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ESG and firm performance

"The Impact of Aggregate ESG and Individual Environmental, Social, and Governance Scores on Firm Performance"

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ABSTRACT:
This study examines the correlation between ESG performance and firm value with special emphasis on the difference between overall ESG measures and ESG pillars. The analysis is conducted on a panel dataset of 186 S&P 500 firms between 2014 and 2024 and assumes the utilisation of fixed effects regression models in order to address heterogeneity of firms. The empirical model is furthered to incorporate firm-level financial variables, time variations, and crisis-specific variables to give a more detailed picture of the ESG-firm value relationship.

The results show that the aggregate ESG performance positively and statistically significantly influences firm value, as indicated by the Q of Tobin, but the impact is economically small. The disaggregation of ESG shows that the social (S) pillar is the main determinant of firm value, and the environmental (E) and governance (G) dimensions do not have statistically significant impacts. Also, the extended control variables are included, which indicates that profitability (ROA) has a positive and significant effect on the firm value, and leverage has a negative and significant effect. The statistical significance of firm growth is not found, and further suggests that growth does not always yield immediate valuation increases.

Further examination with crisis conditions added shows that the COVID-19 period positively and statistically significantly affected firm value, which is indicative of broader market dynamics in this period. Nevertheless, there is no statistical significance between the growth and the crisis, which implies that the association between growth and firm value is maintained under various economic environments. These results indicate that external shocks have an effect on the overall firm valuation, but they do not have a significant impact on the role of firm-specific growth dynamics.

Altogether, the findings emphasize that ESG cannot be viewed as a uniform concept since the value is not equally relevant across dimensions. The strong emphasis of the social pillar highlights the relevance of stakeholder participation, corporate image, and trust in determining the market valuation. This research has added to the literature by providing a more detailed and holistic view of the firm value determinants by combining ESG measures with firm-level financial and crisis-related factors. The results have significant implications for investors, corporate managers and policymakers, by highlighting that sustainable practices, in addition to the financial basics, are paramount in the performance of firms.

KEYWORDS: ESG performance, Environmental, Social and Governance (ESG) pillars, ROA (Return on Assets), Tobin's Q, ESG disclosure, financial performance, Firm value.

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1. INTRODUCTION

Corporate finance and investment decision-making have been focusing on the Environmental, Social and Governance (ESG) factors in recent few years. The companies are no longer evaluated based on their financial performance, but rather more on how they handle the environmental risks, their social responsibility as well as their governance system. This change can be used as a reflection of wider shifts in the requirements of regulation, need of investors and social requirements of corporate responsibility.

Although ESG has gained popularity in the recent past, its economic implications are highly controversial. In a conventional model of shareholders, companies should strive to optimise the value of the shareholders, and the ESG engagements can be regarded as unnecessary costs of achieving this goal (Friedman, 1970). However, instead, the stakeholder theory argues that companies that engage in ESG can potentially increase the long-term value by creating a healthier relationship with the most important stakeholders, diminishing the information asymmetry, and minimising the impact of non-financial risks (Freeman, 1984). These contrary theoretical ways demonstrate a contradiction in the nature of the understanding of whether the ESG engagement generates or destroys the value of firms.

This non-clarity of theory is expressed in empirical research. According to many sources, the ESG performance is positively correlated with the firm value, which is explained by the fact that the firms are more characterised by improved reputation, greater trust of stakeholders and improved risk management (Orlitzky et al., 2003; Deng et al., 2013). Nevertheless, in the other literature, both neutral or even negative returns are also documented, and it is believed that ESG investments may be associated with extra expenditures or may signify managerial self-interest as opposed to value-maximising behaviour (Krueger, 2015). Interestingly, these ambivalent findings imply that the ESG-performance association is not universal and that measurement tools, institutional settings, and other firm-specific attributes can have an impact on it.

Such inconsistencies are better explained in recent literature in the sense that it identifies the shortcomings of the aggregate ESG measures and non-linear and context-specific effects. In particular, the fact that ESG ratings are highly diverse across providers, establishing measurement noise (Berg et al., 2022), and that ESG pillars impact firm performance in mixed ways (Mashayekhi et al., 2024) illustrate that ESG is a heterogeneous concept that is different across providers. In addition, Ersoy et al. (2022) mention that the ESG-performance relationships may be non-linear, which means that the impact of ESG varies according to the level of investment and firm-specific conditions.

The aggregation of the environmental, social, and governance factors into a single index is one of the key drawbacks of the existing research. These measures may provide a simplistic perspective of the sustainability performance, but could conceal wide differences in each of the individual ESG measures.

Moreover, the lack of consensus in the literature is also affected by discrepancies in the measurement of the performance of the firms. Other studies are based on accounting-based indicators as compared to other studies based on market-based indicators like the Tobin's Q, which are the expectations of future growth and sustainability by the investors. Such methodological differences make the comparisons of the studies difficult and the explanation of the empirical findings difficult.

Here, it is against this backdrop that the current study will attempt to provide a refined perspective on the relationship between ESG-firm value by looking at aggregate ESG scores and looking at the individual pillars of ESG separately. The article is anchored on a S&P 500 companies panel study of 2014-2024, to use the market-based measure of firm value, the Tobin Q, to show a forward-looking perception as an investor.

This research study contributes to the body of literature in three ways. First, it can be used to address potential bias because of the usage of composite ESG indices. Second,

it enhances comparability by using a similar market-based measure of performance. Third, it provides evidence, which is based on a vast sample of firms that can work in a developed capital market over the long-run.

In general, the paper is supposed to bring the contradictory findings available in the literature to a compromise and provide more tangible findings on the impact of the various dimensions of ESG performance on the firm value.

1.1. Research Gap

The current literature still has some major flaws, but the research on ESG-related questions has become extremely rapid.

