE do not report sufficiently yet. Additionally, we had to exclude all companies who published their first sustainability report in 2021, as we used the residuals of the change in the Materiality and Immateriality score to isolate the unexpected level of a sustainability investment to construct the portfolios. Due to the importance of obtaining historical stock returns and financial data, the sample is also limited to only public companies.

The findings in this thesis are based on OSE, and it can be challenging to generalize our key takeaways to other markets. Firstly, the findings are based on Norwegian annual and sustainability reports which are a result of Norwegian regulations and norms. Other markets may be exposed to different regulations and norms, as there does not exist a common global reporting standard yet. Secondly, the mechanisms within ESG are under constant development and can therefore vary from period to period, and also between markets depending on how far the integration of ESG has come.

Further, Dorfleitner, Halbritter & Nguyen (2015) argue that the inconsistent results concerning the relation between materiality and financial performance stem from researchers relying on ESG scores from different providers. Their analysis considers all ESG dimensions, including ESG risk, and they find a low convergence of the methodologies used by the different providers. According to Brandon, Krueger & Schmidt (2021), established ESG scores generally have a low correlation, especially on the social and governance pillars. They find an average correlation of 0.45 between 7 different score providers when examining the total score, and only a correlation of 0.155 when looking at the governance pillar.

Brandon, Krueger & Schmidt (2021) found that stock returns are positively related to ESG disagreements, with a risk premium for companies with higher ESG disagreements as this can be perceived as an uncertainty. In fact, the informational value of ESG ratings have been actively debated. The divergence of ESG ratings from competing agencies make the usability in investment strategies and stock screening limited. Further, companies that are subject to ESG ratings might manipulate reporting practices to appear more ethical and attractive to socially responsible investors (Shanaev & Ghimire, 2021). Conclusively, we argue that our findings are subject to weak external validity, mostly based on uncertainties regarding ESG and not the methodological choices.

8.2 Extensions

To further investigate the relation between material investments and financial performance it would be interesting to additionally include material issues based on GRI. By including both material issues from SASB and GRI, the issues covers financial, environmental, and social materiality which is also known as double materiality (Jørgensen et al., 2021). As sustainability reporting evolves, double materiality is gradually taken more into consideration by the companies. In addition, it would also be interesting to recreate this analysis when it is possible to obtain MSCI data from a greater number of publicly listed companies in Norway to increase the size of the sample. We argue that the future sustainability reporting regulations and ESG assurance will increase the credibility of the sustainability information, which could also increase validity of the results.

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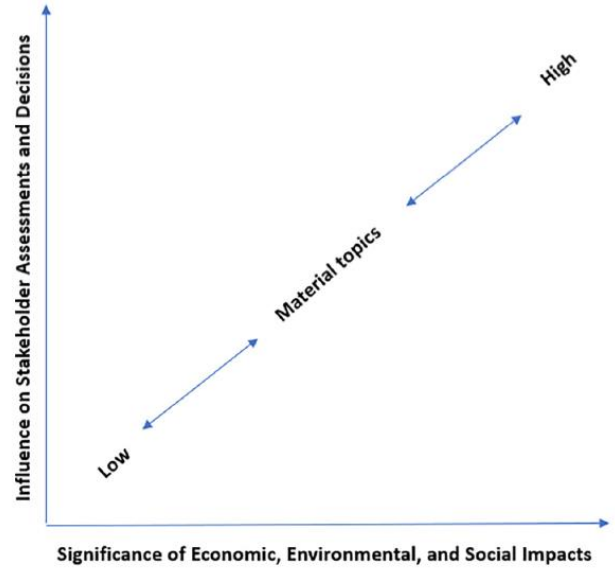
Appendix

Appendix A – Materiality matrices

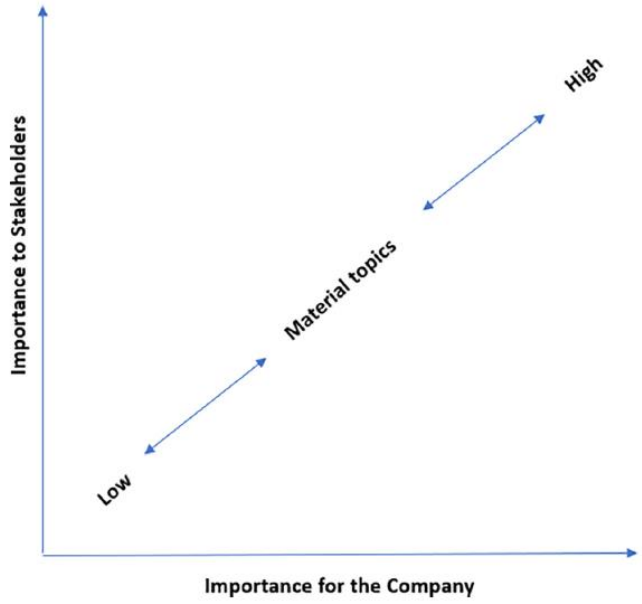
Figure 6: GRI and SASB Materiality Matrices

Figure 6 shows an illustration of the materiality matrices based on the GRI and SASB definitions of materiality respectively.

