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ESG materiality and firm performance

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Abstract

Academic literature finds that ESG performance positively impacts a company's profitability and market value but discussions on the underlying mechanisms leading to this impact remain. This thesis analyses the relationship between ESG and financial performance distinguishing between material and immaterial ESG issues. A linear regression analysis of ESG sentiment data and accounting- and market-based financial performance indicators reveals that material ESG sentiment does not significantly correlate with market-based financial performance. However, immaterial ESG sentiment shows a positive correlation with a company's market value. The study highlights potential limitations in using SASB's industry-specific materiality classification, as this may not be able to fully capture company-specific characteristics and temporal dynamics. Additionally, the emphasis on short-term financial benefits in material ESG investments may inhibit the creation of long-term market value. Stakeholder perceptions also play a role, as material ESG disclosures may draw attention to negative impacts. These insights have implications for regulators, investors, and executives, pointing to the need for more relevant financial materiality classifications and offering directions for future research on ESG and financial performance.

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List of Abbreviations

ESG	Environmental, social and governance
EU	European Union
OCFOA	Operating cash flow on assets
PTB	Price to book ratio
ROA	Return on assets
SASB	Sustainability Accounting Standards Board
TQ	Tobin's Q
UN	United Nations
WRDS	Wharton Research Data Services

1 Introduction

“Who Cares Wins” is the headline of a report the United Nations (UN) published in 2004 in the context of the UN Global Compact to introduce environmental, social and governance (ESG) considerations into the financial sector (UN, 2004). Since then, investors, analysts, regulators and executives have followed the call for action and increasingly integrated ESG issues into investment strategies, policies and corporate strategy (UN, 2009). Along with this development, negative environmental and social impacts of business activities are increasingly attracting public attention. This increases the pressure for companies to positively contribute to environmental and societal issues (UN, 2009).

Although it is appealing through its simplicity, the validity of the phrase “Who Cares Wins” has been put into question. While the UN report does not provide accompanying evidence in support of this, it has been the subject of an extensive debate in the field of economic research and beyond. Academic, professional and public discussions attribute a company’s performance on ESG-related issues (ESG performance) an operational, reputational and overall value-enhancing effect. Along buzzwords such as “business case for sustainability” (Steger, 2006) and “eco-efficiency” (DeSimone & Popoff, 2000), those who improve their ESG performance are assured of direct financial benefits. However, the underlying mechanisms that link ESG and financial performance remain disputed in academic discussions. Clearly defining the relationship is complex, as there are many different non-financial performance factors that fall under the umbrella term of ESG. Depending on a company’s business environment certain ESG issues have a higher or lower significance for the company (Busch & Hoffmann, 2011). Direct effects of ESG issues on financial performance can potentially be derived from a company’s specific business environment, yet the more indirect effects remain difficult to define (Salzmann, Ionescu-Somers & Steger, 2005).

An accurate understanding of how the integration of ESG issues impacts financial performance has crucial implications for investors, regulators and businesses. Investors base decisions on whether to integrate ESG issues into valuation models and portfolio strategies on their understanding of this relationship. Policymakers determine the extent to which regulation is needed and which ESG issues should be targeted by new disclosure regulations, for which they need an understanding of how new regulations

on sustainability disclosure and performance will constrain the business environment. Executives decide whether to introduce ESG related initiatives, strategies and targets which are based on their understanding of whether these ESG related investments lead to financial benefits. In addition, it has implications for the way these investment decisions are communicated internally and externally. Overall, understanding how ESG and financial performance are related has important implications for the way relevant stakeholders approach ESG issues (UN, 2009). More clarity on this issue could eliminate uncertainties and reluctancies to a strategic commitment according to the UN phrase “Who Cares Wins”.

The concept of materiality attempts to reduce uncertainties about the financial relevance of ESG issues by classifying them as financially material and immaterial by industry. The classification of an ESG issue as financially material to an industry implies that a company’s performance regarding this issue influences how financial stakeholders assess the company (SASB, n.d. a). Nevertheless, the financial relevance of ESG issues independent of their materiality is still being questioned by investors (Cornell & Damodaran, 2020) and public discussions are focussed on material as well as immaterial ESG issues (Kuh, Shepley, Bala & Flowers, 2020). Equally, executives do not focus their ESG related investments on only material issues and companies keep investing in and improving their immaterial ESG performance (Christophe & Lee, 2021; Kuh et al., 2020).

Hence, the question remains whether investments in immaterial ESG issues can be viewed as an error in management decision making (Christophe & Lee, 2021) or whether there are financial performance implications that justify investments into immaterial ESG issues. To date, the potential mechanisms through which immaterial ESG issues relate to financial performance have been the focus of only a few research approaches. In the following thesis this issue will be addressed by comparing how material and immaterial ESG issues relate to financial performance and by connecting the analysis results to theories on potential underlying mechanisms.

The thesis is structured as follows: Section 2 provides a detailed overview of the theoretical framework surrounding the concept of materiality and summarizes prior research findings on the relationship between ESG and financial performance in academic literature. Section 3 outlines the methodology used to analyse the relationship

between ESG and financial performance by explaining the generation of the data sample and regression model used. The analysis results are presented in section 4, followed by a discussion of the corresponding implications, limitations and suggestions for future research directions in section 5. Lastly, section 6 concludes the thesis with a summary of the findings.

2 Theoretical background

This section provides an overview of the economic research field that examines the relationship between ESG and financial performance. In this context, a company's ESG performance describes how well a company manages environmental, social and governance issues. As the term ESG performance encompasses a large variety of issues, the concept of materiality is used to differentiate between financially relevant and irrelevant issues. A detailed explanation is provided in section 2.1. Section 2.2 and 2.3 describe how ESG performance can impact financial performance and how this relationship changes when material and immaterial ESG issues are distinguished.

2.1 Concept of materiality

Financial materiality is a concept applied in financial auditing and reporting. Financial audit providers rely on the concept of materiality to select disclosures with a considerable impact on the overall financial statement for in-depth audits and process reviews. Those disclosures within a company's reporting are referred to as "financially material" (Chong, 2015; Edgley, 2014). Disclosures that are not considered to have a substantial impact on the informational value of the financial statement are deprioritised in the audit context to manage the workload of auditing (Chong, 2015; Edgley, 2014). Similarly, reporting requirements include thresholds that define the risk levels above which a risk needs to be included in the risk disclosures within a financial statement. Above a certain degree of potential financial damage this information is valuable for investor decision-making and is therefore considered financially material (Chong, 2015; Edgley, 2014). The concept of materiality has evolved and changed meaning over the time of its practical application (Edgley, 2014). A clear definition of when a

disclosure is material depends on contextual factors, such as the reporting framework used and the company or the profession applying the concept (Chong, 2015).

With increasing requirements for corporate non-financial disclosures, the concept of financial materiality is also commonly applied in reporting practices on sustainability issues. Non-financial statements can potentially include a wide range of performance indicators on environmental, social and governance issues. For example, the European Union (EU) non-financial disclosure regulation defines over 1,000 potential data points for companies to disclose (EFRAG, n.d.). Therefore, applying the concept of materiality to non-financial reporting limits a company's non-financial disclosures to information that provides value to their stakeholders (Edgley, Jones & Atkins, 2015).

As non-financial disclosures serve investors (Schiehl & Kollahgar, 2021) as well as a wider range of a company's stakeholders (Edgley et al., 2015), the concept and application of materiality has changed and expanded. Different reporting framework providers define material topics differently, depending on the stakeholder perspective they take. For example, EU regulators expanded the concept of financial materiality to "double materiality". Following the EU regulation, companies disclose issues with a significant financial impact on the company as well as issues with a significant impact on environment or social causes impacting a wider range of stakeholders (EFRAG, n.d.).

The Sustainability Accounting Standards Board (SASB) provides an international reporting standard including its own concept of materiality which is applied in the following analysis. The framework classifies a sustainability issue as material if a company's financial performance is influenced by this sustainability issue in a way that could impact the decision-making process of investors and other financial stakeholders (SASB, n.d. a). In addition, SASB provides a classification of ESG issues as material and immaterial by industry. These standards are set in collaboration with financial market stakeholders and industry experts (SASB, n.d. a). Thus, SASB's materiality classification reproduces expert estimations of which ESG issues impact investor decision making. This concept of materiality is applied in the context of this thesis because SASB's materiality classification as well as the following analysis evaluate the impact of ESG issue performance along its financial relevance to companies. This consistent perspective is useful when interpreting the results.

2.2 ESG and financial performance

Academic research exploring the effect of a company's ESG performance on its financial performance and the underlying mechanisms has so far not reached a consensus on how to characterize this relationship. Meta-analyses examining common results and trends across the field of research mostly find a positive effect of ESG on financial performance (Friede, Busch & Bassen, 2015; Huang, 2021; Khan, Serafeim & Yoon, 2016; Orlitzky, Schmidt & Rynes, 2003; Wang, Dou & Jia, 2016). Although the findings of a positive relationship are statistically significant, some researchers argue that the mostly small effect sizes render the relationship economically insignificant (Cornell & Damodaran, 2020; Huang, 2021; Wang et al., 2016). Some even argue that this positive relationship is merely a reflection of the internal beliefs of the research community (Busch & Orlitzky, 2019).

Still, academic literature provides theories on a number of possible direct and indirect mechanisms that link ESG performance and financial performance. Firstly, a company's performance regarding ESG issues can directly impact the financial bottom line. Integrating ESG-related considerations is found to increase operational efficiency, for example in the field of materials and resource management or the attraction and retention of talent in the field of human resource management. Improving resource use or employer branding can decrease costs and therefore improve profitability measures (DeSimone & Popoff, 2000; Steger, 2006). Additionally, integrating an ESG perspective into operational risk management can lead to a reduced risk exposure (Perini, Russo, Tencati & Vurro, 2011; Sassen, Hinze & Hardeck, 2016). For example, a strong ESG performance enforced by policies on the handling of hazardous materials or on the handling of internal harassment allegations, avoids potential future costs related to legal fees and fine payments (McGuire, Sundgren & Schneeweis, 1988). In the medium- to long-term, strategically factoring in ESG issues can lead to additional business opportunities and a competitive advantage (DeSimone & Popoff, 2000; Perini et al., 2011; Steger, 2006). A stronger focus on long-term market developments drives explorative innovation (Flammer & Bansal, 2017) which is needed to adapt business models to a changing business environment and create competitive business opportunities (Eccles, Ioannou & Serafeim, 2014; Kiron, Kruschwitz, Reeves & Goh, 2013).

In summary, the mechanisms of introducing ESG-related considerations into business practices that directly affect a company's bottom line represent financial benefits resulting from resourceful and forward-looking management practices (Salzmann et al., 2005). There are industry- and company-specific factors that affect a company's ability to capitalize on these direct value-enhancing factors (Perrini et al., 2011; Salzmann et al., 2005; Sassen et al., 2016). Depending on which ESG factors are closely related to a company's business model, different mechanisms drive the financial impact of ESG performance (Busch & Hoffmann, 2011; Steger, 2006).

Secondly, a company's performance regarding ESG issues can indirectly impact financial performance. One main element which can lead to a competitive advantage are the strengthened relationships between a firm and its stakeholders resulting from a focus on ESG issues (Barnett, 2007; Choi & Wang, 2009; Jones, 1995; Lozano, Carpenter & Huisingh, 2015; Perrini et al., 2011). For example, a strong performance regarding ESG issues, especially in the social dimension of ESG, builds trusting relationships with authorities and general society (Lozano et al., 2015). In an environment where these issues are more relevant to societal and regulatory stakeholders, for example, when comparing developed and emerging countries, a strong performance and high rate of compliance leads to a stronger corporate financial performance (Friede et al., 2015; Naeem, Cankaya & Bildik, 2022; Wang et al., 2016).

Another intangible value driver of corporate performance in this context is corporate reputation (Perrini et al., 2011). Investments into ESG issues can increase stakeholder loyalty as they improve a company's reputation as ethical and contributing to society. This can act as insurance against negative events, meaning companies with a good ESG-related reputation can more easily uphold firm value in times of crisis (Kang, Germann & Grewal, 2016; Godfrey, Merrill & Hansen, 2009). The increased stakeholder loyalty can decrease reactive responses to negative events (Sassen et al., 2016). A similar relationship is not found for ESG investments that are made after a negative event. Therefore, researchers theorize that the insurance effect holds as long as stakeholders perceive a company's ESG investments as legitimate and driven by good intentions (Kang et al., 2016; Godfrey et al., 2009).