First, most of the studies rely on aggregate ESG scores, which are a combination of environmental, social, and governance factors into a single index. Although this approach is an easier way of measuring sustainability performance, the assumption made is that each of the ESG factors impacts the firm value equally. This supposition could be limiting because all the pillars of ESG will probably affect the performance of the companies differently. Consequently, the homogenous impact of the environmental, social, and governance dimensions may be hidden with the help of aggregate scores.

Second, the earlier study has covered a lot of firm performance indicators (accounting and market-based). This inconsistency restricts the ability to compare the studies and to achieve the inconsistency of empirical data. Specifically, not every research article can adequately isolate retrogressive accounting signals and progressive market-based signals like the Tobin's Q, which are signatory of investor anticipations of future performance.

Third, despite the increased ESG research, there is a lack of evidence that has numerous firms operating in advanced capital markets, and the time frame is extensive. Very

numerous studies use shorter periods or regions, and this limits the capturing of long-term ESG effects and limits the generalisability of generalised results.

Such restrictions imply that it is necessary to possess a superior empirical design that is capable of isolating the aggregate and disaggregated ESG indicators, with stable per-per-formance benchmarks, and with long-term panel data of developed markets.

1.2. Research Objective

The primary aim of the research is to empirically test the relationship between the ESG score and firm value by looking at both the aggregate ESG score and individual environmental, social and governance pillars. The sample includes 186 S&P 500-listed U.S. companies from 2014-2024.

Refinitiv, a popular source of corporate sustainability ratings, was used as a source of ESG data, and firm-level data, such as that of Tobin's Q, was provided by Bloomberg. The primary measure of firm value is the Q of Tobin since it takes into account the future growth and sustainability of a firm, as anticipated by the market. The study will assist in determining the elements that contribute to a greater value and sustainability of the firm by breaking down the aggregate ESG score into the performance of the separate ESG pillars.

1.3. Development of Hypotheses

The relationship between the ESG performance and the value of the firm is not clear in theory and practice. The conflicting nature of theoretical approaches and the inconsistency of the empirical evidence indicate that ESG engagement can have a positive or a negative impact on the company value, based on the implied mechanism and the contextual factors.

According to a stakeholder theory, the ESG engagement should add value to the firms, which will contribute to the improvement of the relations with the key stakeholders and raise the corporate image, as well as decrease the information asymmetry (Freeman, 1984; Orlitzky et al., 2003; Deng et al., 2013). Similarly, the resource-based view suggests that the ESG-related capabilities, which encompass innovation and reputation, could be regarded as the strategic resources that could be leveraged in developing the long-term competitive advantage.

In its turn, the agency theory underlines that the ESG investments could be related to the self-interest of the managers rather than the value-maximising practices (Jensen and Meckling, 1976; Krueger, 2015). When this happens, the ESG engagement can lead to the escalation of operational expenses that do not yield adequate financial returns that can reduce the value of the firms.

Considering these rebuttals, the general impact of ESG performance on firm value is a question for empirical studies. Though much literature indicates that ESG performance is positively associated with firm value, as new evidence has demonstrated, this relation can be heterogeneous, non-linear, and situation-specific. The relationship direction that is likely to occur is, therefore, an empirical question. These suppositions are probed within a broader framework of mixed and contextualised empirical facts, but there exists a positive correlation in the above literature.

Based on existing theoretical arguments, the following hypotheses are formulated:

H1: The relationship is positive between the aggregate ESG score and the value of firms (Tobin’s Q).

Although aggregate ESG scores may give a broad understanding of the sustainability performance, this may conceal variations in the specific ESG dimensions. The pillars can

have different impacts on the value of the firms, as all of them are environmental, social, and governance pillars.

Environmental performance is also linked to better resource efficiency and reduced regulatory risk, and can add value to a firm (Porter and van der Linde, 1995; Xie et al., 2019). Social performance can lead to improvements in stakeholder relationships and could increase corporate reputation, which in turn can lead to elevated valuation of the firm (Aguinis and Glavas, 2012; Deng et al., 2013). Governance performance, in turn, is crucial in mitigating the agency conflict, as well as improving transparency, thereby increasing investor confidence (Jensen and Meckling, 1976; Krueger, 2015).

The following arguments are developed into the hypotheses:

H2: Environmental performance is positively associated with firm value.
H3: Firm value is positively related to social performance.
H4: There is a positive relationship between firm value and governance performance.

1.4. Contribution of the Study

This paper has a number of contributions to the literature. Firstly, it provides empirical evidence of the ESG relationship with the firm value using a big panel of S&P 500 companies. Second, it separates aggregate ESG scores and ESG pillars, which allows a more stringent analysis to investigate the effects on the value of firms of different dimensions of sustainability. Third, the article employs a panel data regression with firm financial variables at the firm level, time effects to address the heterogeneity and to increase the strength of the empirical findings and finally, the crisis conditions to test the applicability of the findings.

The implications of the results on investors, corporate managers and policymakers contribute to a better understanding of whether and how better ESG performance influences the firm value in the large publicly traded firms.

1.5. Structure of the Thesis

In order to give some coherence and clarity, this thesis is further divided into six chapters to give it some clarity and coherence. The chapters focus on a certain part of the research process and evolve logically up to the finding of the primary research questions associated with the influence of ESG aggregate and ESG individual score on firm performance. The chapter structure helps the reader to navigate the theoretical background, methodological development, empirical findings and wraps up the thesis with a summary of the major findings and implications to future research and practice.

2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

The multidimensional nature of Environmental, Social and Governance (ESG) practices has been studied in various theoretical frameworks because it plays a controversial role in business strategy. The earliest theoretical literature (with much of this statement by Milton Friedman: the social responsibility of business is to maximise its profits), theorised the concept of CSR in terms of the sole business role, which is to create shareholder wealth through operating within the law and ethical considerations. According to this school of thought, the corporate managers represent the shareholders and resources allocated to environmental, social or governance programs are a misallocation of resources that minimises the value of the shareholders. This line of thought provoked a lot of doubt concerning the ESG practice in the middle to late twentieth century and gave rise to further theories.