Panel A: Materiality Matrix based on GRI's definition. Retrieved from Jørgensen et al. (2021), p.5.



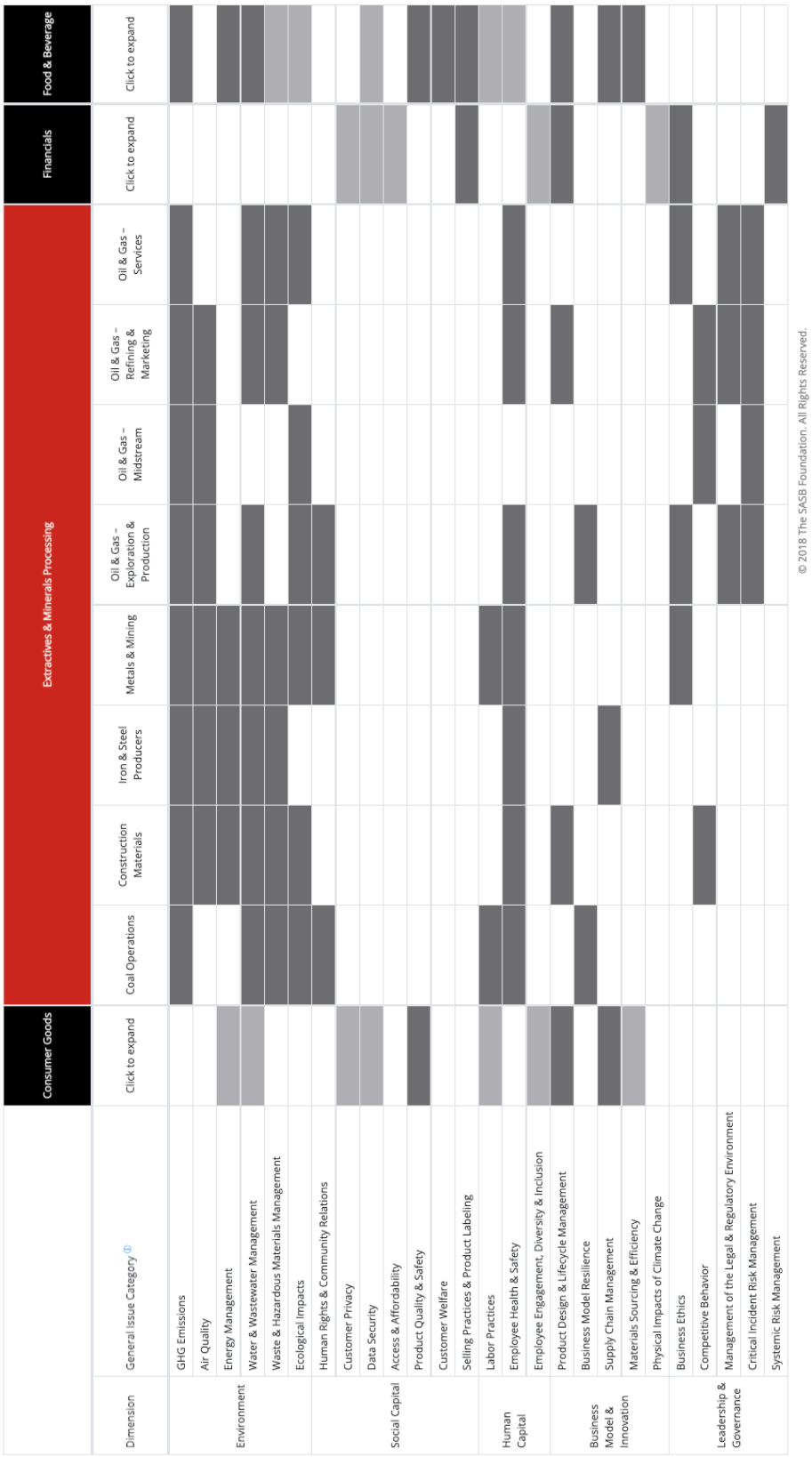
Panel B: Materiality Matrix based on SASB's dimensions. Retrieved from Jørgensen et al. (2021), p.5.