Additionally, a good reputation can not only uphold a company's financial performance but improve it by increasing brand value and attracting customers (Perrini et

al., 2011; Servaes & Tamayo, 2013; Lev, Petrovits & Radhakrishnan, 2010). ESG investments can increase the market value of companies with a good reputation and high public visibility (Servaes & Tamayo, 2013). Similarly to the insurance mechanism, this positive effect on brand value is found, as long as customers perceive good intentions as the driver of engaging in ESG-related activities (Nickerson, Lowe, Patabhiraiah & Sorescu, 2022). However, there is also evidence of more severe negative financial consequences as a response to negative ESG-related events for companies with an increasingly good and publicly visible reputation (Nickerson et al., 2022). This inconsistency with the insurance effect theory can be attempted to be explained by the severity of a negative event (Kang et al., 2016; Servaes & Tamayo, 2013), however, it offers grounds for further research.

Overall, strong relationships with stakeholders have been found to support the ability to maintain high levels of financial performance in the long-term and facilitate the faster improvement of low performance levels (Choi & Wang, 2009). The actual relationship between a company's ESG performance and its stakeholders is however largely company- and stakeholder-specific. This leads to inconclusive results and makes it difficult to capture the effect on a more general application level (Barnett, 2007; Fu, Boehe, Orlitzky & Swanson, 2019). Other factors influencing this relationship include a company's marketing capability (Mishra & Modi, 2016; Nickerson et al., 2022), firm size and environment (Kim & Lee, 2020), target customer group (Eccles et al., 2014; Lev et al., 2010) and amount of stakeholder pressures (Fu et al., 2019). Although stakeholder theory is widely referenced in the context of ESG and financial performance, the understanding of the underlying mechanisms remains incomplete (Barnett, 2007; Eccles et al., 2014; Lozano et al., 2015; Servaes & Tamayo, 2013).

The effect size of ESG performance on financial performance differs across the applied concepts of operationalization (Huang, 2021; Wang et al., 2016) and study types (Friede et al., 2015). Portfolio studies mainly serve the interest group of investors and analyse the potential effect of ESG performance on risk-adjusted stock performance. Recent portfolio studies mostly find no effect of ESG performance on financial performance and express the hypothesis, that ESG performance is already factored into the market valuation (King & Pucker, 2022; Halbritter & Dorfleitner, 2015). ESG performance indicators are increasingly integrated into analyst's valuation models and

ESG information is widely accessible. Following this rationale, identifying companies that are showing signs of improving their ESG performance is a strategy of ESG investing which can generate higher abnormal returns (Cornell & Damodaran, 2020; King & Pucker, 2022).

In portfolio studies, stock returns are used as measures of financial performance, which are influenced by a broad variety of factors so that it is difficult to attribute causal effects (Friede et al., 2015; King & Pucker, 2022; McGuire et al., 1988). Further approaches to the operationalization of corporate financial performance distinguish between accounting-based and market-based indicators. Accounting-based financial performance indicators reflect the direct mechanisms of how ESG performance can affect profitability and a company's bottom line (Huang, 2021). The indirect mechanisms underlying the relationship between ESG and financial performance are largely intangible and have a longer-term impact (Salzmann et al., 2005). As market valuation metrics incorporate both, intangible and forward-looking elements, they are better suited to additionally capture the effects based on indirect mechanisms than accounting-based metrics (Huang, 2021). Both types of financial indicators show a positive correlation with ESG performance across various meta-studies. However, accounting-based financial performance indicators show a slightly stronger correlation with ESG performance measures than market-based indicators (Huang, 2021; Wang et al., 2016).

Additionally, ESG performance can be operationalized in various ways, for example using stakeholder perception, rating agency scores, industry leadership scores, rates of disclosure or operational measures (Busch & Hoffmann, 2011; Galant & Cadez, 2017). Among researchers the measurement types are grouped into process- and outcome-based measures. Process-based measures indicate the strategic intent and direction a company is taking towards improving their ESG performance, for example the introduction of a new policy or corporate targets on a specific issue. They tend to clearly show a positive or negative development in ESG performance. In contrast, the evaluation of outcome-based indicators is more volatile as it is missing objective guidelines (Christensen, Serafeim & Sikochi, 2022). Therefore, this differentiation can have implications for result interpretation. However, its significance for the relationship between ESG and financial performance remains unclear (Busch & Hoffmann, 2011; Busch & Orlitzky, 2023).

2.3 ESG materiality and financial performance

A main factor influencing the relationship between ESG and financial performance is the distinction between material and immaterial ESG performance. The wide and diverse range of ESG issues is often summarized into a one-dimensional ESG performance score. This serves as an explanation for the small effect size and difficulties characterizing and quantifying the relationship between ESG and financial performance (Barnett, 2007; Busch & Hoffmann, 2011; Sassen et al., 2016). Not every ESG issue has an equal impact, either directly or indirectly, on a company's performance. This relationship is industry- and company-specific and depends on the business model and business environment (Barnett, 2007; Busch & Hoffmann, 2011; Christophe & Lee, 2021). For example, the level to which companies directly affect the environment with their business activities influences the financial relevance of ESG-related performance (Naeem et al., 2022; Sassen et al., 2016). A company in the mining sector, for example, would assess its ecological impacts as material while the issue of data security would be considered immaterial (SASB, n.d. b). The importance of this distinction is additionally reflected by the finding that ESG performance information has more informational value to investors when material topics are distinguished from immaterial topics (Madison & Schiehl, 2021; Schiehl & Kolahgar, 2021).

Research applying the concept of materiality suggests that a company's strong performance in material ESG issues increases financial performance (Christophe & Lee, 2021; Consolandi, Eccles & Gabbi, 2020; Grewal, Serafeim & Yoon, 2016; Khan et al., 2016). The effect size for material issues is larger and more significant than the effect when considering all issues together (Khan et al., 2016; Serafeim & Yoon, 2023). A proposed explanation for this result is that focussing only on material issues selects only the value-driving ESG-related activities. It is assumed that the effect size of the relationship between material ESG and financial performance is corrected for ESG-related activities that are irrelevant to financial performance. The direct effects of investments into material ESG, such as costs savings and revenue opportunities, are included into the effect size while immaterial issues that have no impact or potentially negatively impact financial performance are not (Khan et al., 2016). A focus on material ESG can increase the perceived legitimacy of a company's ESG-related activities among its stakeholders. Nickerson et al. (2022) argue that customers perceive material activities as more credible than immaterial activities. Equally, investors attribute a

higher value to corporate ESG-related activities that concentrate on the most relevant financially material issues (Consolandi et al., 2020).

The effect of immaterial ESG performance on financial performance is found to be small but positive (Serafeim & Yoon, 2023), insignificant (Khan et al., 2016) or negative (Grewal et al., 2016; Khan et al., 2016; Nickerson et al., 2022). In contrast to material ESG issues, the concept of materiality suggests that an increase in performance on immaterial ESG issues does not create significant financial value for the company. Therefore, immaterial ESG-related activities would have no or a negative effect on the company's financial performance as resources are invested without creating value in return. In support of this statement, studies find that investors do not value immaterial ESG issue performance. Instead, immaterial ESG engagement can decrease a company's stock returns (Christophe & Lee, 2021; Grewal et al., 2016; Khan et al., 2016). Equally, customer reactions to immaterial ESG engagement are negative, which leads researchers to theorize that customers perceive the unclear intention behind immaterial ESG activities as misleading and insincere (Nickerson et al., 2022).

Conversely, selected studies find a neutral or positive relationship between immaterial ESG and financial performance. A potential explanation for these findings may lie in the indirect effects. An improved stakeholder relationship could positively impact the company long-term, even if the stakeholder is not considered financially material. For example, immaterial ESG-related activities can improve the company's reputation as long as they are perceived as being well intended (Kang et al., 2016; Godfrey et al., 2009). However, the argument of the financial materiality concept remains, which argues that the same resources spent on immaterial ESG investments would have created higher financial value in the context of focussed material ESG engagements (Consolandi et al., 2020).

3 Data and methodology

The following analysis uses ESG and financial data to explore the relationship between a company's ESG performance and its financial performance. There are various possibilities to operationalize the two concepts of ESG performance and financial performance. For this thesis, ESG sentiment scores are used as a proxy for ESG performance.

Financial performance is measured using four accounting- and market-based financial performance indicators.

The final dataset contains 17,519 observations across a timeframe from 2008 to 2019 (see Table 1). It consists of ESG and financial data from 2,267 publicly traded North American companies across 11 sectors and 78 industries. The companies are distributed across 11 sectors as follows: “Consumer Goods” (9.83%), “Extractives and Minerals Processing” (6.23%), “Financials” (6.91%), “Food and Beverage” (6.02%), “Health Care” (16.55%), “Infrastructure” (7.83%), “Renewable Resources and Alternative Energy” (0.74%), “Resource Transformation” (13.55%), “Services” (7.35%), “Technology & Communications” (20.82%) and “Transportation” (4.17%). Currently, the Sustainability Accounting Standards Board (SASB) differentiates between 77 industries (see Appendix, Table 6), however the dataset is based on an earlier version of the industry classification system that has since been revised (SASB, n.d. b). In contrast to the current industry classification, the dataset used for this thesis considers “Pharmaceuticals” and “Biotechnology” as two separate industries, the “Cable & Satellites” industry is part of the “Telecommunications” industry, and there is no company classified under the “Cruise Lines” industry. The chosen timeframe ensures that any irregularities in the data resulting from the financial crisis in 2007 and the Corona crisis in 2020 are largely excluded from the period under review.

The following sections give an overview over the data sample and the regression model used for this research. The creation of the data sample is explained in section 3.1, including a detailed description of the selection and interpretation of the financial performance data. The ESG sentiment data and the control variables are explained in sections 3.2 and 3.3. The regression model used for the following analysis is explained in section 3.4.

3.1 Financial performance data

Four financial performance indicators were used to operationalize corporate financial performance, two accounting-based and two market-based measures. Accounting-based financial performance indicators are directly computed from a company’s financial statement and reflect internal operational and management performance (Orlitzky

et al., 2003). Market-based financial performance indicators consider operational performance as well as external perceptions of the company's historic and future performance capabilities (Orlitzky et al., 2003). In the context of the relationship between ESG and financial performance, accounting-based financial indicators are expected to mainly reflect the direct effects of ESG performance on financial performance (Huang, 2021). The direct effects are closely linked to the company's business model, so that improvements in these directly linked ESG issues affect the financial bottom line. As market-based indicators additionally reproduce forward-looking performance assessments and market valuations, they are interpreted to also reflect the indirect effects of ESG performance through intangible value creation (Huang, 2021).

The two accounting-based financial performance indicators used in the following analysis are the return on assets (ROA) and the operational cash flow on assets (OCFOA). ROA reflects the operational profitability of a company and is applied in scientific literature as well as financial management contexts. Due to its accessibility and interpretability, it is also commonly applied in the research field on the relationship of ESG and financial performance (Huang, 2021; Wang et al., 2016). ROA is calculated as the ratio of operating income before depreciation to the book value of total assets. OCFOA also reflects a company's operational profitability, however it is an accounting-based financial performance indicator that is not as widely used in ESG and financial performance research as ROA. It is calculated as the ratio of operating cash flow and the book value of total assets. OCFOA was chosen in line with Gibbs, Simcoe and Waguespack (2023), who suggest that it represents a more accurate reflection of operational profitability. While ROA is susceptible to balance adjustments for reporting purposes, the operating cash flow reporting offers less room for interpretation (Gibbs et al., 2023). The two accounting-based indicators ROA and OCFOA are positively correlated (see Table 2) as expected since both measure profitability using total assets as a denominator. Further descriptive statistics and pairwise correlations for all variables in the data sample are presented in Tables 1 and 2.