2.1. Conceptual Evolution of ESG and Firm Performance

The concept of Environmental, Social, and Governance (ESG) performance has developed out of the broader literature on corporate social responsibility (CSR) and sustainability into a fundamental construct of modern corporate finance and investment decision-making. In the past, voluntary organisational actions that considered the social and environmental effects of business operations, typically towards society, were referred to as CSR. The first application of CSR was on the moral responsibility of businesses to be good citizens to the social well-being of society, with minimal focus on measurable financial outcomes.

This normative perception, in the long run, transformed into a better-structured and measurable model, which led to the creation of ESG. Unlike the conventional CSR, ESG establishes measurable and standard non-financial parameters, which assist investors and stakeholders in evaluating how firms address the environmental risks, social

relations, and governance systems. These measures are gradually becoming important predictors of long-term firm value, riskiness, and sustainability (Gillan et al., 2021).

The report Who Cares Wins (2004), published under the patronage of the United Nations, which advocated the introduction of the issues of environmental, social, and governance into the process of investment analysis and decision-making, can be considered the first step to the formalisation of ESG as a universal framework. Since then, ESG has been a component of sustainable finance and is becoming increasingly popular among institutional investors, regulators, and corporations worldwide.

The conceptual pillars of ESG include three, but separate pillars:
Environmental (E) refers to the corporate activities that impact the natural environment, including carbon, energy efficiency, resource use, waste disposal, and prevention of climate change. Companies that effectively reduce environmental risks are able to enjoy improved operational performance, reduced regulatory risk and improved corporate image.

Social (S) involves the associations that a firm maintains with its stakeholders, such as employees, customers, suppliers and communities. It includes labour practices, diversity and inclusion, product responsibility and community engagement. Improved employee performance, retention of customers and reputational wealth are normally associated with good social performance.

Governance (G) can be used in relation to internal corporate policies and decision making, board composition, executive compensation, shareholder rights, transparency and ethical behaviour. Good governance systems are valued to reduce agency problems and make corporations more responsible and, consequently, have an impact on the valuation of firms.

As shown in Figure 1, the notion of ESG is multidimensional because it divides the corporate responsibilities into the factors of environment, social, and governance. The pillars, as stressed by this framework, are another aspect of firm behaviour and may influence firm performance in diverse ways, which explains why it is important to research ESG as a composite and disaggregated indicator.

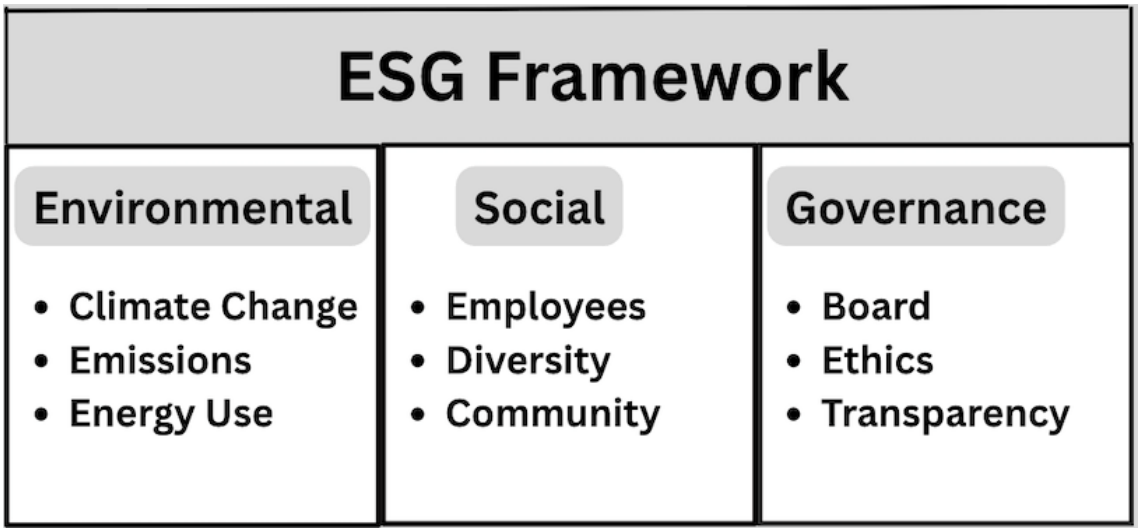

Figure 1: ESG Framework (Source: Author's own illustration)

Early empirical research examining the association between CSR and firm performance was inclined to show that there was a positive, but a weak association, as observed in meta-analyses of Orlitzky et al. (2003) and Margolis et al. (2009). According to these papers, there is a likelihood that the performance of a socially responsible firm will be improved with respect to financial performance, but the correlation between these two is highly heterogeneous across firms and settings.

However, recent research indicates that the ESG-firm performance relationship is not uniform and highly relies on the measurement schemes, the circumstantial factors, and the aspects of ESG (Gillan et al., 2021). The main flaw of the earlier research is that these studies have utilised aggregate ESG or CSR scores that combine the three components of the environment, social and governance in a single index.

New sources are doubting this mode of aggregation. Berg et al. (2022) argue that ESG ratings differ considerably across the providers because these mechanisms are inconsistent with varying methods and weighting schemes to produce inconsistencies in empirical evidence. Similarly, Mashayekhi et al. (2024) posit that the overall ESG scores can mask the relative importance of individual pillars, thereby bridging a vast amount of heterogeneity in the correlations between ESG and performance.

At the same time, ESG disclosure has been gaining significant momentum in the past 10 years. The firms are also publishing sustainability reports and integrated reports as a way of reporting to their stakeholders regarding their performance in relation to environmental sustainability. This disclosure of information reduces information asymmetry and assists investors in assessing the practices of corporate sustainability and risk management more efficiently (Chen and Xie, 2022).

The quality and the level of ESG disclosure are determined by both institutional and firm-level factors. To give an example, visibility of firms, ownership structure, and regulatory environments are crucial elements that determine the ESG reporting practices, as indicated by Baldini et al. (2018). The more developed the institutional setting of the company is, or the more the stakeholders scrutinise the company, the more they are likely to disclose their ESG in a more comprehensive way.