Appendix B – Materiality map

Figure 7: Materiality Map

Screenshot of SASB's materiality map. Retrieved from https://www.sasb.org/wp-content/uploads/2021/11/MMap-2021.png



Appendix C – Summary statistics

Table 10: Summary Statistics

Table 10 presents the summary statistics for the thesis sample. Panel A presents a summary of the financial data retrieved from Bloomberg and Panel B presents the summary of the sustainability scores created using MSCI and SASB. Market Cap is the market capitalization at the end of the year. Financial leverage is the long-term debt plus current debt over the total assets. Price-to-book is the market value at the end of the year over the book value of equity. ROA is income before extraordinary items over the total assets.

Panel A: Summary Statistics for Sample

	Mean	Median	St. dev.	Q1	Q3	Nr obs
Market Cap (in M)	15,696.46	4,393.82	24,469.97	825.90	15,528.47	529.00
Leverage	3.82	2.51	3.75	1.84	3.91	529.00
Price to Book	3.00	1.64	5.69	0.77	3.66	529.00
ROA	-0.02	0.01	0.21	-0.03	0.06	529.00
ΔMarket Cap	0.14	0.02	0.45	-0.12	0.37	529.00
ΔLeverage	0.02	0.00	0.12	-0.04	0.08	529.00
ΔPrice to Book	0.09	0.00	0.38	-0.15	0.28	529.00
ΔROA	0.00	0.00	0.07	-0.03	0.02	529.00

Panel B: Summary Statistics for Sustainability Scores

	Mean	Median	St. dev.	Q1	Q3	Nr obs
Materiality	1.86	2.00	4.17	-1.00	4.00	529.00
Immateriality	1.87	1.00	6.17	-2.00	7.00	529.00
ΔMateriality	0.84	0.00	1.93	0.00	2.00	529.00
ΔImmateriality	-1.28	0.00	2.71	-2.00	0.00	529.00

Appendix D – Regression model outputs

Table 11: Regression model outputs for Sustainability Investments

Panel A: Material Sustainability Investments (equal-weighted portfolios)

	Dependent variable:					
	Risk Premium					
	(1)	(2)	(3)	(4)	(5)	(6)
OSEAX	0.074***	0.075***	0.065***	0.060***	0.047***	0.050***
	t = 10.448	t = 10.468	t = 12.666	t = 11.746	t = 14.021	t = 15.032
SMB	0.013**	0.010***	0.013***	0.009**	0.008***	0.006***
	t = 2.500	t = 2.012	t = 3.451	t = 2.520	t = 3.323	t = 2.685
HML	0.0001	-0.002	-0.003	-0.003	-0.002	-0.003
	t = 0.015	t = -0.437	t = -0.885	t = -1.043	t = -0.903	t = -1.508
UMD	-0.001	-0.008	0.001	-0.009**	-0.003	-0.003
	t = -0.200	t = -1.313	t = 0.317	t = -2.000	t = -1.155	t = -1.052
Constant	-0.001***	-0.001***	-0.001**	-0.001***	-0.001***	-0.001***
	t = -2.851	t = -2.041	t = -4.332	t = -3.389	t = -5.943	t = -6.015
Group	High	Low	High	Low	High	Low
Portfolio size	Quintile	Quintile	Quartile	Quartile	Tercile	Tercile
Observations	1,224	1,320	1,536	1,620	2,084	2,148
Note:						* p < 0.1; ** p < 0.05; *** p < 0.01

Panel B: Material Sustainability Investments (value-weighted portfolios)

	Dependent variable:					
	Risk Premium					
	(1)	(2)	(3)	(4)	(5)	(6)
OSEAX	0.055***	0.057***	0.047***	0.051***	0.036***	0.044***
	t = 5.415	t = 6.976	t = 6.232	t = 8.416	t = 7.130	t = 10.349
SMB	0.013*	0.002	0.009	0.001	0.007*	0.0002
	t = 1.837	t = 0.382	t = 1.606	t = 0.222	t = 1.867	t = 0.064
HML	-0.005	-0.005	-0.004	-0.004	-0.005*	-0.002
	t = -0.741	t = -0.998	t = -0.848	t = -1.207	t = -1.679	t = -0.828
UMD	-0.002	0.004	0.007	0.002	0.003	-0.0004
	t = -0.192	t = 0.596	t = 1.116	t = 0.449	t = 0.789	t = -0.109
Constant	-0.00001	-0.0004	-0.0005	-0.001**	-0.001***	-0.001***
	t = -0.033	t = -1.217	t = -1.367	t = -2.101	t = -2.905	t = -3.244
Group	High	Low	High	Low	High	Low
Portfolio size	Quintile	Quintile	Quartile	Quartile	Tercile	Tercile
Observations	1,234	1,320	1,536	1,620	2,084	2,148
Note:						* p < 0.1; ** p < 0.05; *** p < 0.01