The two market-based financial performance indicators used in the following analysis are Tobin's Q (TQ) and the price to book ratio (PTB). TQ is a widely used market-based financial performance indicator (Huang, 2021; Wang et al., 2016) reflecting a company's market valuation in relation to its remuneration value. It is calculated as the ratio of a company's market value of total shares outstanding to the replacement

costs of its tangible and intangible assets, in line with Peters and Taylor (2016). As the indicator includes the valuation of intangible assets, it is commonly applied in research on the relationship between ESG and financial performance (Huang, 2021; Wang et al., 2016). The price to book ratio (PTB) is another widely used market-based financial performance indicator (Wang et al., 2016) reflecting a company's market valuation in relation to its book value. It is calculated as the ratio of a company's market value of total shares outstanding to the book value of equity. In addition to accounting-based performance, PTB reflects the market perception of a company's historic and future performance. The interpretation of TQ is then further extended by also explicitly incorporating the valuation of intangible assets. Therefore, it is expected that the two market-based indicators show little correlation (see Table 2).

All financial performance indicators were sourced from the Wharton Research Data Services (WRDS) and included into the data sample as annual average values. Specifically, the two indicators ROA and PTB were directly sourced from the Financial Ratios Suite database provided through WRDS. OCFOA was self-computed using the Compustat Daily Updates database. The database provides the annual operating cash flow and total assets values for publicly traded North American firms on WRDS. TQ was directly sourced from the Peters and Taylor Total Q database provided through WRDS.

Table 1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Year	17519	2013.839	3.289	2008	2019
ROA	17519	.075	.209	-4.631	1.404
OCFOA	17519	.056	.188	-5.234	1.967
TQ	17519	2.051	46.935	-302.088	5982.006
PTB	17519	4.294	6.512	.126	79.711
Firm Size	17519	7.173	1.996	1.058	13.809
Leverage	17519	.511	.225	.005	2.144
Attention	17519	1.828	1.555	.000	8.963
All-Categories Score	17519	52.570	8.743	2.256	97.988
Materiality Score	16065	53.973	12.512	.109	100
Immateriality Score	16255	51.993	9.641	1.015	99.026
All-Categories Score Change	17519	50.331	6.831	4.968	94.596
Materiality Score Change	16047	50.702	11.428	1.707	97.297
Immateriality Score Change	16237	50.160	7.262	4.900	99.461

Table 2: Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) ROA	1.000												
(2) OCFOA	0.856	1.000											
(3) TQ	-0.002	0.000	1.000										
(4) PTB	-0.143	-0.142	0.015	1.000									
(5) Firm Size	0.354	0.329	-0.014	-0.101	1.000								
(6) Leverage	0.067	0.023	-0.034	0.263	0.443	1.000							
(7) Attention	0.130	0.128	-0.012	0.093	0.587	0.226	1.000						
(8) All-Categories Score	0.012	0.015	-0.012	0.003	-0.089	-0.054	-0.029	1.000					
(9) Materiality Score	0.066	0.059	-0.026	-0.019	-0.051	-0.056	0.002	0.707	1.000				
(10) Immateriality Score	-0.061	-0.050	0.009	0.038	-0.112	-0.047	-0.049	0.790	0.130	1.000			
(11) All-Categories Score Change	0.010	0.012	0.000	-0.007	-0.027	-0.021	-0.017	0.512	0.380	0.376	1.000		
(12) Materiality Score Change	0.016	0.021	-0.008	-0.016	-0.009	-0.012	-0.005	0.341	0.520	0.046	0.680	1.000	
(13) Immateriality Score Change	-0.007	-0.016	0.014	0.006	-0.042	-0.030	-0.026	0.379	0.040	0.495	0.730	0.050	1.000

3.2 ESG sentiment data

For this analysis, ESG performance was measured using a data set of ESG sentiment scores provided by Truvalue Labs. Truvalue Labs collects ESG data points from non-company sources that relate to at least one of 26 SASB sustainability issues (see Appendix, Table 7) and analyses their sentiment using a machine learning tool. The non-company sources range from local, national and international news reports, NGO reports, trade journals and industry-specific publications to ESG articles on social media (FactSet, n.d.). Data on negative and positive events from these sources is then categorized into 26 categories of sustainability issues based on SASB's issue categorization for its sustainability disclosure guidelines. Within SASB's corporate reporting framework, the sustainability issues are categorized into six environmental sub-categories, ten social sub-categories in the areas "Social Capital" and "Human Capital" and ten governance sub-categories in the areas "Business Model & Innovation" and "Leadership & Governance" (SASB, n.d. a).

The data on company activities and industries is extracted and scored on a scale of 0 to 100 through a machine learning tool using natural language processing (FactSet, n.d.). A sentiment score of 0 indicates a strongly negative sentiment of a company's performance in the respective SASB category, a sentiment score of 100 reflects a strongly positive sentiment and a score of 50 shows a neutral evaluation. These sentiment scores are aggregated on a daily basis and provided by Truvalue Labs in form of the daily "pulse" score (FactSet, n.d.).

To analyse the relationship between ESG and financial performance, this ESG sentiment data provided by Truvalue Labs was used as a proxy for corporate ESG performance. ESG performance is constructed from various ESG issues with different operationalizations, so an accurate representation of ESG performance would need to be based on a variety of process- and outcome-based performance indicators. Even then, the evaluation of an ESG issue performance level remains largely undefined (Christensen et al., 2022). The ESG sentiment score represents a content analysis of reported events that are quantitatively assessed based on the positive or negative direction and the extent of external stakeholder reactions. Thus, it acts as a proxy for operational ESG performance, assuming that external stakeholder reactions adequately assess ESG performance and that these reactions are appropriately reflected in the database.

As the score is based on non-company disclosures, the potential bias of using a company's own publications is mitigated (Wang et al., 2016).

For their application in the following analysis, the Truvalue Labs pulse scores were converted into annual firm-specific ESG sentiment scores. The daily pulse scores were averaged by company and year, for those of the 26 SASB sustainability issues for which data was available. The resulting ESG sentiment scores were then added to the data sample. The result is an interpretable annual sentiment score for each of the 26 sustainability categories for each company. This score either shows a number between 0 and 100, indicating the direction and strength of the sentiment, or it shows a missing variable, indicating that there were no data points evaluated for that sustainability category in the respective year.

The annual firm-specific ESG sentiment scores were then used to generate an "All-Categories" score, a "Materiality" score, and an "Immateriality" score. The All-Categories score is the average annual firm-specific ESG sentiment score of all 26 sustainability categories combined. The Materiality (Immateriality) score is the average annual firm-specific ESG sentiment score of a company's material (immaterial) sustainability categories. As the annual firm-specific ESG sentiment scores are not available for every sustainability issue, there are missing values in the Materiality and Immateriality scores (see Table 1). These occur when a company has a low total article volume, especially when few sustainability categories are material for a specific industry. These All-Categories, Materiality and Immateriality scores were self-computed to increase the interpretability and comparability of the analysis results. This is due to the fact that Truvalue Labs does not transparently disclose its formulas to compute weighted averages and materiality scores. As a result, the annual scores as well as materiality scores provided by Truvalue Labs lack interpretability. Additionally, Truvalue Labs does not provide an immateriality score. Due to the lack of transparency, creating an immateriality score that is comparable to the provided materiality score was not possible.

Truvalue Labs also provides a "momentum" score which was used to compute the annual ESG sentiment change for every company. The Truvalue Labs momentum score reflects the ESG sentiment score change over one year. This daily momentum score was averaged by company and year, for those of the 26 SASB sustainability

issues for which data was available. Similarly to the ESG sentiment score, the annual firm-specific ESG sentiment score changes were then used to create an All-Categories momentum score, a Materiality momentum score and an Immateriality momentum score. The final result is an interpretable annual firm-specific momentum score expressing the ESG sentiment score change over the previous two years.

Lastly, Truvalue Labs provides a “volume” score which was used to calculate the annual number of articles included in the assessment of a company’s ESG sentiment score. The Truvalue Labs volume score can be interpreted as the weighted number of scored articles a company has received within one year. This daily volume score was averaged by company and year, resulting in an interpretable annual firm-specific volume score expressing the volume of scored articles a company received over the previous two years.

3.3 Control variables

Firm size and growth opportunities were identified as two time-variant factors on firm-level that affect the financial performance as well as the ESG performance of a company (Drempetic, Klein & Zwergel, 2019; Orlitzky, 2001). Firm size was added to the data sample as the natural logarithm of total assets. In order to control for differing growth opportunities, a measure of leverage was added to the data set. Leverage was computed as a ratio of a company’s total debts to its total assets.

Additionally, differing levels of public attention affect the ESG sentiment towards a company as well as the relationship between ESG and financial performance. Prior research provides evidence for the impact of public attention on ESG sentiment and performance in form of a measure of online search attention (Zhao, Fang & Zhang, 2023), media coverage (Christophe & Lee, 2021) or investor attention (Serafeim & Yoon, 2023). The findings are further supported by the considerable differences in article volume between the companies in the Truvalue Labs dataset which range from 1 to over 7,800 articles. Therefore, a measure of public attention in form of the natural logarithm of the volume score was added to the data set.

Further time-invariant firm- and industry-specific factors were introduced as dummies into the regression model which is presented in the following section 3.4. Additionally, a year dummy was introduced to the model. Firm dummies capture characteristics such

as firm age, ownership structure, geographical location and time-invariant aspects of organizational culture and corporate governance that can affect a company's financial and ESG performance (Friede et al., 2015; Perrini et al., 2011). Industry dummies capture characteristics such as the regulatory environment, resource intensity, capital intensity, dependency on technology and the competitive environment which are industry-specific factors that can influence ESG performance and its influence on financial performance (Banerjee, Iyer & Kashyap, 2003; Eccles et al., 2014).

3.4 Regression model

The correlation of ESG sentiment and a company's financial performance is analysed using a fixed effects OLS model. The OLS model is based on the following equation:

$$\begin{aligned} CFP_{ijt} = & \alpha + \beta_1 \text{ESG sentiment (change)}_{it} + \beta_2 \text{Firm size}_{it} + \beta_3 \text{Leverage}_{it} \\ & + \beta_4 \text{Attention}_{it} + \beta_5 \text{Firm dummies}_i + \beta_6 \text{Industry dummies}_j \\ & + \beta_7 \text{Time dummies}_t + \varepsilon_{ijt} \end{aligned}$$

The model regresses corporate financial performance of firm i in industry j in year t on the ESG sentiment of firm i in year t and on the control variables. Coefficient β_1 indicates the effect of ESG sentiment on financial performance which represents the effect analysed. When analysing score changes, the ESG sentiment variable is exchanged with a variable representing ESG sentiment score changes. Then, the coefficient β_1 indicates the effect of ESG sentiment change on financial performance.

For the analysis of the effect of ESG sentiment on financial performance by industry, the following regression equation was used:

$$\begin{aligned} CFP_{it} = & \alpha + \beta_1 \text{ESG sentiment}_{it} + \beta_2 \text{Firm size}_{it} + \beta_3 \text{Leverage}_{it} \\ & + \beta_4 \text{Attention}_{it} + \beta_5 \text{Firm dummies}_i + \beta_6 \text{Time dummies}_t + \varepsilon_{it} \end{aligned}$$

The model regresses corporate financial performance of firm i in year t on the ESG sentiment of firm i in year t and on the control variables. The industry dummies are removed from this model, as the regression equation is applied to each industry separately, so that all companies within one regression are in the same industry.

4 Results

4.1 ESG sentiment and financial performance

The analysis of the relationship between the ESG sentiment score of all 26 sustainability issues combined (All-Categories score) and the four financial performance indicators produces insignificant results (see Table 3). Both, accounting-based as well as market-based financial indicators show a positive trend but no significant correlation with the All-Categories sentiment score.

Table 3: Regression of the All-Categories score on financial performance

	(1)	(2)	(3)	(4)
	ROA	OCFOA	TQ	PTB
All-Categories Score	.0003 (.0002)	.0001 (.0002)	.0647 (.0525)	.0076 (.006)
Firm Size	.0462*** (.0065)	.0629*** (.0077)	-.0192 (.4818)	-1.843*** (.1407)
Leverage	-.1009*** (.0185)	-.1715*** (.0267)	-3.6376*** (.7748)	16.559*** (.7468)
Attention	-.0074*** (.0015)	-.0095*** (.0016)	-.9608 (.7837)	-1.1987*** (.059)
Time Dummy	Yes	Yes	Yes	Yes
Firm Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes
Observations	17443	17443	17443	17443
R-squared	.8077	.7151	.3158	.6702

Note: Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

When analysing only the material sustainability issues, the regression results show a significant positive correlation with both accounting-based financial performance indicators (see Table 4). Although the significant correlation coefficients are small for ROA ($\beta = 0.0002$, $p = 0.087$) as well as for OCFOA ($\beta = 0.0002$, $p = 0.082$), the results support the findings of previous researchers. The material ESG sentiment score positively correlates with financial profitability indicators, showing higher significance levels than the correlation between the All-Categories ESG sentiment score and financial performance.