Overall, ESG evolution may be regarded as a sign of the shift in a normative perception of CSR to a data-driven, investor-centric one, where the non-financial performance is increasingly integrated into financial decision-making. At the same time, more and more evidence is accumulating to demonstrate that ESG is not a monolithic construct and that specific components of the construct may affect firm performance in a specific way, and not necessarily in a linear manner. It has led to a rise in attention to the pillar-level analysis, the primary topic of the sections that follow.

2.2. Theoretical Foundations and Mechanisms

The ESG-firm performance relationship is based on various complementary and competitive theory frameworks.

ESG investments may decrease or increase agency problems in terms of agency theory (Jensen and Meckling, 1976). Good governance mechanisms can be used to reduce managerial opportunism and increase the allocation of resources, which means that there is a positive relationship between ESG, particularly governance, and firm value. However, in certain situations, ESG initiatives may also be a testament to managerial overinvestments due to reputational reasons, which leads to the destruction of values (Krueger, 2015).

Stakeholder theory (Freeman, 1984) provides a different viewpoint, as it states that active companies regarding ESG activity improve the connection with stakeholders, including customers, employees, regulators, and investors. Empirical studies have shown that such participation facilitates the reputation of the company and reduces conflict, which ultimately results in improved financial performance (Servaes and Tamayo, 2013; Deng et al., 2013).

Figure 2 illustrates the theoretical connection of firms with their stakeholders as outlined by the stakeholder theory. The framework places the firm in the centre of a network of relationships among firms and stakeholders, and the ability to be able to manage these relationships is critical.

Companies are engaged with a variety of stakeholder groups at the same time, as Figure 2 shows, and ESG activities are the avenue through which these relationships are maintained and strengthened. This supports the opinion that stakeholder engagement can contribute to the long-term value creation.

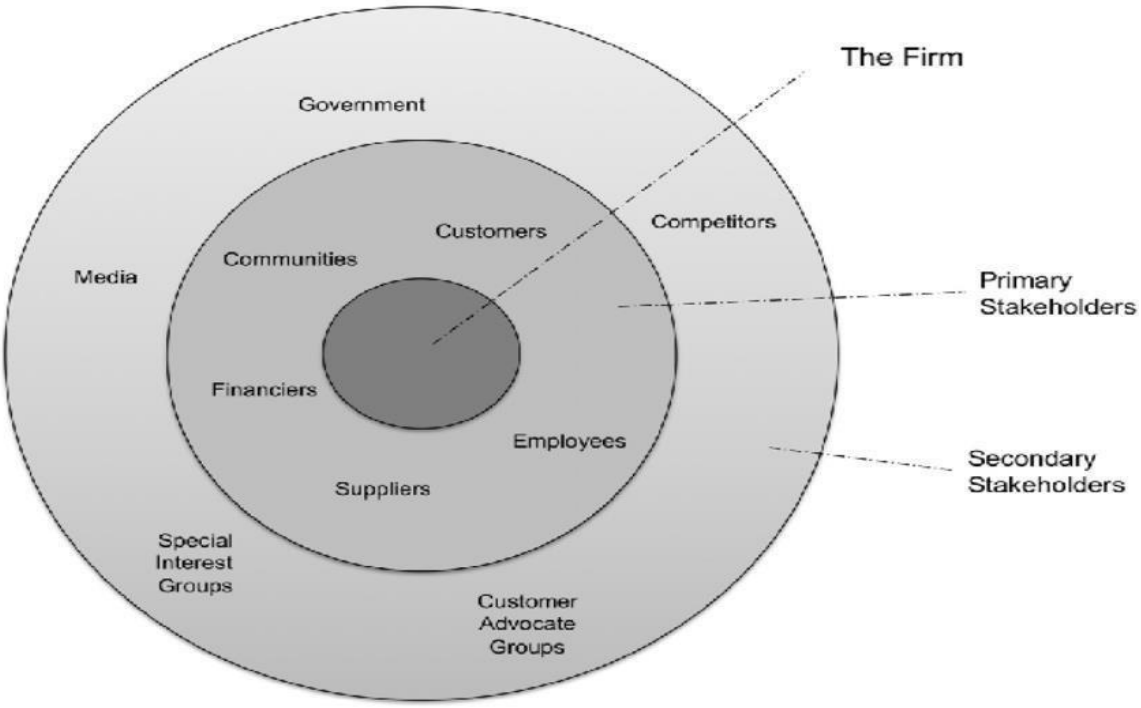

Figure 2: Two-tier stakeholders map (Source: Adapted from Power, K.,2010)

Resource-based view (RBV) (Barney, 1991) that suggests that ESG-oriented capabilities (such as reputation, innovation, and organisational culture) could be a resource that can be valuable and inimitable to copy and provide sustained competitive advantage also supports the strategic value of ESG (Fatemi et al., 2017).

In addition, the legitimacy theory and the institutional theory emphasize the aspect that firms adopt ESG practices in order to satisfy the demands of society and the pressure of regulations. ESG disclosures and practices are primarily associated with corporate legitimacy and the reduction of reputational risk in the high scrutiny (or weak-institutional) environment (Baldini et al., 2018; Seow, 2023).

The increased emphasis on signalling mechanisms has been a force behind the construction of more recent literature in terms of such frameworks. ESG reporting and ratings are signals that reduce information asymmetry between firms and investors, and

influence the cost of capital, availability of finance, and market value. In a sign, Bikmetova and Pirinsky (2026) reveal that ESG rating agencies can employ external monitoring and signalling effects to motivate ESG performance. On the same note, Chen et al. (2025) conclude that ESG ratings enhance the reputation of the firm, particularly in the emerging markets where information asymmetry is high.

All these theoretical perspectives suggest that ESG may affect the performance of firms in a number of ways, which include efficiency in governance, stakeholder relations, reputational capital and financial market signalling. However, they also indicate that the directions and magnitudes of the ESG effects are most probably context and dimension-specific.