Panel C: Immaterial Sustainability Investments (equal-weighted portfolios)

	Dependent variable:					
	Risk Premium					
	(1)	(2)	(3)	(4)	(5)	(6)
OSEAX	0.068***	0.081***	0.055***	0.064***	0.045***	0.050***
	t = 10.878	t = 10.562	t = 11.778	t = 11.596	t = 14.564	t = 12.763
SMB	0.009**	0.010*	0.009***	0.008**	0.007***	0.005**
	t = 2.074	t = 1.772	t = 2.824	t = 2.178	t = 3.165	t = 2.176
HML	-0.003	-0.002	-0.003	-0.005	-0.003*	-0.002
	t = -0.889	t = -0.528	t = -1.174	t = -1.466	t = -1.882	t = -1.180
UMD	-0.002	0.006	-0.001	-0.002	-0.003	0.0005
	t = -0.461	t = 0.891	t = -0.151	t = -0.426	t = -1.002	t = 0.171
Constant	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	t = -3.606	t = -2.942	t = -4.860	t = -4.339	t = -6.667	t = -6.880
Group	High	Low	High	Low	High	Low
Portfolio size	Quintile	Quintile	Quartile	Quartile	Tercile	Tercile
Observations	1,320	1,224	1,616	1,536	2,144	2,085
Note:						* p < 0.1; ** p < 0.05; *** p < 0.01

Panel D: Immaterial Sustainability Investments (value-weighted portfolios)

	Dependent variable:					
	Risk Premium					
	(1)	(2)	(3)	(4)	(5)	(6)
OSEAX	0.052***	0.070***	0.042***	0.054***	0.035***	0.046***
	t = 6.419	t = 8.206	t = 7.097	t = 8.745	t = 9.259	t = 10.623
SMB	-0.001	-0.010*	0.001	-0.007*	0.002	-0.005
	t = -0.174	t = -1.707	t = 0.145	t = -1.690	t = 0.671	t = -1.504
HML	-0.001	0.008	-0.003	0.003	-0.004	0.002
	t = -0.157	t = 1.515	t = -0.773	t = 0.779	t = -1.579	t = 0.772
UMD	0.004	0.011	0.007	0.005	0.006*	0.006*
	t = 0.549	t = 1.565	t = 1.326	t = 0.864	t = 1.693	t = 1.733
Constant	-0.0004	-0.001	-0.001**	-0.001**	-0.001***	-0.001***
	t = -1.237	t = -1.336	t = -2.254	t = -2.526	t = -4.174	t = -3.534
Group	High	Low	High	Low	High	Low
Portfolio size	Quintile	Quintile	Quartile	Quartile	Tercile	Tercile
Observations	1,320	1,224	1,616	1,536	2,144	2,085
Note:						* p < 0.1; ** p < 0.05; *** p < 0.01

Table 12: Regression model outputs for Sustainability Investments by Sector – FF3F

Panel A: Material Sustainability Investments by Sector (equal-weighted portfolios)

	Dependent variable:									
	Risk Premium									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
OSEAX	0.559***	0.396***	0.284***	0.339***	0.598***	0.358***	0.377***	0.207***	0.307**	0.338***
	t = 13.266	t = 11.973	t = 4.795	t = 9.856	t = 8.891	t = 6.233	t = 4.022	t = 3.577	t = 2.507	t = 3.068
SMB	0.086***	0.059**	-0.036	0.029	0.032	0.083*	-0.069	-0.053	0.253**	0.214**
	t = 2.614	t = 2.273	t = -0.777	t = 1.023	t = 0.599	t = 1.722	t = -0.863	t = -1.131	t = 2.581	t = 2.449
HML	0.008	0.016	0.053	0.020	0.032	0.001	-0.019	-0.052	-0.161**	-0.283***
	t = 0.284	t = 0.743	t = 1.358	t = 0.860	t = 0.738	t = 0.034	t = -0.286	t = -1.362	t = 2.023	t = 3.900
Constant	-0.006***	-0.004***	0.006**	0.003*	-0.0003	-0.007***	0.006	0.007***	-0.003	-0.010**
	t = -2.907	t = -2.954	t = 2.105	t = 1.756	t = -0.106	t = -2.870	t = 1.419	t = 2.639	t = -0.489	t = -1.971
Group	High	Low	High	Low	High	Low	High	Low	High	Low
Sector	E&MP	E&MP	Financial	Financial	Transp.	Transp.	F&B	F&B	T&C	T&C
Observations	360	456	216	300	312	384	204	240	252	288