There is no significant correlation between ESG sentiment and market-based financial performance as well as no clear positive or negative trend (see Table 4). In contrast to what previous findings on ESG materiality and financial performance would suggest,

the analysis results do not support a correlation between ESG performance and market-based indicators.

Table 4: Regression of the Materiality score on financial performance

	(1) ROA	(2) OCFOA	(3) TQ	(4) PTB
Materiality Score	.0002* (.0001)	.0002* (.0001)	.0356 (.0496)	-.0011 (.0047)
Firm Size	.0445*** (.007)	.064*** (.0084)	.0138 (.5396)	-1.9546*** (.1514)
Leverage	-.0995*** (.0191)	-.1781*** (.0287)	-3.7685*** (.829)	17.1043*** (.7764)
Attention	-.0073*** (.0015)	-.0093*** (.0017)	-1.1154 (.8772)	-.2143*** (.063)
Time Dummy	Yes	Yes	Yes	Yes
Firm Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes
Observations	15976	15976	15976	15976
R-squared	.817	.7245	.3157	.6764

Note: Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

When analysing only the immaterial sustainability issues, the regression results show a significant positive correlation with both market-based financial performance indicators (see Table 5). The positive correlations with TQ ($\beta = 0.020$, $p = 0.012$) and PTB ($\beta = 0.012$, $p = 0.019$) show a significant correlation, while material ESG sentiment does not show a significant correlation with a company's market valuation. Contrary to previous findings, these results indicate that immaterial ESG performance is positively related to a company's market valuation. In line with previous literature, the results show no significant accounting-based correlations and an inconclusive trend.

Table 5: Regression of the Immateriality score on financial performance

	(1) ROA	(2) OCFOA	(3) TQ	(4) PTB
Immateriality Score	.0002 (.0001)	-.0001 (.0001)	.02** (.008)	.012** (.0051)
Firm Size	.0305*** (.005)	.0383*** (.0072)	-.268* (.1565)	-1.7966*** (.1467)
Leverage	-.0864*** (.0172)	-.1343*** (.017)	-3.0057*** (.47)	16.728*** (.8491)
Attention	-.0077*** (.0013)	-.0077*** (.0016)	-.217*** (.0619)	-.1778*** (.06)
Time Dummy	Yes	Yes	Yes	Yes
Firm Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes
Observations	16156	16156	16156	16156
R-squared	.8206	.7358	.8157	.6737

Note: Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

The significant correlation between immaterial ESG sentiment and market value indicates that the positive correlation between immaterial ESG performance and market value goes beyond the findings in previous literature. This notion is supported by the coefficient size, the positive significant correlation coefficients for both market-based financial performance indicators and the insignificant results for material ESG performance (see Table 4). The positive correlation with PTB indicates that immaterial ESG performance positively affects a company's market valuation. Since the results show no direct effect on the financial bottom line, these findings suggest that immaterial ESG performance indirectly increases financial performance through an improved long-term outlook. Additionally, the positive coefficient of TQ is higher than the PTB coefficient, indicating that immaterial ESG performance positively impacts a company's intangible assets.

One possible explanation for the missing correlation findings of material ESG performance and market-based financial performance indicators lies in the market valuation. Potentially, the material ESG performance is already incorporated into the company's market value as ESG information and materiality assessments are widely accessible. As presented in section 2.2, recent research using portfolio studies has found evidence for this connection (King & Pucker, 2022; Cornell & Damodaran, 2020). Following the line of argumentation, material ESG performance and market-based financial performance show no correlation because investors have already anticipated the performance. Immaterial ESG performance and market-based financial performance then show a positive correlation because the performance on immaterial topics is not already incorporated into the market value of a company. Based on the approach of Cornell and Damodaran (2020), changes in material sentiment scores instead of material sentiment score levels would more likely be positively correlated with market-based financial performance indicators. This theory is tested in the following section 4.2 by replacing the ESG sentiment score with ESG sentiment score changes in the OLS regression model.

4.2 ESG sentiment change & financial performance

Analysing the relationship between the All-Categories ESG sentiment score change and the four financial performance indicators yields insignificant results (see Appendix, Table 11), just like the regression using ESG sentiment scores in section 4.1.

A sentiment change in the material ESG issues largely reproduces the regression results from 4.1 using ESG sentiment scores (see Appendix, Table 12). OCFOA shows a small significant positive coefficient ($\beta = 0.0002$, $p = 0.046$). However, this coefficient is not reproduced with ROA. The market-based financial performance indicators are also not significantly correlated with a sentiment change in material ESG issues (see Appendix, Table 12).

A sentiment change in the immaterial sustainability issues shows a significant positive correlation with TQ ($\beta = 0.0137$, $p = 0.019$), however, the results are not reproduced with the other market-based financial performance indicator PTB (see Appendix, Table 13). Additionally, a sentiment change in the immaterial sustainability issues shows a significant correlation with the accounting-based financial performance indicator ROA ($\beta = 0.0003$, $p = 0.039$). This finding is neither reproduced with the other accounting-based financial performance indicator OCFOA, nor using ESG sentiment scores.

Overall, analysing the ESG sentiment score changes did not provide an explanation for the insignificant correlation coefficients of material ESG sentiment and the positive correlation of immaterial ESG sentiment with market-based financial performance indicators. The findings therefore do not support the proposed explanation that the market value estimate already accounts for material ESG performance but does not account for immaterial ESG performance. Further alternative explanations for these findings are discussed in section 5.

4.3 ESG sentiment and financial performance by industry

As the materiality classification differs across industries, the analysis of the relationship between ESG and financial performance was additionally performed at industry-level. The regression results of the All-Categories score, the Materiality score and the Immateriality score on accounting- and market-based financial performance indicators

by industry show no visible sector-specific trends or groupings of specific industries with similar trends. The results do not show a stronger correlation between ESG performance and financial performance in consumer-facing industries (Eccles et al., 2014; Lev et al., 2010; Zhao et al., 2023) or resource-intensive industries (Eccles et al., 2014). Instead, the results show a high variation in coefficients, positive and negative trends and large confidence intervals (see Figure 1).

Among those industry-specific regression results that are significant, there are mostly positive coefficients describing the relationship between material ESG sentiment and financial performance. This positive trend is evident for both accounting- and market-based financial performance indicators. The significant industry-specific regression results representing the correlation between immaterial ESG sentiment and financial performance show no clear positive or negative trend.

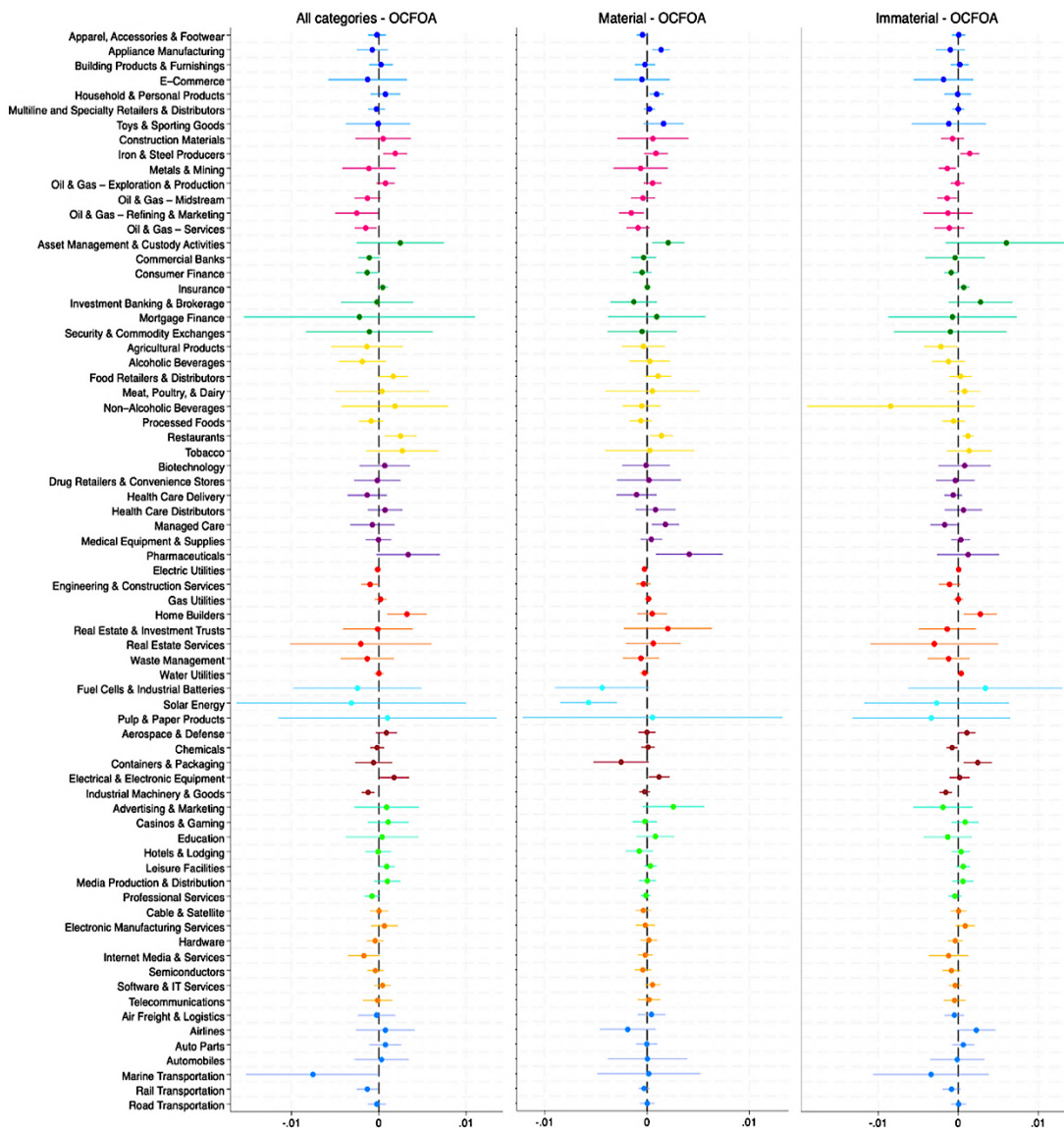


Figure 1: Regression coefficients of ESG performance and OCFOA by industry

Note: This plot does not show the industry Biofuels for illustration purposes.

The complexity of the correlation results by industry and their interpretation possibilities are demonstrated by the example of the biotechnology and the pharmaceuticals industry. These two industries were chosen because they have the same material topics and are highly related industries with few specific differences in their business environment. Although the two industries are similar, the analysis of the relationship between immaterial ESG sentiment and financial performance produces different results for the biotechnology and the pharmaceuticals industry. The regression results of the biotechnology industry show a significant positive relationship between the immaterial

ESG sentiment score and ROA and TQ (see Appendix, Table 14). However, the regression results of the pharmaceuticals industry show an insignificant relationship between the immaterial ESG sentiment score and ROA, OCFOA and TQ, and a significant negative correlation between the industry-specific immaterial ESG sentiment score and PTB (see Appendix, Table 15). Thus, the relationship between immaterial ESG and financial performance within the pharmaceuticals industry is in line with predictions based on previous literature, while the analysis shows contrary results within the biotechnology industry.

To identify the immaterial ESG issues driving the positive relationship between immaterial ESG and financial performance within the biotechnology industry, a further exploration of the relationship of specific ESG issues is needed. Clustering the immaterial issues by environmental, social and governance issues reveals a positive and significant correlation of the immaterial governance sentiment scores with all financial performance indicators (see Appendix, Table 18). Within the immaterial governance ESG issues the immaterial governance factor “legal regulation” stands out, as it shows a significant positive correlation with both market-based financial indicators (see Appendix, Table 19). Therefore, it can be identified as a factor that is potentially driving the positive correlation between immaterial ESG performance and financial performance in the biotechnology industry. The legal regulation score evaluates a company’s approach to lobbying and its reliance on favourable regulation.