2.3. Aggregate ESG and Firm Performance: Evidence and Limitations

There is empirical evidence on the relationship between overall ESG ratings and firm performance is quite abundant and with mixed and often contradictory results.

The meta-analyses, as well as large sample studies, on the one hand, point to a more or less positive correlation. To illustrate, Friede et al. (2015) found out that approximately 90 per cent of the studies report a non-negative relationship between ESG and financial performance. Similarly, as seen by Eccles et al. (2014), firms with strong sustainability practices outperform their peers in the long-term.

On the other hand, several studies indicate negative or insignificant effects. Krueger (2015) concludes that the response of markets to specific CSR activities is not favourable, particularly in cases where they are believed to be managerial overinvestment. Rao et al. (2023) also report the same and document inconsistent ESG-performance relationships, particularly in emerging markets.

More importantly, the recent literature indicates that these inconsistencies can be explained by the inadequacy of the methodological and conceptual approaches, namely,

the aggregate ESG measures. As demonstrated by Berg et al. (2022), the ESG rating varies significantly across the providers, and the findings reported are noisy and unreliable. This is compounded by the fact that the heterogeneous ESG dimensions are pooled in a single score.

Expounding on this criticism, Mashayekhi et al. (2024) provide enough evidence to demonstrate that the phenomenon of aggregate ESG scores fails to depict the relative importance of the separate ESG pillars. Using a machine learning application, they show that the predictive power of the ESG elements can vary radically across firms and that in most instances, governance can be an important factor.

Similarly, Ersoy et al. (2022) identify non-linear relationships between ESG and firm value, particularly in the environmental dimension, because an investment in ESG may reduce the firm value beyond certain levels. The findings are in line with other theoretical literature on this matter, with Barnett (2012) making a suggestion of decreasing returns to ESG investment.

The role of contextual factors has been given more focus in recent studies. To illustrate this point, Yuen et al. (2022) show that ESG is beneficial in making companies resilient during times of crisis, and Kouzez et al. (2024) unveil that ownership structure is one of the challenges that influence the efficacy of ESG. The findings hypothesise that aggregate ESG impacts are highly context-dependent and cannot be used in different contexts.

Overall, the literature indicates that aggregate ESG can be employed to capture general trends, but does not provide the opportunity to have a close-up view of the influence of different ESG factors on the performance of firms. This has led to a greater attention on pillar-level analysis, which is explained in the next section.

2.4. Transition Toward Pillar-Level Analysis

The recent literature suggests more support to disaggregation of ESG as its constitutive pillars -environmental (E), social (S), and governance (G) in order to understand more about how ESG affects the performance of firms.

Mashayekhi et al. (2024) make it quite clear that ESG pillars can influence the performance of the firms in a heterogeneous way, with the governance often becoming a key predictor. They also emphasize though, that the relevance of the pillars varies according to contexts, industries and periods and thus no pillar can be prevailing everywhere.

Similarly, Menicucci and Paolucci (2024) and Gangwani and Kashiramka (2024) indicate that the factor of governance plays a significant role in the explanation of the performance of the firms included in the banking and institutional environment, but the environmental and social factors show a more context-specific effect.

At the same time, the recent studies caution against excessive extrapolation of the applicability of governance. Indicatively, Ji et al. (2022) and Ersoy et al. (2022) highlight that in some cases, social and environmental factors can be of significant importance, particularly in industries where environmental exposure is high or highly sensitive to stakeholders.

It is important to note that there has been an emergence of evidence that pillar effects are non-linear and dynamic. Environmental investments may have decreasing payoffs as time goes by, and social initiatives may have a greater effect during a crisis or when stakeholders are put under a higher strain (Yuen et al., 2022; Kouzez et al., 2024).

This trend of pillar-level analysis points to an even broader appreciation of the fact that ESG is not a unitary concept but a bundle of different dimensions, which have different economic implications.

2.5. Pillar-Level ESG and Firm Performance: A Disaggregated View

Building up on the weaknesses of aggregate ESG measures above, more attention has also been given by the recent literature to the fact that disaggregating ESG into its environmental, social and governance facets is becoming more important. This trend signals the growing amount of evidence that the ESG dimensions can be unique, context-specific, and potentially non-linear in their impact on firm performance and can be obscured with aggregate ESG scores.

2.5.1. Environmental (E) Dimension: Non-Linearity and Cost–Benefit Trade-offs

The environmental pillar is often associated with building long-term value for the firms by creating more efficiency, innovation, and regulatory alignment. In theory, particularly in Porter's hypothesis (Porter and van der Linde, 1995), the environmental investments can be employed to enhance competitiveness through resource efficiency and innovation.

However, recent empirical research shows that the dependence of the environmental performance and the firm value is non-linear and contextual. Indicatively, Ersoy et al. (2022) state that there are U-shaped relationships between environmental performance and firm value, with moderate environmental investments potentially enhancing the value, but excessive investments are expensive and have more side effects than benefits.

This finding is consistent with more recent results of studies that dwell on threshold effects and decreasing returns to ESG investments. Athari et al. (2024) illustrate that environmental performance non-linearly affects the profitability, particularly in the sovereign and banking industries, at the macro-financial level. Similarly, Gangwani and Kashiramka (2024) note that the environmental programmes have the potential to reduce the profitability achieved in the short term due to the compliance and operation costs, but the gains may be accrued in the long-term.

The environmental impacts are also very sector-based, as indicated by recent studies. Baldissarro et al. (2024) demonstrate in the European energy sector that ESG integration

has different impacts on investment performance depending on the nature of industries, implying that environmental performance is more topical in industries with a high vulnerability to the environment and less in other industries.

Secondly, we have new literature emphasising that regulatory and disclosure systems are strongly linked with environmental performance. Maji and Lohia (2025) show that the processes of stakeholder engagement determine the nature of environmental sensitivity and environmental reporting, which means that not only the processes of functional environmental performance in place, but also the processes of environmental performance are highly conditioned by the processes of governance and disclosure.