Note: * p < 0.1; ** p < 0.05; *** p < 0.01

Panel B: Immaterial Sustainability Investments by Sector (equal-weighted portfolios)

	Dependent variable:									
	Risk Premium									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
OSEAX	0.479***	0.494***	0.475***	0.291***	0.584***	0.373***	0.210***	0.349***	0.366***	0.467***
	t = 35.114	t = 15.602	t = 24.185	t = 8.902	t = 31.491	t = 7.212	t = 8.040	t = 6.064	t = 11.121	t = 4.261
SMB	0.067***	0.069**	0.027*	-0.004	0.075***	0.072*	-0.078***	-0.054	0.204***	0.386***
	t = 6.296	t = 2.762	t = 1.746	t = -0.161	t = 5.060	t = 1.651	t = -3.492	t = -1.166	t = 7.745	t = 4.438
HML	0.016*	0.011	0.014	0.049**	0.011	0.017	-0.063***	0.007	-0.192***	-0.318***
	t = 1.752	t = 0.538	t = 1.081	t = 2.244	t = 0.913	t = 0.489	t = -3.485	t = 0.198	t = -8.937	t = -4.396
Constant	-0.006***	-0.005***	0.003***	0.003**	-0.003***	-0.007***	0.006***	0.004	-0.004**	-0.007
	t = -9.887	t = -3.618	t = 2.891	t = 2.301	t = -4.099	t = -2.908	t = 4.973	t = 1.579	t = -2.345	t = -1.423
Group	High	Low	High	Low	High	Low	High	Low	High	Low
Sector	E&MP	E&MP	Financial	Financial	Transp.	Transp.	F&B	F&B	T&C	T&C
Observations	360	456	216	300	312	384	204	240	252	288

Note: * p < 0.1; ** p < 0.05; *** p < 0.01

Table 13: Regression model outputs for Sustainability Investments by Sector – FF4F

Panel A: Material Sustainability Investments by Sector (equal-weighted portfolios)

	Dependent variable:									
	Risk Premium									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
OSEAX	0.504***	0.308***	0.304***	0.373***	0.547***	0.296***	0.474***	0.243***	0.392**	0.367***
	t = 10.597	t = 8.417	t = 4.522	t = 9.681	t = 7.419	t = 4.694	t = 4.497	t = 3.760	t = 2.779	t = 2.938
SMB	0.081**	0.052**	-0.035	0.034	0.022	0.069	-0.054	-0.050	0.253**	0.216**
	t = 2.490	t = 2.042	t = -0.743	t = 1.189	t = 0.404	t = 1.429	t = -0.681	t = -1.072	t = 2.581	t = 2.463
HML	-0.006	-0.008	0.059	0.029	0.018	-0.018	0.015	-0.041	-0.133	-0.275***
	t = -0.232	t = -0.353	t = 1.464	t = 1.251	t = 0.422	t = -0.457	t = 0.219	t = -1.058	t = -1.600	t = -3.665
UMD	-0.098**	-0.158**	0.037	0.063*	-0.102*	-0.122**	0.179*	0.069	0.150	0.053
	t = -2.426	t = -5.109	t = 0.640	t = 1.916	t = -1.681	t = -2.297	t = 1.961	t = 1.247	t = 1.210	t = 0.492
Constant	-0.003	-0.001	0.005	0.001	0.002	-0.004	0.002	0.005*	-0.006	-0.011**
	t = -1.563	t = -0.493	t = 1.628	t = 0.730	t = 0.670	t = -1.566	t = 0.454	t = 1.887	t = -0.932	t = -1.997
Group	High	Low	High	Low	High	Low	High	Low	High	Low
Sector	E&MP	E&MP	Financial	Financial	Transp.	Transp.	F&B	F&B	T&C	T&C
Observations	360	456	216	300	312	384	204	240	252	288

Note: * p < 0.1; ** p < 0.05; *** p < 0.01

Panel B: Immaterial Sustainability Investments by Sector (equal-weighted portfolios)