Industry-specific market analyses support the finding that the issue of legal regulation plays an important role with financial implications in the business environment of the biotechnology industry. The approach to legal regulations and a company’s positioning towards regulatory stakeholders can be indicative of future performance opportunities in a volatile and innovative industry like biotechnology (Chui, Evers, Manyika, Zheng & Nisbet, 2020; Otto, Santagostino & Schrader, 2014). While the legal regulation sentiment score correlates positively with financial performance within the biotechnology industry, the same issue is insignificant for the pharmaceuticals industry (see Appendix, Table 20). Supporting literature shows that the pharmaceuticals industry is a more established industry in which a volatile regulation landscape is not to be expected (Chui et al., 2020). Potential explanations of the issue classification as immaterial, although these financial implications in the business environment of the biotechnology industry exist, are discussed further in section 5.1.

5 Discussion

5.1 Contributions to theory

Overall, the analysis results put two unexpected findings up for further discussion. ESG sentiment and accounting-based financial performance indicators are correlated as expected. Material ESG sentiment shows a positive relationship with profitability metrics, while the analysis of immaterial ESG sentiment and profitability produces insignificant results. However, the findings regarding market-based financial performance raise the following questions: First, how can the positive correlation between immaterial ESG sentiment and market-based financial performance be explained? And second, why is there no correlation between material ESG sentiment and market-based financial performance?

One potential explanation for the positive correlation of immaterial ESG and financial performance can be found by questioning the materiality classification. SASB's approach to generalize material topics across an industry assumes that industry-specific factors are highly relevant to assess the materiality of an issue. This assumption is still subject of scientific discussion (Kim & Lee, 2020; Kuh et al., 2020; Short, Ketchen, Palmer, & Hult, 2007). The inconclusive results of the industry-specific analysis in section 4.3, especially the mostly insignificant results when analysing the industry-specific material ESG issues and their impact on financial performance, provide further arguments to question this assumption. As the industry-specific materiality concept serves as an approach to simplify and generalize a company's materiality assessment, it does not take company-specific factors into account. However, Kim and Lee (2020) hypothesize that with a larger firm size and a broader range of stakeholders, company-specific ESG issues can gain importance over industry-specific material issues. Thus, an immaterial ESG issue that is financially material to one or several companies within an industry could be driving the positive correlation, while SASB does not classify it as material for the entire industry. For example, the issue of legal regulation significantly correlates with market-based financial performance of biotechnology companies but not that of pharmaceutical companies. As SASB combines the two industries into one in the materiality assessment, the legal regulation issue is not classified as material.

In addition, there are temporal dynamics that influence the materiality of an ESG issue. In detail, there may be ESG issues that are becoming increasingly financially material to companies within an industry, however this recent development is not yet reflected in the materiality classification. Long-term developments in the market environment can take a considerable amount of time to become financially material (Freiberg, Rogers & Serafeim, 2019). Therefore, an ESG issue may already impact financial performance, and forecasts may show that this impact will increase considering long-term market developments, without the ESG issue being currently classified as material. The regulatory reaction is considered the last step in the process towards an ESG issue becoming financially material (Freiberg et al., 2019). Taking the biotechnology industry as an example, latest technological advancements raised ethical and legal debates on topics such as cell therapy approaches or genetically modified crops (Chui et al., 2020). The legal positioning of countries on these issues affects a company's research and development, operation processes as well as business opportunities on end-consumer markets. Therefore, the issue of legal regulation is increasingly impacting the long-term outlook of a biotechnology company and becoming financially material (Chui et al., 2020). Applying Freiberg et al.'s (2019) concept of how ESG issues become material, the legal regulation issue may however still be in the early stages of becoming material and the market as well as regulators will take time to react.

Overall, SASB's classification of material issues imprecisely reflects the financially material issues of a company as it generalizes across industries and has significant limits in integrating long-term developments into the classification model. Even if these aspects may not hinder the application of SASB's concept of materiality in relation to disclosure requirements, it does have its limitations in the context of this analysis. These limitations supply one potential answer as to why immaterial ESG performance positively correlates with market-based financial performance indicators. However, the question remains as to why material issues show no correlation with market-based financial performance in this analysis and therefore do not seem to create long-term market value.

As stated in section 4.2, the analysis results do not support the hypothesis that the market value estimate already accounts for material ESG performance. The findings in previous literature based on portfolio studies (King & Pucker, 2022; Cornell & Damodaran, 2020) could not be reproduced in the present analysis using market-based

financial performance indicators. Further research is needed to be able to confirm these findings. For example, comparing the effect of score changes on the financial performance of industry leaders with that of industry laggards could provide further insights. Another explanation might be that investments to improve the material ESG performance focus on short-term financial gains while investments into immaterial issues may be differently motivated (Grewal et al., 2016). As material ESG activities can provide short-term financial advantages, managers may prioritize short-term value creation before a longer-term orientation when integrating material ESG issues into business strategy. Factors such as the availability of resources and the strength of certain stakeholders (Fu et al., 2019) influence managers' decision-making on ESG related investments. For example, investors may direct managers to focus on short-term performance through a variable compensation incentive scheme with short-term objectives (Busch, Bauer & Orlitzky, 2016; Laverty, 1996). However, extensively focussing resources on short-term performance can lead to missing investments into long-term performance opportunities (Eccles et al., 2014). A long-term perspective is a sign of effective management and has been proven to increase the impact ESG performance management has on a company's financial performance (Eccles et al., 2014; Flammer & Bansal, 2017). Without the potential for short-term financial gains, the internal or external pressures leading to investments into immaterial issues are unlikely to be motivated by direct financial benefits (Grewal et al., 2016). The findings of this study support the notion that immaterial ESG performance does not impact a company's accounting-based financial performance. Therefore, these immaterial ESG investments may be implemented with a stronger external stakeholder focus and a longer-term perspective, leading to indirect financial benefits such as stronger stakeholder relationships (Lev et al., 2010; Lozano et al., 2015), a better reputation and higher brand value (Perrini et al., 2011; Servaes & Tamayo, 2013).

Finally, the aspect of public attention may provide another potential explanation as to why immaterial ESG performance is positively correlated with market-based financial performance, while the same relationship is not found for material ESG performance. Grewal et al. (2016) propose that companies engage in immaterial ESG activities to distract from their performance on material ESG issues. Building on this idea, increasing public attention on corporate initiatives that decrease material negative impacts may not have a solely positive connotation for different groups of stakeholders. While

investor reactions towards positive material ESG news are found to be more positive than their reactions towards immaterial ESG news (Serafeim & Yoon, 2023), other external stakeholder groups with less previous knowledge of the company may react differently. Companies might bring new or an increased attention to negatively connotated issues that were not associated with the company before, by disclosing measures to reduce severe negative impacts resulting from their business operations. Unlike material ESG issues which are closely related to the company business model, immaterial ESG issues are not related to the direct negative impacts a company has on its environment and stakeholders. Additionally, immaterial ESG activities tend to require fewer financial resources and a shorter timeframe to achieve positive environmental and social impacts (Grewal et al., 2016). Therefore, advances in material ESG performance may lead to ambiguous stakeholder perceptions while the same advances in immaterial ESG performance have a clear positive connotation. The positive perception of immaterial issue performance may indirectly lead to financial benefits through its effect on stakeholder relationships and reputation. Following this line of reasoning, material ESG performance may not correlate significantly with market-based financial performance because stakeholders are critical of material ESG performance improvements as long as significant negative impacts remain.

Overall, the research field on the relationship between ESG and financial performance is large and growing. This analysis provides an addition to the exploration of mechanisms underlying the relationship between ESG and financial performance. In particular, the focus on immateriality as an area of interest is relatively new to the discussion. Research findings on the effect of immateriality on financial performance have so far not been consistent (Grewal et al., 2016; Khan et al., 2016; Serafeim & Yoon, 2023) and understanding the underlying mechanisms can contribute to explain potential conflicting findings. In this context, this analysis contributes to the field of research by positing that immaterial ESG issues can also influence the financial performance of a company, albeit in a different way than material ESG issues.

5.2 Practical implications

The results of this thesis have practical implications for regulators, investors and executives. The regulation landscape on non-financial disclosure is currently in the process of changing and the concept of materiality plays an important role in shaping new disclosure requirements (Edgley et al., 2015; EFRAG, n.d.; SASB, n.d. a). The presented findings highlight that SASB's concept of financial materiality may not accurately capture the indirect impact ESG issues can have on a company's financial performance. By including considerations of company-specific factors that may indirectly impact the financial materiality of ESG issues, the validity of a materiality classification can be improved. This has implications for the way regulators define financial materiality going forward. Instead of applying industry-wide disclosure regulations, regulators may need to let companies themselves assess which ESG issues are material to their business. The EU regulation on non-financial disclosure provides an example for the implementation of this idea, by basing the EU non-financial disclosure requirements on a company's audited materiality analysis (EFRAG, n.d).

Additionally, an improved understanding of financial materiality has relevant implications for investors. Researchers hypothesize that ESG investing does not show abnormal stock returns in recent studies because ESG performance information is widely available and integrating ESG issues into investment decisions is common practice (Cornell & Damodaran, 2020; King & Pucker, 2022). Based on the presented findings, investors might develop an investment strategy which integrates company-specific ESG issues that are considered immaterial at the industry-level. Expanding the industry-specific concept of materiality by identifying ESG issues that can indirectly create market value might be an investment strategy which provides a competitive advantage.

For executives, the presented findings indicate that ESG-related investment decisions do not need be material by the standard of industry-specific materiality assessments to provide future financial value. Performing a financial materiality assessment, which takes company-specific factors and potential indirect financial impacts of ESG performance into account, can provide executives with valuable guidance on ESG related strategy and decision making. In addition, the presented findings suggest that investments into material ESG issues do not necessarily have a positive impact on a company's market value. For executives this may imply that an in-depth analysis of the underlying mechanisms within the company's business environment is needed to be

able to ensure that ESG investments provide the maximal benefit. One important consideration to ensure the strategic relevance of ESG investments might be the company's most important stakeholder perceptions of ESG performance. The way executives choose to communicate ESG performance to internal and external stakeholders can be a determining factor in the strategic relevance of ESG performance. In this context understanding the influence of different stakeholder groups on the company's performance requires further research.

5.3 Limitations and future research

The potential implications and causal relationships resulting from the analysis results require further research to confirm their statistical robustness and to provide further evidence for the hypothesized underlying mechanisms. The analytical approach is limited due to factors such as the operationalization of ESG and financial performance as well as the choice of regression model presented in section 3. These limit the interpretation of the results and open opportunities for future research.

ESG sentiment data was used to operationalize ESG performance which depicts the public perception of ESG performance. As presented in section 3.2, this choice of operationalization affects the interpretation and implications to be considered, especially as factors such as public attention influence the public perception of ESG performance (Christophe & Lee, 2021; Serafeim & Yoon, 2023; Zhao et al., 2023). Although the regression model controls for differences in public attention across companies, limitations regarding the application of the analysis results towards overall ESG performance remain. Moreover, this analysis considers material and immaterial issues independently and compares their relationship to financial performance. In this context the sentiment data contains the risk that the material ESG sentiment score is more accurate than the immaterial ESG score. As material issues are considered to be more relevant, there is more information available on material issue performance than immaterial issue performance within the Truvalue Labs data sample (Kuh et al., 2020). Although the regression model controls for article volume, the Materiality and Immateriality scores may contain different levels of informative value. This approach of using ESG sentiment limits the comparability of the analysis results with studies using other

measures of operationalization. However, as any operationalization of ESG performance has advantages and disadvantages in its application, using ESG sentiment as a proxy for ESG performance can provide an additional perspective on the relationship between ESG and financial performance. Since stakeholder relationships are considered to be an important driver of the impact of ESG performance on financial performance, using stakeholder sentiment as a proxy for ESG performance provides opportunities to further explore the impact of stakeholders in this context.