Together, these findings suggest that the pillar of environment may not necessarily be positively correlated with firm performance. Instead, it bears non-linear effects, sector-specific effects and is mediated by the quality of governance and disclosure, which justifies the disaggregated analysis.

2.5.2. Social (S) Dimension: Stakeholder Value and Crisis Sensitivity

The social pillar brings about strict engagement with the stakeholders, including employees, customers and communities and is almost overlapping with the stakeholder theory (Freeman, 1984). Social programs have been associated with an improved image, retention of customers and increased efficiency by employees which can translate to improved performance at the company.

Empirical evidence is extremely helpful to support the positive but situation-specificity of the relationship between social performance and firm value. Lins et al. (2017) reveal that the financial crisis favours companies with high social capital, which is also a vivid demonstration of the significance of trust and relationships between companies in the context of minimizing downside risk.

The latter is further explicated in more recent research which emphasize on context sensitivity of social performance. Besides the fact that the social performance is particularly crucial in economic uncertainty (Kouzez et al., 2024), Yuen et al. (2022) show that ESG, and its social component, in particular, can enable firms to become more crisis-resilient during the COVID-19.

In the meantime, recent literature highlights the importance of reputation and network effects in shaping social performance outcomes. Akbar et al. (2025) demonstrate that peer environmental and social occurrences may negatively affect firm value, which is attributable to reputational spillovers, meaning that social performance is not only dependent on the actions of firms but also the industry.

Still on the same note, Karr et al. (2025) reveal that material ESG scandals significantly affect the performance of firms, and when the stakeholders view them as either socially or ethically significant. The findings justify the necessity to determine the different types of social risks and their materiality.

The social and governance disclosures are intertwined in the emerging markets and SMEs. Shalhoob and Hussainey (2023) found that ESG disclosures, especially governance and stakeholder engagement disclosures, enhance sustainability performance in SMEs, and governance mechanisms are likely to mediate social performance.

Overall, the literature points out that the social pillar is a significant driver of performance in firms in the presence of some conditions, typically in stakeholder sensitive environment and during periods of crisis. However, the impacts are not universal and depend on such issues as industry dynamics, expectations of the stakeholders and reputational risks.

2.5.3. Governance (G) Dimension: Central but Context-Dependent

The pillar of governance is normally considered as the theoretically most substantiated part of ESG since it is directly related to the agency problems, board structure, transparency and accountability of the manager.

There is immense literature that has established governance to be a good predictor of firm performance. Indicatively, Mashayekhi et al. (2024) show that governance can be the most prominent factor of ESG to foresee the results of companies. Similarly, Menicucci and Paolucci (2024) and Gangwani and Kashiramka (2024) find that governance is a crucial factor that dictates performance both in the banking and institutional environment.

Recent research further emphasises the significance of governance in the signalling of ESG and quality of disclosure. Bikmetova and Pirinsky (2026) demonstrate that the ESG rating agencies can maximise the ESG performance of the firms by introducing changes in the governance and disclosure, which is why the importance of external monitoring is revealed. Similarly, Chen et al. (2025) are able to illustrate that ESG ratings are useful in enhancing the reputation of companies, particularly in emerging markets where the governance indicators are critical.

The other aspect that is important in minimising ESG risks is governance. Karr et al. (2025) found that the controversies surrounding governance in specific, affect the performance of a firm to a relatively great extent, negatively suggesting that governance failure is a relevant aspect to investors.

However, despite the good theoretical and empirical foundation, the current literature also indicates that the impact of governance might be context-dependent and not always be traced in short-term performance indicators. Taking the case of Ji et al. (2022), the impacts of governance are not cross-country and institutionally uniform in mediating the outcomes of performance, and Athari et al. (2024) highlight that the governance and

macroeconomic situations are interacting variables in shaping the performance outcomes.

Secondly, in developed markets with relatively high institutional frameworks, the practices of governance may already be reflected in the valuation of the firms, and thus their apparent margin effects on performance are smaller. This suggests that the effect of governance will tend to be indirect, long-run or concealed in some other aspects of ESG and may not be directly reflected in financial performance in the short-term.

Thus, although governance can be considered one of the most common ESG pillars, its input is determined by the institutional situation, market efficiency, and time horizon, which might be the motivation behind the fact that the findings of empirical research are not always consistent.

2.6. Moderating Factors and Contextual Dependencies

In recent literature, the relevance of the consideration of contextual factors, e.g., firm size, ownership structure, sector, and institutional environment, is increasingly gaining momentum in the structure of the ESG performance relationship in the recent literature.

One of the moderators has been identified as firm size. The larger firms get bigger payoffs of ESG activities due to increased resources, visibility, and governance arrangements, as shown by Chen et al. (2021). This idea is supported by Shalhoob and Hussainey (2023), who note how governance disclosures play an important role in SMEs, and information asymmetry is more pronounced.

The ownership is of vital importance. Kouzez et al. (2024) suggest that companies that are foreign-owned are at an advantage due to the reduced governance and legitimacy pressures, due to which ESG is more advantageous. Similarly, the literature in the

developing world emphasizes the fact that the ESG implications are stronger in an environment, which is characterized by a lower institutional quality (Chen et al., 2025).

The disparities across industries also affect the ESG results. Baldissarro et al. (2024) demonstrate that the implications of ESG performance are more relevant in the environmentally sensitive sector, such as energy but are less relevant in less-regulated sectors.

Finally, crisis periods also radically transform the ESG dynamics. ESG performance, as shown by Yuen et al. (2022) and Kouzez et al. (2024) is more resilient in crisis situations by firms, particularly through social and governance practices.

2.7. ESG Measurement, Data Limitations, and Methodological Challenges

Although the ESG study has significantly increased over the years, the measurement and comparability of the ESG data remain one of the most persistent research problems in the literature. Unlike conventional financial metrics, ESG indicators do not have a standardisation and are constructed with non-homogeneous approaches across data providers.