	Dependent variable:									
	Risk Premium									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
OSEAX	0.411***	0.425***	0.524***	0.315***	0.524***	0.310***	0.294***	0.404***	0.429***	0.515***
	t = 7.674	t = 12.025	t = 6.750	t = 8.573	t = 7.411	t = 5.448	t = 2.847	t = 6.319	t = 3.229	t = 4.151
SMB	0.061*	0.063**	0.031	-0.001	0.063	0.058	-0.065	-0.050	0.204**	0.389***
	t = 1.668	t = 2.571	t = 0.568	t = -0.039	t = 1.213	t = 1.331	t = -0.838	t = -1.080	t = 2.211	t = 4.465
HML	-0.002	-0.007	0.028	0.056**	-0.005	-0.004	-0.035	0.024	-0.171**	-0.303***
	t = -0.069	t = -0.356	t = 0.603	t = 2.495	t = -0.119	t = -0.107	t = -0.534	t = 0.617	t = -2.180	t = -4.069
UMD	-0.122***	-0.124***	0.090	0.044	-0.120**	-0.124**	0.153*	0.106*	0.111	0.089
	t = -2.681	t = 4.146	t = 1.351	t = 1.406	t =2.070	t = -2.582	t = 1.717	t = 1.936	t = 0.955	t = 0.829
Constant	-0.003	-0.002	0.001	0.002	-0.0003	-0.004	0.003	0.002	-0.006	-0.009
	t = -1.394	t = -1.497	t = 0.173	t = 1.441	t = -0.113	t = -1.491	t = 0.559	t = 0.642	t = -0.996	t = -1.638
Group	High	Low	High	Low	High	Low	High	Low	High	Low
Sector	E&MP	E&MP	Financial	Financial	Transp.	Transp.	F&B	F&B	T&C	T&C
Observations	360	456	216	300	312	384	204	240	252	288

Note: * p < 0.1; ** p < 0.05; *** p < 0.01

Table 14: Regression model outputs for Relative Sustainability Performance

Panel A: Relative Performance on Material Sustainability (equal-weighted portfolios)

	Dependent variable:					
	Risk Premium					
	(1)	(2)	(3)	(4)	(5)	(6)
OSEAX	0.081***	0.083***	0.063***	0.067***	0.046***	0.048***
	t = 11.303	t = 12.434	t = 12.456	t = 13.880	t = 14.436	t = 14.899
SMB	0.007	0.012**	0.004	0.008**	0.003	0.007***
	t = 1.401	t = 2.370	t = 1.094	t = 2.339	t = 1.286	t = 3.130
HML	-0.004	-0.001	-0.003	-0.001	-0.001	-0.002
	t = -0.951	t = -0.234	t = -0.934	t = -0.448	t = -0.728	t = -1.082
UMD	-0.008	0.012**	-0.010**	0.009**	-0.005*	0.003
	t = -1.365	t = 2.150	t = -2.312	t = 2.189	t = -1.930	t = 1.201
Constant	-0.001***	-0.001***	-0.001**	-0.001***	-0.001***	-0.001***
	t = -4.599	t = -4.599	t = -2.258	t = -5.444	t = -5.368	t = -6.749
Group	High	Low	High	Low	High	Low
Portfolio size	Quintile	Quintile	Quartile	Quartile	Tercile	Tercile
Observations	1,235	1,320	1,543	1,629	2,088	2,133
Note:						* p < 0.1; ** p < 0.05; *** p < 0.01

Panel B: Relative Performance on Material Sustainability (value-weighted portfolios)

	Dependent variable:					
	Risk Premium					
	(1)	(2)	(3)	(4)	(5)	(6)
OSEAX	0.086***	0.061***	0.067***	0.050***	0.049***	0.030***
	t = 8.837	t = 6.954	t = 9.279	t = 8.289	t = 10.240	t = 7.765
SMB	0.001	0.004	-0.001	0.004	-0.001	0.003
	t = 0.196	t = 0.561	t = -0.160	t = 1.032	t = -0.226	t = 1.180
HML	0.004	-0.007	0.003	-0.006*	0.003	-0.005**
	t = 0.747	t = -1.227	t = 0.736	t = -1.687	t = 1.087	t = -2.144
UMD	-0.001	0.019**	-0.003	0.009*	0.001	0.005
	t = -0.112	t = 2.454	t = -0.448	t = 1.768	t = 0.188	t = 1.608
Constant	-0.0003	-0.001	-0.0003	-0.001***	-0.0004**	-0.001***
	t = -0.706	t = -1.624	t = -1.056	t = -2.737	t = -2.079	t = -4.126
Group	High	Low	High	Low	High	Low
Portfolio size	Quintile	Quintile	Quartile	Quartile	Tercile	Tercile
Observations	1,235	1,320	1,543	1,629	2,088	2,133
Note:						* p < 0.1; ** p < 0.05; *** p < 0.01

Panel C: Relative Performance on Immaterial Sustainability (equal-weighted portfolios)