Further research approaches could use the ESG sentiment data to explore the difference between outcome- and process-based ESG measures (as explained in section 2.2). For example, sorting the Truvalue Labs news events by outcome- and process-based information could provide insights into the different influence the two types of ESG information have on stakeholder sentiment and its effect on financial performance. Additionally, introducing the concept of materiality to this analysis could test the hypothesis that material ESG information is perceived more ambiguously than immaterial ESG information, as presented in section 5.1. Specifically, process-based information on material ESG performance could lead stakeholders to perceive a company more negatively because they become more aware of the company's direct negative environmental or social impacts. To confirm this hypothesis, an analysis could examine whether information on process-based material ESG performance is less highly evaluated than similar information on immaterial ESG performance.

Moreover, a deeper understanding of the different relationships between a firm and its specific stakeholders may enable conclusions on the mechanisms linking ESG and financial performance. Analysing the impact of ESG sentiments for different stakeholder groups individually could advance the understanding of how different stakeholders influence financial performance (as partly seen in Sassen et al., 2016). The Truvalue Labs sentiment data can potentially be used to implement this research approach. In the present analysis all stakeholder group sentiments were merged to one stakeholder sentiment score, however, the Truvalue Labs data sources could be differentiated by stakeholder groups. Additionally, the results could provide insights into materiality classifications, specifically, which stakeholders they serve, and which materiality classification approaches best identify financially material ESG issues.

In addition, further analyses are required to examine the effect of negative and positive ESG performance on financial performance separately. While positive and negative

ESG data were combined into one score in the present analysis approach, researchers theorize that positive and negative ESG performance events affect financial performance through different mechanisms (Kang et al., 2016; Price & Sun, 2017). Furthermore, the order in which positive and negative events occur influences their impact on financial performance (Kang et al., 2016). Cornell and Damodaran (2020) find that the absence of negative ESG-related impacts has a greater effect on financial performance than the positive ESG-related impacts. To further analyse these theories, the effect of ESG sentiment on financial performance could be separated into negative and positive ESG sentiments. Then, analysing how negative ESG sentiment affects financial performance as well as comparing the interactions between positive and negative sentiment effects would contribute to the understanding of the underlying mechanisms.

Additionally, the choice of financial performance indicator impacts the analysis results and their interpretation. There is a wide range of financial performance indicators that can be applied in the context of ESG and financial performance, capturing different concepts with certain advantages and disadvantages for the analysis. Accounting-based indicators are limited in their reflection of corporate financial performance as they are based on historical data (Galant & Cadez, 2017) and are subject to balancing adjustments (Gibbs et al., 2023). Market-based indicators can be determined by a wide range of external influential factors (Galant & Cadez, 2017; McGuire et al., 1988) which impedes clear effect attributions. There are further opportunities for future research to identify financial performance measures that are more directly linked to a specific mechanism underlying the relationship between ESG and financial performance. For example, measuring the level of provisions related to the potential costs of negative environmental and social impacts could provide a direct measure of risk exposure, at least in certain industries.

The external validity of the study results is limited as the data set is restricted to large, publicly traded companies in developed economies. This subset of companies is exposed to similar environmental and societal pressures which largely influence the relationship of ESG and financial performance (Friede et al., 2015; Galant & Cadez, 2017). The results are therefore not representative for small- and medium-sized companies or for companies in emerging markets due to their different market environments (Friede et al., 2015). In this regard, it is also important to consider potential omitted control variables. Additional factors, such as the level of R&D intensity (Fu,

Boehe & Orlitzky, 2020) or the level of advertising expenses (Serafeim & Yoon, 2023) may influence ESG performance and its relationship with financial performance.

In addition to further control variables, the regression model applied in this analysis could be adapted in future research approaches. This analysis uses a linear regression model, however, a non-linear relationship of ESG and financial performance is also hypothesised (Nickerson et al., 2022; Salzmann et al., 2005). Potential non-linear relationships of ESG performance and financial performance were not introduced in the model. The application of a linear model on potentially non-linear relationships may impact the effect size as well as significance levels. Furthermore, the exploration of industry-specific driving factors and the in-depth analysis of the biotechnology and the pharmaceuticals industry were limited to a preliminary, superficial ESG issue analysis. The analysis does not account for interactions between ESG issues and industry-specific influencing factors. Therefore, section 4.3 should merely be regarded as an identification of surface level trends that require more in-depth industry-specific research.

As a final limitation of the results, the presented findings representing the relationship of ESG and financial performance are subject to an endogeneity bias, as an effect of financial performance on ESG performance cannot be ruled out. Especially in the context of immaterial issues, a financially well-performing company can be more likely to invest into ESG issues (Christophe & Lee, 2021). The presented analysis results merely represent correlations that support certain theories on a causal relationship. However, in support of the hypothesized effect direction, there are first implications that the effect of financial performance on ESG performance is not supported by scientific findings (Kang et al., 2016; Wang et al., 2016). Lagging the ESG data to decrease the endogeneity bias was not implemented in this analysis due to data constraints. However, previous studies find little difference in the results from introducing a time lag (Lo & Sheu, 2007; Orlitzky et al., 2003). An enhanced understanding of the mechanisms underlying the relationship between ESG and financial performance, by exploring the research approaches presented above, will provide further evidence of the potentially causal relationship.

6 Conclusion

This thesis analyses the relationship between ESG and financial performance while distinguishing between material and immaterial ESG performance. Scientific literature describes a multitude of mechanisms that directly and indirectly link ESG and financial performance. ESG performance is found to improve operational efficiency, reduce risk exposure and strengthen a company's relationship with its stakeholders and therefore positively impacts financial performance. As ESG performance encompasses a large variety of issues, the concept of financial materiality is introduced to identify those ESG issues that are financially relevant in a business environment by industry. Previous studies find that material ESG issues positively impact financial performance, while the impact of immaterial ESG issues remains unclear. This research gap is explored in this thesis using a linear regression analysis of ESG sentiment data and accounting- and market-based financial performance measures of over 2,200 North American companies. The results indicate that immaterial ESG issues positively impact financial performance - but in a different way to material issues. Material and immaterial ESG sentiment correlates with accounting-based financial performance indicators as expected. However, the results show no positive correlation between material ESG performance and market-based financial performance. Conversely, immaterial ESG sentiment positively correlates with market-based financial performance.

There are several potential explanations for these findings. The results indicate that the application of SASB's industry-specific materiality classification does not adequately reflect the financial materiality of ESG issues in this research context. These limitations result from an oversimplification through the industry-specific grouping of ESG issues and a limited reflection of dynamic changes in the business environment. Especially, since an additional analysis of industry-specific trends was inconclusive, finding a concept of financial materiality which provides a more accurate classification leaves room for future research. Additionally, material ESG-related investments are more likely to be focussed around providing direct financial benefits than immaterial ESG-related investments. This emphasis on short-term financial benefits may inhibit material ESG activities from creating long-term market value. Stakeholder perceptions are another factor that potentially inhibits the financial impact of material ESG performance. Stakeholders may perceive disclosures related to material ESG issues more critically, as they bring attention to the remaining negative environmental and social

impacts. The study results contribute to an improved understanding of financial materiality which has implications for regulators as well as the strategic decisions of investors and executives. The findings provide ample opportunity for future research into the mechanisms underlying the relationship between ESG and financial performance.

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8 Appendix

Table 6: Distribution of SASB industries

SICS Industry	Freq.	Percent	Cum.
Advertising & Marketing	69	0.39	0.39
Aerospace & Defence	270	1.54	1.94
Agricultural Products	95	0.54	2.48
Air Freight & Logistics	114	0.65	3.13
Airlines	94	0.54	3.66
Alcoholic Beverages	74	0.42	4.09
Apparel, Accessories & Footwear	518	2.96	7.04
Appliance Manufacturing	61	0.35	7.39
Asset Management & Custody Activities	224	1.28	8.67
Auto Parts	214	1.22	9.89
Automobiles	87	0.50	10.39
Biofuels	21	0.12	10.51
Biotechnology	691	3.94	14.45
Building Products & Furnishings	188	1.07	15.53
Cable & Satellite	41	0.23	15.76
Casinos & Gaming	117	0.67	16.43
Chemicals	429	2.45	18.88
Coal Operations	13	0.07	18.95
Commercial Banks	51	0.29	19.24
Construction Materials	136	0.78	20.02
Consumer Finance	244	1.39	21.41
Containers & Packaging	188	1.07	22.48
Cruise Lines	4	0.02	22.51
Drug Retailers & Convenience Stores	40	0.23	22.74
Education	68	0.39	23.12
Electric Utilities	493	2.81	25.94
Electrical & Electronic Equipment	458	2.61	28.55
Electronic Manufacturing Services & Original Design Manufacturing	101	0.58	29.13
Engineering & Construction Services	309	1.76	30.89
E-Commerce	96	0.55	31.44
Food Retailers & Distributors	144	0.82	32.26
Forestry & Logging	2	0.01	32.27
Fuel Cells & Industrial Batteries	32	0.18	32.46
Gas Utilities	120	0.68	33.14
Hardware	832	4.75	37.89
Health Care Delivery	294	1.68	39.57
Health Care Distributors	72	0.41	39.98
Home Builders	132	0.75	40.73
Hotels & Lodging	54	0.31	41.04
Household & Personal Products	168	0.96	42.00
Industrial Machinery & Goods	1028	5.87	47.87
Insurance	411	2.35	50.21
Internet Media & Services	208	1.19	51.40
Investment Banking & Brokerage	149	0.85	52.25
Iron & Steel Producers	136	0.78	53.03
Leisure Facilities	157	0.90	53.92
Managed Care	128	0.73	54.65
Marine Transportation	29	0.17	54.82
Meat, Poultry & Dairy	76	0.43	55.25
Media Production & Distribution	238	1.36	56.61
Medical Equipment & Supplies	910	5.19	61.81
Metals & Mining	158	0.90	62.71
Mortgage Finance	85	0.49	63.19

Multiline and Specialty Retailers & Distributors	646	3.69	66.88
Non-Alcoholic Beverages	72	0.41	67.29
Oil & Gas - Exploration & Production	287	1.64	68.93
Oil & Gas - Midstream	69	0.39	69.32
Oil & Gas - Refining & Marketing	92	0.53	69.85
Oil & Gas - Services	201	1.15	71.00
Pharmaceuticals	764	4.36	75.36
Processed Foods	237	1.35	76.71
Professional Services	585	3.34	80.05
Pulp & Paper Products	23	0.13	80.18
Rail Transportation	49	0.28	80.46
Real Estate Owners, Developers & Investment Trusts	71	0.41	80.87
Real Estate Services	39	0.22	81.09
Restaurants	318	1.82	82.90
Road Transportation	139	0.79	83.70
Security & Commodity Exchanges	46	0.26	83.96
Semiconductors	740	4.22	88.18
Software & IT Services	1464	8.36	96.54
Solar Energy	41	0.23	96.77
Telecommunications	262	1.50	98.27
Tobacco	39	0.22	98.49
Toys & Sporting Goods	45	0.26	98.75
Waste Management	129	0.74	99.49
Water Utilities	79	0.45	99.94
Wind Energy	11	0.06	100.00
Total	17519	100.00	

Table 7: Descriptive statistics of pulse score categories

Variable	Obs	Mean	Std. Dev.	Min	Max
All categories pulse	17519	54.1513	16.1691	.4254	99.8485
Material categories pulse	16202	55.1456	17.9772	.1093	100
Access afford pulse	7053	52.4133	16.3876	.567	99.69
Air quality pulse	4144	41.7459	15.8844	1.0491	99.003
Business ethics pulse	11749	36.9744	15.7527	.311	98.3582
Business model pulse	2664	52.2281	19.7487	.239	99.935
Competitive pulse	7444	40.6438	16.786	.04	98.276
Critical risk pulse	5348	48.2919	18.115	.3079	99.111
Customer privacy pulse	4464	59.9677	17.9665	.4905	100
Customer welfare pulse	5120	59.5794	17.1779	1.729	99.834
Data security pulse	7433	43.176	16.8202	.345	99.0292
Ecological pulse	6562	53.5522	17.2082	.3694	99.6797
Employee engagement pulse	9010	59.8714	17.5857	.4268	99.848
Employee health pulse	8476	60.5164	20.4528	.2741	99.9975
Energy pulse	9073	67.7147	14.0587	8.7339	99.953
GHG emissions pulse	8958	62.4731	13.9741	1.9155	99.99
Human rights pulse	3246	43.3036	15.4839	.126	99.592
Labor practices pulse	10201	49.512	16.5179	.1584	99.792
Legal regulation pulse	7568	58.8015	18.9149	.327	99.9867
Material sourcing pulse	4827	54.1344	16.5906	1.426	99.454
Climate change pulse	3034	38.5027	19.4546	.04	98.585
Product lifecycle pulse	8568	65.3651	14.7205	2.248	99.979
Product quality pulse	9406	50.0541	14.4526	.2811	98.581
Selling practices pulse	6422	38.6983	17.1217	.052	98.5062
Supply chain pulse	10119	59.7579	15.432	.0052	99.9993
Systemic risk pulse	1049	50.5551	14.4706	7.8419	97.6
Hazardous materials pulse	4822	46.9528	17.3046	.035	99.619
Water wastewater pulse	6191	45.8019	17.9525	.015	99.271