A valuable contribution in this direction is provided by Berg et al. (2022), who demonstrate that the dispersion of ESG ratings among the providers is very high due to the variety of their scopes, schemes of measurement and weighting. This inconsistency introduces a considerable measurement error, which could distort empirical findings and is one of the reasons why inconsistent findings are obtained in the ESG-performance literature.

The issue is amplified as far as aggregate ESG scores are concerned, with environmental, social, and governance aspects being vastly different in the weighting of providers. Therefore, the same underlying ESG practices of two companies may lead to different aggregate ratings due to the rating methodology. This substantiates the thesis of

Mashayekhi et al. (2024) and Ersoy et al. (2022) that the pillar-specific effect of a study can be hidden by aggregation and so limit the interpretability of empirical results.

In addition to the measurement issues, the endogeneity problem is in the limelight of ESG research. The performance of ESG and firm value is also interdependent: to the extent to which ESG practices can contribute to better performance of firms, a more profitable firm is also more able to invest in ESG practices. This creates potential reverse causality and omitted variable bias, which may result in biased estimates.

To address these challenges, dynamic panel models, in particular, the system Generalised Method of Moments (GMM), to accommodate unobserved heterogeneity and endogeneity has gained more and more popularity in the current research (Yuen et al., 2022; Gangwani and Kashiramka, 2024). Other techniques include the instrumental variable techniques and fixed-effects models; however, both techniques have drawbacks.

The other methodological issue is related to the specification of functional forms. ESG-performance relationships are non-linear, as Ersoy et al. (2022) and Athari et al. (2024) show, and linear regression may not be the most appropriate tools to capture the nature of the relationships. This has led to an increase in the use of quadratic terms, threshold models and the effect of interaction in the literature.

Finally, other issues brought about by contextual heterogeneity exist. The generalizability of the results across the research, even of the institutional settings, regulatory frameworks, and industry characteristics, can significantly influence the ESG results (Ji et al., 2022; Kouzez et al., 2024).

Overall, these methodological concerns demonstrate that it is vital to specify models, employ powerful estimation techniques, and disaggregate ESG analysis, which are required in order to generate plausible and interpretable results.

2.8. Critical Synthesis of the Literature

The existing body of ESG and firm performance literature is confusing and contradictory, having been affected by differences in measurement, methodology, and context.

At the aggregate level, the positive impact of ESG is usually associated with the improved performance of firms, particularly in the long-term research (Friede et al., 2015; Eccles et al., 2014). However, neutral or even negative associations are reported in an ever-growing body of literature, particularly in the short-run or where ESG investments are defined by high expenses (Krueger, 2015; Rao et al., 2023).

Among the key lessons that the recent literature teaches is that the aggregation of heterogeneous dimensions of ESG to a large degree can explain such inconsistencies. Studies such as Mashayekhi et al. (2024) and Ersoy et al. (2022) demonstrate that the factors of environmental, social, and governance have various and even opposite effects on the performance of firms.

A pillar that is often raised is governance, notably on a monetary and institutional level (Menicucci and Paolucci, 2024; Gangwani and Kashiramka, 2024). However, this is not universal. Nonetheless, more recent research suggests that the influence on the governance pillar of ESG can be indirect, situation-specific, or reflected by market prices in particular, particularly in the case of developed countries where the institutional environment is strong (Ji et al., 2022; Athari et al., 2024).

Though environmental performance has a theoretically related impact on innovation and efficiency, non-linear and industry-specific effects, both positive and negative, depend on the level of investment and regulation (Ersoy et al., 2022; Baldissarro et al., 2024).

On the other hand, this social pillar is identified as a performance driver in some cases, namely, the stakeholder sensitive environment and during periods of economic uncertainty (Lins et al., 2017; Yuen et al., 2022; Kouzez et al., 2024). This means that the trust,

reputation and stakeholder engagement mechanisms can be used to attain social performance, particularly in unpredictable environments.

The external signal and perception of the market are also important, as it has been highlighted in the recent literature. The factors influencing the performance of the firm are the ESG ratings (Bikmetova and Pirinsky, 2026) and reputation effects (Chen et al., 2025), which create expectations of investors and the cost of capital. At the same time, any adverse ESG-related data, such as ESG controversies (Karr et al., 2025) or peer incidents (Akbar et al., 2025), can significantly affect the decrease in the firm value, which demonstrates the asymmetry of the information related to ESG.

All these suggestions point to the fact that the relationships between ESG-performance are context-dependent and non-linear and multi-dimensional and that they cannot be represented by aggregate ESG measures.

2.9. Research Gap and Contribution

Although numerous publications on the ESG and performance of firms have been published, there are several gaps that are of critical relevance.

Firstly, much of the research out there is founded on aggregate ESG ratings, which conceal the actual effects of the environmental, social and governance factors. Even though the latter, more modern researches are pursuing a pillar-level strategy, it is uncommon to find evidence of the comparison between aggregate ESG and single ESG pillars within one empirical framework, in particular, when using consistent measures of performance.

Second, the results obtained in the literature are inconsistent, partly due to the differences in the measurement methodologies, sources of data and model specifications. It is also not possible to standardise ESG ratings, and that is why it is hard to compare the studies across studies (Berg et al., 2022).

Third, although recent studies have focused on non-linear relationships and contextual dependencies, few studies explicitly model them in an overall empirical model. In particular, there is a lack of research into the contribution of the time dynamics (i.e., lagged ESG effects) to it.

Fourth, a large part of current literature concentrates on certain industries (e.g., banking) or countries (e.g., emerging markets), which constrains the applicability of the results to other corporate contexts.

3. Research Methodology

This section deeply discusses the methods applied for research analysis and provides their explanations. Further, it also provides information about the models used and the variables included in each model to establish and understand the relationship between ESG and firm value. This part also provide briefly about the data utilised to confirm the validity and genuineness of the sample. Finally, concluded with the additional tests conducted to check endogeneity and robustness concerns.