	Dependent variable:					
	Risk Premium					
	(1)	(2)	(3)	(4)	(5)	(6)
OSEAX	0.065***	0.051***	0.052***	0.064***	0.038***	0.050***
	t = 9.364	t = 15.263	t = 10.476	t = 11.778	t = 11.999	t = 12.763
SMB	0.011**	0.003	0.012***	0.009	0.010***	0.003
	t = 2.274	t = 1.422	t = 3.444	t = 2.824	t = 4.206	t = 1.222
HML	-0.013***	0.004*	-0.010***	-0.003	-0.007***	0.006*
	t = -3.188	t = 1.883	t = -3.234	t = -1.174	t = -3.610	t = 1.783
UMD	-0.001	0.003	-0.001	-0.001	-0.001	0.004
	t = -0.209	t = 1.184	t = -0.134	t = -0.151	t = -0.504	t = 1.324
Constant	-0.002***	-0.001***	-0.002***	-0.001***	-0.001***	-0.001***
	t = -5.331	t = -3.875	t = -7.035	t = -3.875	t = -8.366	t = -3.833
Group	High	Low	High	Low	High	Low
Portfolio size	Quintile	Quintile	Quartile	Quartile	Tercile	Tercile
Observations	1,229	2,115	1,541	2,115	2,093	2,115
Note:						* p < 0.1; ** p < 0.05; *** p < 0.01

Panel D: Relative Performance on Immaterial Sustainability (value-weighted portfolios)

	Dependent variable:					
	Risk Premium					
	(1)	(2)	(3)	(4)	(5)	(6)
OSEAX	0.036***	0.050***	0.030***	0.053***	0.026***	0.045***
	t = 5.302	t = 7.283	t = 5.635	t = 14.719	t = 7.000	t = 10.279
SMB	-0.002	-0.002	-0.001	-0.002	-0.0003	-0.002
	t = -0.364	t = -0.566	t = -0.309	t = -0.506	t = -0.113	t = -0.704
HML	-0.004	0.004	-0.004	0.004	-0.005**	0.003
	t = -1.065	t = 1.382	t = -1.252	t = 2.332	t = -2.176	t = 1.361
UMD	-0.010*	0.010**	0.007	0.009**	0.005*	0.011**
	t = 1.660	t = 2.320	t = 1.630	t = 2.320	t = 1.736	t = 1.184
Constant	-0.001***	-0.0005**	-0.001***	-0.0005**	-0.001***	-0.0007***
	t = -2.628	t = -3.122	t = -3.536	t = -2.122	t = -4.938	t = -3.011
Group	High	Low	High	Low	High	Low
Portfolio size	Quintile	Quintile	Quartile	Quartile	Tercile	Tercile
Observations	1,229	2,115	1,541	2,115	2,093	2,115
Note:						* p < 0.1; ** p < 0.05; *** p < 0.01

Appendix E – Robustness tests

Table 15: Breusch-Pagan test for heteroskedasticity

Table 15 shows the p-value from the Breusch-Pagan test conducted for each of the regressions. A p-value above the 5% significance level suggests that the null hypothesis is rejected, and that there is no evidence of heteroskedasticity. Panel A shows the results from the regressions on OSE as a whole, Panel B shows the results for the relative performance regression models, and Panel C shows the results of the tests conducted on the regressions on sector level.

Panel A: Sustainability Investments

		Equal-weighted portfolios			Value-weighted portfolios		
		Tercile	Quartile	Quintile	Tercile	Quartile	Quintile
Materiality	High	5.3513 (0.2531)	4.2186 (0.3772)	6.2456 (0.1815)	3.8763 (0.423)	3.0345 (0.5521)	6.6866 (0.1534)
	Low	3.8236 (0.4304)	3.8004 (0.4337)	4.1912 (0.3808)	1.8421 (0.7648)	2.9152 (0.5721)	3.7268 (0.4442)
Immateriality	High	13.162 (0.0105)	8.6500 (0.0705)	9.7538 (0.0448)	2.8691 (0.5800)	2.7277 (0.6044)	3.8921 (0.4208)
	Low	4.8406 (0.3040)	5.527 (0.2374)	4.5606 (0.3354)	3.5474 (0.4707)	0.7590 (0.9439)	0.8071 (0.9375)

Panel B: Relative Sustainability Performance

		Equal-weighted portfolios			Value-weighted portfolios		
		Tercile	Quartile	Quintile	Tercile	Quartile	Quintile
Materiality	Top	5.399 (0.2488)	8.3449 (0.0797)	8.2281 (0.0836)	7.2108 (0.1252)	3.5265 (0.4739)	1.6229 (0.8047)
	Bottom	12.0990 (0.0166)	11.9220 (0.0179)	5.8734 (0.2088)	1.0934 (0.8953)	1.8474 (0.7638)	3.5907 (0.4642)
Immateriality	Top	16.8150 (0.0021)	15.6670 (0.0035)	14.1880 (0.0067)	3.4779 (0.4812)	1.9577 (0.7435)	3.6033 0.4623
	Bottom	2.9918 (0.5592)	3.1698 (0.5298)	1.3968 (0.8447)	5.5313 (0.2370)	4.9541 (0.2920)	4.6899 (0.3206)