Table 8: Pairwise correlations environmental factors

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Materiality Score	1.000							
(2) Immateriality Score	0.134	1.000						
(3) GHG emissions Score	0.186	0.187	1.000					
(4) Air quality pulse	0.186	0.238	0.087	1.000				
(5) Energy pulse	0.214	0.117	0.014	-0.008	1.000			
(6) Hazardous materials pulse	0.290	0.283	0.064	0.079	0.082	1.000		
(7) Water wastewater pulse	0.272	0.305	0.010	0.103	0.048	0.189	1.000	
(8) Ecological pulse	0.167	0.358	0.008	0.034	0.062	0.122	0.203	1.000

Table 9: Pairwise correlations social factors

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Materiality Score	1.000											
(2) Immateriality Score	0.134	1.000										
(3) Human rights pulse	0.154	0.279	1.000									
(4) Customer privacy pulse	0.237	0.279	-0.051	1.000								
(5) Data security pulse	0.272	0.246	-0.054	0.128	1.000							
(6) Access afford pulse	0.269	0.193	0.104	-0.005	-0.070	1.000						
(7) Product quality pulse	0.290	0.147	0.064	0.017	-0.002	0.034	1.000					
(8) Customer welfare pulse	0.176	0.199	0.019	-0.011	0.066	0.045	0.030	1.000				
(9) Selling practices pulse	0.179	0.282	0.115	0.031	0.035	-0.007	0.057	0.005	1.000			
(10) Labor practices pulse	0.101	0.398	-0.026	0.057	0.041	0.014	-0.018	-0.045	0.040	1.000		
(11) Employee engagement pulse	0.232	0.348	0.059	0.047	0.049	0.043	0.016	-0.053	0.073	0.161	1.000	
(12) Employee health pulse	0.279	0.342	0.059	0.037	-0.012	0.065	0.037	-0.017	-0.008	0.099	0.121	1.000

Table 10: Pairwise correlations governance factors

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Materiality Score	1.000											
(2) Immateriality Score	0.134	1.000										
(3) Product lifecycle pulse	0.390	0.193	1.000									
(4) Business model pulse	0.165	0.167	-0.184	1.000								
(5) Supply chain pulse	0.209	0.267	0.027	0.007	1.000							
(6) Material sourcing pulse	0.288	0.187	0.034	-0.051	0.040	1.000						
(7) Climate change pulse	0.234	0.257	0.056	0.081	-0.009	0.023	1.000					
(8) Business ethics pulse	0.173	0.286	0.003	0.056	0.047	0.027	-0.025	1.000				
(9) Competitive pulse	0.115	0.348	0.059	0.036	0.039	0.030	0.016	0.069	1.000			
(10) Legal regulation pulse	0.065	0.389	0.009	0.057	0.022	0.010	-0.039	0.026	0.019	1.000		
(11) Critical risk pulse	0.241	0.301	0.077	-0.011	0.049	0.059	0.054	-0.003	0.025	0.027	1.000	
(12) Systemic risk pulse	0.221	0.068	-0.029	0.019	-0.044	0.019	0.091	-0.084	0.010	0.040	0.019	1.000

Table 11: Regression of the All-Categories score change on financial performance

		(1)	(2)	(3)	(4)
		ROA	OCFOA	TQ	PTB
Overall Score	Momentum	.0002	.0002	.078	-.0005
		(.0002)	(.0002)	(.0579)	(.0049)
Firm Size		.0463***	.0629***	.0129	-1.8416***
		(.0065)	(.0077)	(.4912)	(.1409)
Leverage		-.1007***	-.1712***	-3.5665***	16.5553***
		(.0185)	(.0267)	(.7333)	(.7468)
Attention		-.0075***	-.0095***	-.9746	-.2011***
		(.0015)	(.0016)	(.7908)	(.059)
Time Dummy		Yes	Yes	Yes	Yes
Firm Dummy		Yes	Yes	Yes	Yes
Industry Dummy		Yes	Yes	Yes	Yes
Observations		17443	17443	17443	17443
R-squared		.8077	.7152	.3159	.6701

Note: Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Table 12: Regression of the Material score change on financial performance

		(1)	(2)	(3)	(4)
		ROA	OCFOA	TQ	PTB
Materiality Score	Momentum	0	.0002**	.0479	-.0013
		(.0001)	(.0001)	(.0413)	(.003)
Firm Size		.0445***	.0641***	.0286	-1.9584***
		(.007)	(.0084)	(.5484)	(.1516)
Leverage		-.0996***	-.178***	-3.6941***	17.0868***
		(.0192)	(.0287)	(.7921)	(.7763)
Attention		-.0074***	-.0094***	-1.118	-.2168***
		(.0015)	(.0017)	(.8773)	(.0631)
Time Dummy		Yes	Yes	Yes	Yes
Firm Dummy		Yes	Yes	Yes	Yes
Industry Dummy		Yes	Yes	Yes	Yes
Observations		15961	15961	15961	15961
R-squared		.817	.7245	.3157	.6769

Note: Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Table 13: Regression of the Immaterial score change on financial performance

		(1) ROA	(2) OCFOA	(3) TQ	(4) PTB
Immateriality Score	Momentum	.0003**	-.0001	.0137**	.0036
		(.0001)	(.0001)	(.0058)	(.0045)
Firm Size		.0308***	.0385***	-.2535	-1.8115***
		(.0049)	(.0071)	(.1569)	(.1466)
Leverage		-.087***	-.1316***	-3.04***	16.9798***
		(.0173)	(.017)	(.4779)	(.8297)
Attention		-.0078***	-.0078***	-.22***	-.1844***
		(.0013)	(.0016)	(.0631)	(.0602)
Time Dummy		Yes	Yes	Yes	Yes
Firm Dummy		Yes	Yes	Yes	Yes
Industry Dummy		Yes	Yes	Yes	Yes
Observations		16141	16141	16141	16141
R-squared		.821	.7361	.8157	.6747

Note: Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Table 14: Regression of the Biotechnology Immateriality score on financial performance

	(1) ROA	(2) OCFOA	(3) TQ	(4) PTB
Immateriality Score	.0031*	.0008	.0683***	.0892
	(.0018)	(.0017)	(.0264)	(.0554)
Firm Size	.0724*	.1262*	.7339***	-2.0447***
	(.04)	(.0687)	(.2645)	(.6314)
Leverage	-.0256	-.1748**	-.8167	21.5567***
	(.0839)	(.0806)	(.5358)	(3.0368)
Attention	.0103	-.0064	-.2446	-.3496
	(.0151)	(.0167)	(.1805)	(.4201)
Time Dummy	Yes	Yes	Yes	Yes
Firm Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes
Observations	539	539	539	539
R-squared	.7132	.614	.5692	.6546

Note: Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Table 15: Regression of the Pharmaceuticals Immateriality score on financial performance

	(1) ROA	(2) OCFOA	(3) TQ	(4) PTB
Immateriality Score	-.0013 (.0019)	.0012 (.002)	.0069 (.0337)	-.0923** (.0458)
Firm Size	.1843*** (.0257)	.2715*** (.0446)	.3488 (.3471)	-2.2685*** (.6035)
Leverage	.0444 (.0821)	-.0274 (.0887)	-2.4557*** (.8013)	21.2841*** (2.3957)
Attention	-.032** (.0151)	-.0224 (.0168)	-.5762** (.2245)	-.9334** (.4107)
Time Dummy	Yes	Yes	Yes	Yes
Firm Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes
Observations	528	528	528	528
R-squared	.8264	.7269	.562	.7206

Note: Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Table 16: Regression of the Biotechnology Immaterial-environmental-issues score on financial performance

	(1) ROA	(2) OCFOA	(3) TQ	(4) PTB
Immaterial Environ- mental Issues Score	-.0003 (.0014)	-.0003 (.0013)	-.002 (.0158)	.0413 (.0469)
Firm Size	.1018*** (.0316)	.1769*** (.0281)	.1546 (.4477)	-4.2135*** (1.1293)
Leverage	-.0423 (.1258)	-.1069 (.0957)	-1.3335* (.7507)	28.6418*** (3.1069)
Attention	-.0002 (.0149)	-.0175 (.0151)	-.2518 (.2187)	-.6909 (.4958)
Time Dummy	Yes	Yes	Yes	Yes
Firm Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes
Observations	327	327	327	327
R-squared	.7961	.7574	.6244	.7268

Note: Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Table 17: Regression of the Biotechnology Immaterial-social-issues score on financial performance

	(1) ROA	(2) OCFOA	(3) TQ	(4) PTB
Immaterial Social Issues Score	-.0021 (.0016)	-.0014 (.0016)	.0106 (.0185)	-.0069 (.043)
Firm Size	.057 (.0537)	.0513 (.0793)	.4345* (.246)	-3.3348*** (.7998)
Leverage	-.0459 (.1032)	-.1871* (.1013)	-.9228 (.6021)	25.6886*** (2.9044)
Attention	.0237 (.0163)	.017 (.0172)	-.2787 (.2027)	-.3652 (.4316)
Time Dummy	Yes	Yes	Yes	Yes
Firm Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes
Observations	387	387	387	387
R-squared	.7698	.6581	.6121	.71

Note: Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Table 18: Regression of the Biotechnology Immaterial-governance-issues score on financial performance

	(1) ROA	(2) OCFOA	(3) TQ	(4) PTB
Immaterial Governance Issues Score	.004** (.0017)	.0027* (.0014)	.0398*** (.014)	.1125*** (.0417)
Firm Size	.1712*** (.0348)	.27*** (.0515)	1.2349*** (.3849)	-1.1515 (.8429)
Leverage	.084 (.1154)	-.0329 (.0874)	.4301 (.5541)	25.8267*** (4.5647)
Attention	-.0163 (.0189)	-.0252 (.0209)	-.0298 (.1906)	-.3432 (.5497)
Time Dummy	Yes	Yes	Yes	Yes
Firm Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes
Observations	352	352	352	352
R-squared	.7345	.7131	.5859	.6783

Note: Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Table 19: Regression of the Biotechnology Legal Regulation score on financial performance

	(1) ROA	(2) OCFOA	(3) TQ	(4) PTB
Legal Regulation Pulse Score	0	.0003	.0217**	.1187***
	(.0013)	(.0012)	(.0091)	(.039)
Firm Size	.0918**	.2454***	.0813	-2.1448*
	(.0358)	(.0761)	(.2976)	(1.174)
Leverage	-.0682	-.2359**	1.6533*	32.5631***
	(.0994)	(.0969)	(.9848)	(5.136)
Attention	-.0111	-.0034	-.2341	-1.4159***
	(.0199)	(.0244)	(.2138)	(.5413)
Time Dummy	Yes	Yes	Yes	Yes
Firm Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes
Observations	215	215	215	215
R-squared	.8033	.7569	.6026	.6923

Note: Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Table 20: Regression of the Pharmaceuticals Legal Regulation score on financial performance

	(1) ROA	(2) OCFOA	(3) TQ	(4) PTB
Legal Regulation Pulse Score	.0006	.0008	0	.0184
	(.0008)	(.0006)	(.0043)	(.0166)
Firm Size	.0905**	.1422***	.148	-1.9772***
	(.0409)	(.0429)	(.3242)	(.5633)
Leverage	-.0124	.0863	-3.2028	12.8443***
	(.1706)	(.1156)	(2.3629)	(3.0556)
Attention	.0306**	.0286*	-.0269	-.2402
	(.0146)	(.0162)	(.1134)	(.3048)
Time Dummy	Yes	Yes	Yes	Yes
Firm Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes
Observations	183	183	183	183
R-squared	.7886	.744	.4465	.8009

Note: Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

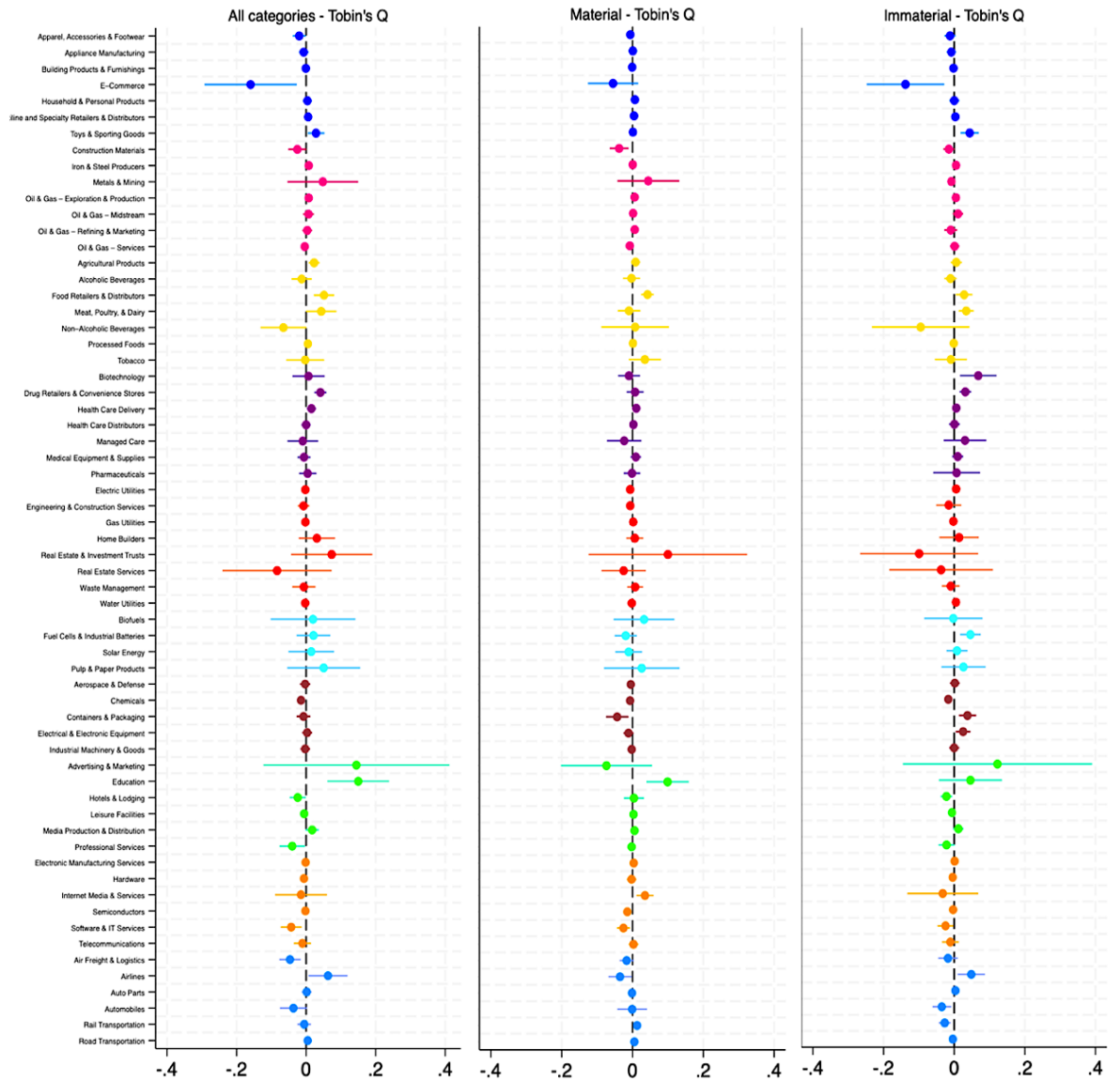


Figure 2: Regression coefficients of ESG performance and TQ by industry

Note: This plot does not show 11 industries (Cable & Satellite, Restaurants, Casinos & Gaming, Marine Transportation and all industries within the Finance sector) for illustration purposes.

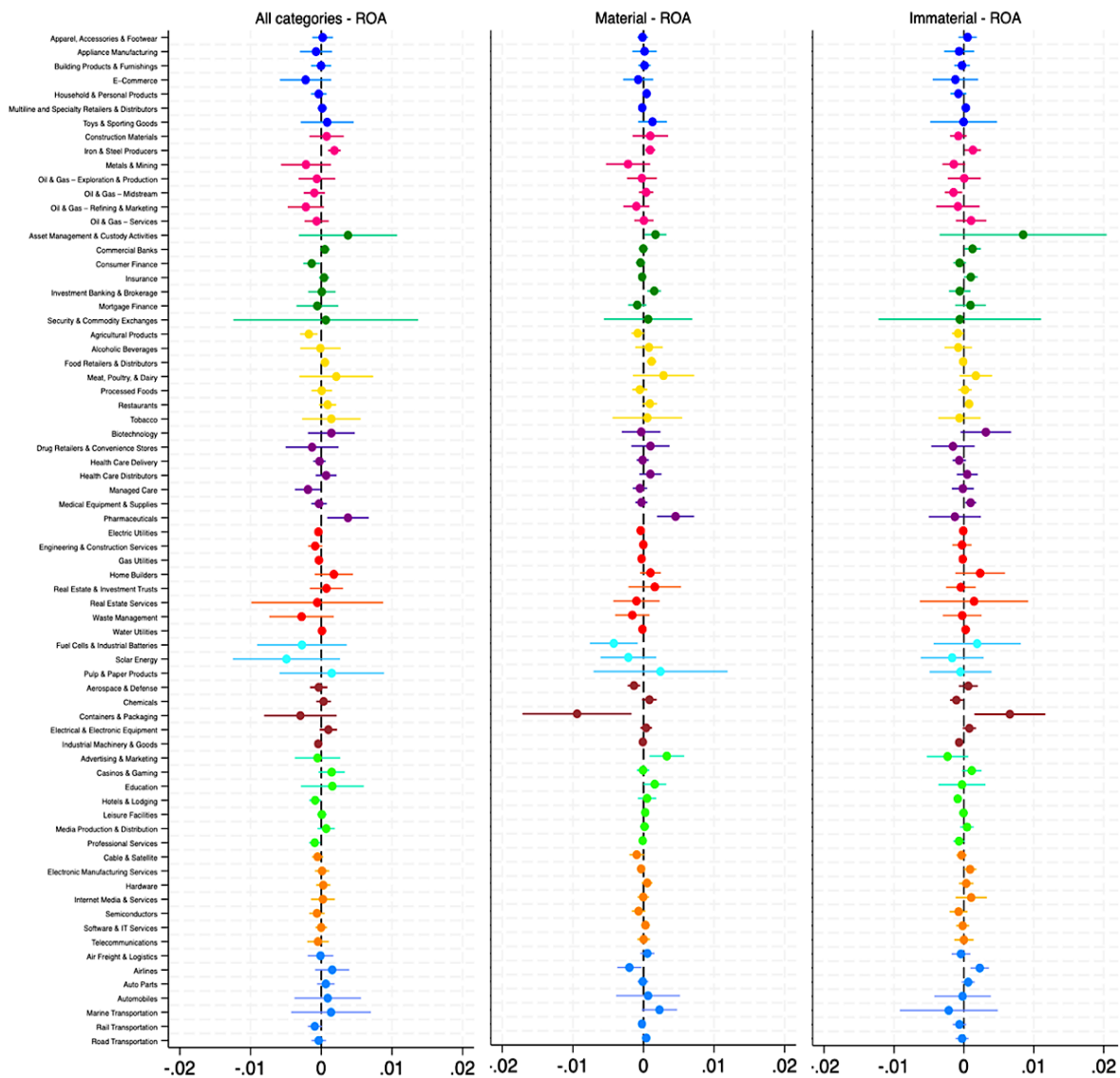


Figure 3: Regression coefficients of ESG performance and ROA by industry

Note: This plot does not show 2 industries (Non-Alcoholic Beverages, Biofuels) for illustration purposes.

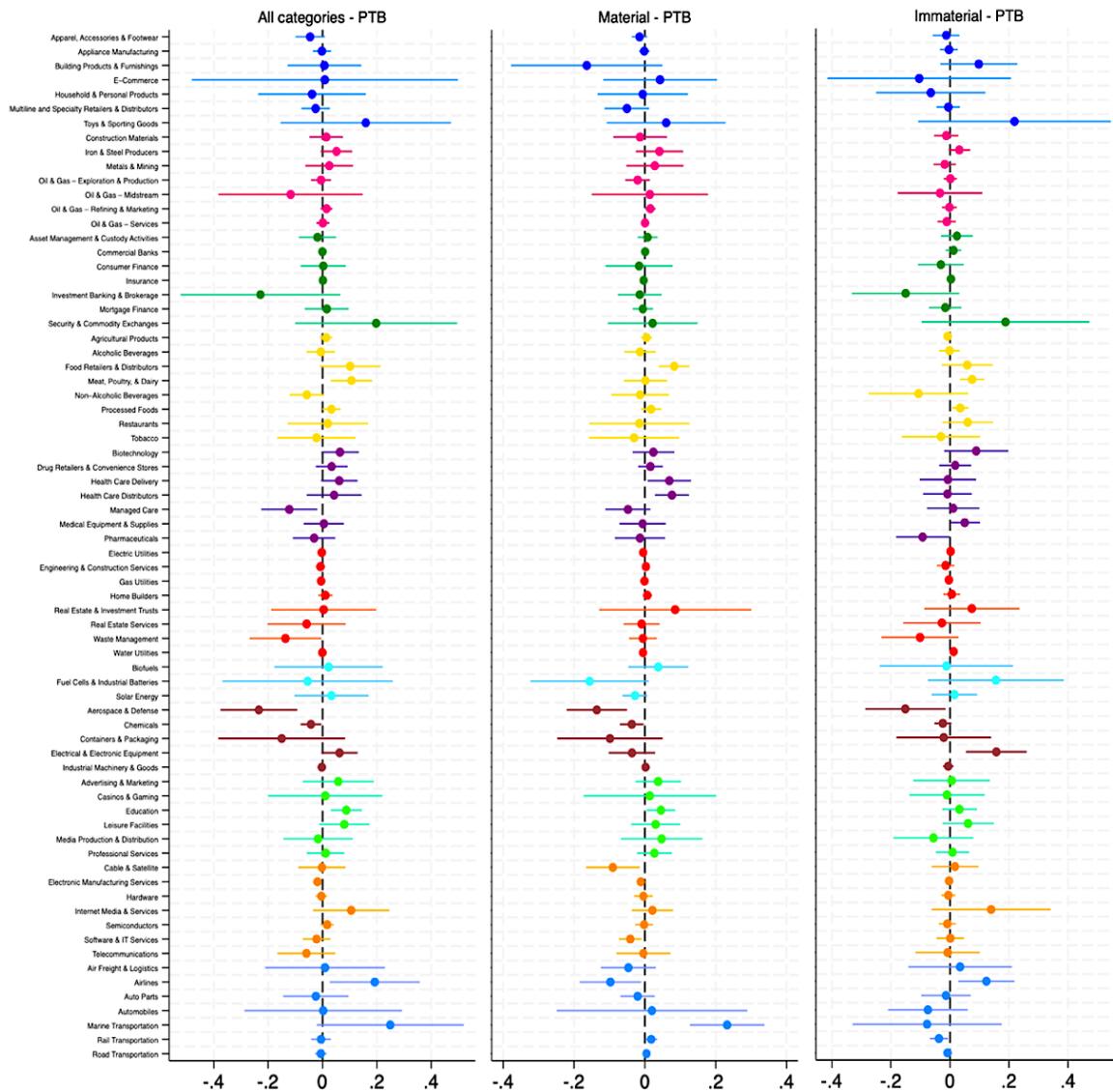


Figure 4: Regression coefficients of ESG performance and PTB by industry

Note: This plot does not show 2 industries (Pulp & Paper Products, Hotels & Lodging) for illustration purposes.

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