Panel C: Sustainability Investments on Sector level

Extractives & Mineral Processing	Materiality	Top	1.5068 (0.8254)
		Bottom	2.6071 (0.6256)
	Immateriality	Top	3.8179 (0.4312)
		Bottom	0.9965 (0.9103)
Financials	Materiality	Top	1.6949 (0.7916)
		Bottom	5.6697 (0.2252)
	Immateriality	Top	9.0831 (0.0591)
		Bottom	4.9319 (0.2944)
Food & Beverage	Materiality	Top	6.0104 (0.1984)
		Bottom	0.2540 (0.9926)
	Immateriality	Top	3.5425 (0.4715)
		Bottom	2.7360 (0.6029)
Transportation	Materiality	Top	2.1053 (0.7164)
		Bottom	6.4179 (0.1700)
	Immateriality	Top	2.3215 (0.6769)
		Bottom	9.1924 (0.0565)
Technology & Communication	Materiality	Top	3.0458 (0.5502)
		Bottom	6.8158 (0.1459)
	Immateriality	Top	8.2591 (0.0825)
		Bottom	10.6260 (0.0311)

Table 16: Breusch-Godfrey test for autocorrelation

Table 16 shows the p-value from the Breusch-Pagan test conducted for each of the regressions. A p-value above the 5% significance level suggests that the null hypothesis is rejected, and that there is no evidence of heteroskedasticity. Panel A shows the results from the regressions on OSE as a whole, Panel B shows the results for the relative performance regression models, and Panel C shows the results of the tests conducted on the regressions on sector level.

Panel A: Sustainability Investments

		Equal-weighted portfolios			Value-weighted portfolios		
		Tercile	Quartile	Quintile	Tercile	Quartile	Quintile
Materiality	Top	3.1971 (0.0738)	1.2602 (0.2616)	0.5398 (0.4625)	1.9258 (0.1623)	10.78 (0.0010)	28.12 (0.000)
	Bottom	0.4566 (0.4992)	0.4105 (0.5217)	2.0091 (0.1564)	1.3015 (0.2539)	0.7752 (0.3786)	12.836 (0.0003)
Immateriality	Top	1.2657 (0.2606)	0.2393 (0.6247)	0.7293 (0.3931)	0.0045 (0.9468)	0.5711 (0.4498)	1.8492 (0.1739)
	Bottom	0.0726 (0.7875)	0.2577 (0.6117)	0.0073 (0.9317)	4.8112 (0.0283)	0.8750 (0.3496)	0.4202 (0.5168)

Panel B: Relative Sustainability Performance

		Equal-weighted portfolios			Value-weighted portfolios		
		Tercile	Quartile	Quintile	Tercile	Quartile	Quintile
Materiality	Top	0.0790 (0.7786)	0.1142 (0.7355)	1.4722 (0.2250)	0.7190 (0.3965)	0.0004 (0.9849)	1.2187 (0.2696)
	Bottom	1.1534 (0.2828)	0.0506 (0.8220)	0.0694 (0.7921	4.6883 (0.0304)	0.0002 (0.9884)	0.1744 (0.6763)
Immateriality	Top	0.2227 (0.6370)	1.9223 (0.1656)	5.3607 (0.0206)	13.4550 (0.0002)	0.2011 (0.6538)	0.0158 (0.900)
	Bottom	0.0433 (0.8351)	0.1693 (0.6808)	0.2159 (0.6422)	2.5001 (0.1138)	2.8372 (0.0921)	2.5017 (0.1137)

Panel C: Sustainability Investments on Sector level

Extractives & Mineral Processing	Materiality	Top	0.3569 (0.5502)
		Bottom	0.2624 (0.6085)
	Immateriality	Top	1.9877 (0.1586)
		Bottom	7.4234 (0.0064)
Financials	Materiality	Top	4.4366 (0.0352)
		Bottom	0.6252 (0.4291)
	Immateriality	Top	0.1128 (0.737)
		Bottom	2.0095 (0.1563)
Food & Beverage	Materiality	Top	0.4785 (0.4891)
		Bottom	4.1328 (0.0421)
	Immateriality	Top	0.1928 (0.6606)
		Bottom	4.8166 (0.0282)
Transportation	Materiality	Top	2.2078 (0.1373)
		Bottom	0.1465 (0.7019)
	Immateriality	Top	0.1288 (0.7197)
		Bottom	0.7603 (0.3832)
Technology & Communication	Materiality	Top	1.2346 (0.2665)
		Bottom	2.1515 (0.1424)
	Immateriality	Top	1.7369 (0.1875)
		Bottom	3.0100 (0.0828)