3.1. Research Design

The research design used in this study is a quantitative empirical research method to investigate a correlation between ESG performance and firm value. In particular, a panel data structure is used to make use of cross-sectional and time-series variation between firms.

In this case, the use of panel data is especially suitable due to three reasons. Firstly, it makes it possible to control unobserved heterogeneity of firms, such as the quality of managers, corporate culture, and position in the industry, which can be both impactful on ESG performance and the value of a firm. Second, it improves efficiency in estimating, as it increases the observations. Third, it enables the evaluation of dynamic relationships that are required because ESG investments may take a time lag when it comes to influencing the value of a firm.

It is noteworthy that the empirical approach is developed in a progressive manner. It will be analysed using an aggregate ESG model and then will be broken down to individual ESG pillars and will be lagged to capture dynamic effects and overcome the endogeneity problem.

3.2. Data and Sample Selection

The final sample sample is comprised of 186 firms that were observed in the year 2014-2024, and it has an unbalanced panel data of 2029 firm-year observations.

The ESG data (aggregate ESG, E, S, G scores) is received in Refinitiv, whereas the financial data, including the values of the Q and the control variables created by Tobin, is received in Bloomberg.

The sample also consists of S&P 500 firms, that guarantee that the sample is composed of large and publicly-traded firms in a developed capital market, which increases the reliability and generalisability of the results.

Tobin's Q is chosen as the main dependent variable because it is a market-based firm value, which indicates the growth and sustainability prospects of the investors in the future.

3.3. Variable Definition

This section identifies the variables in the empirical analysis, such as the dependent variable, independent ESG measures and control variables. The choice of these variables has been based on the previous literature to examine the relationship between the ESG performance and the firm value.

3.3.1. Dependent Variable

The firm value is the dependent variable in this study, which is measured by Tobin's Q (TQ). Q is a ratio of the market value of a company to the replacement cost of its assets, Tobin, which is an index that has become popular in the ESG literature and is a potential index of firm performance in the future (Deng et al., 2013).

3.3.2. Independent Variables

The ESG score (ESG) is the key independent variable and a composite measure of the overall sustainability performance of a firm. Moreover, the ESG is subdivided into the three basic aspects to capture the potential of heterogeneity in its effects.

Environmental score (E) is a performance of a firm in terms of environmental practices in that respect, in terms of emissions and resource management. The social score (S) comprises elements of the stakeholders, including the welfare of the employees, customer relations, and corporate social responsibility. The quality of corporate governance, including board structure, transparency and shareholder rights, is measured by the governance score (G).

These variables can be matched with the past research studies, which have examined the ESG-firm value relationship (Deng et al., 2013; Servaes and Tamayo, 2013).

3.3.3. Control Variables

The study has a number of control variables to differentiate the effect of the ESG variables on the firm value. Firm size (Size) is added also, it is a logarithm of total assets because this aims at controlling the scale effects and firm-specific aspects that may influence the valuation. Leverage (Leverage) ratio is a ratio of the total debt to total assets; it is the financial risk and capital structure of the company. Profitability (ROA) takes care of the overall financial performance of the firm as it is a ratio of the firm to its assets.

These types of control variables are typical of the literature on the ESG firm value relationship that currently exists (Fatemi et al., 2018; Gillan et al., 2021) and can be aligned with the existing body of empirical evidence. Table 1 presents the variables used in the analysis, how they were measured and described.

Table 1: Key variables and description

Variable	Measurement	Description
TQ	Tobin's Q	Market-based measure of firm value
ESG	ESG Score	Overall sustainability performance
E	Environmental Score	Environmental performance of firm
S	Social Score	Stakeholder and social performance
G	Governance Score	Corporate governance quality
Size	Log of Total Assets	Controls for firm size
Leverage	Total Debt / Assets	Measures financial risk
ROA	Net Income / Total Assets	Profitability indicator
Growth	Annual Growth Rate of Sales	Proxy for firm expansion and growth dynamics
Crisis	Dummy Variable (1 = 2020–2021, 0 otherwise)	Captures impact of COVID-19 period
Growth × Crisis	Growth × Crisis Dummy	Captures differential effect of growth during crisis

These variables are in line with the previous studies analysing the ESG-firm value relationship (Deng et al., 2013; Servaes and Tamayo, 2013).

In addition to the control variables in the baseline, the growth of firms and liquidity also feature in this study as an addition to the empirical model, which makes it stronger. The proxy of sales growth is the annual growth of the firm's sales (or revenues). The ratio of liquidity assets and total assets is the liquidity ratio, which shows the ability of the firm to meet its immediate liabilities and also to be a financially flexible entity. These are the variables that have generally featured in the corporate finance literature since they determine the performance and valuation of firms.

3.4. Model Specification

To systematically address the research question, three model specifications are used to systematically answer the research question. This specification also allows making aggregate and disaggregated impact comparisons on ESG, and this is the essence of the research objective. All the models are supposed to reflect a distinct aspect of the ESG-firm value association.

The former is a model that assesses the overall effect of ESG in terms of a composite score. In the second model, ESG is divided into its individual pillars to identify heterogeneous impacts. The third model incorporates the time dynamics to investigate the potential of ESG having a lagging impact on firm value.

Model 1: Aggregate ESG Model

To test H1, the following fixed effects model is estimated:

$$TQ_{it} = \alpha + \beta_1 ESG_{it} + \beta_2 Size_{it} + \beta_3 Leverage_{it} + \beta_4 ROA_{it} + \mu_i + \epsilon_{it}$$

Where,

μ_i represents unobserved firm-specific fixed effects and,

ϵ_{it} represents the idiosyncratic error term

Model 2: ESG Pillars Model

To test H2–H4, ESG is disintegrated into its individual components:

$$TQ_{it} = \alpha + \beta_1 E_{it} + \beta_2 S_{it} + \beta_3 G_{it} + \beta_4 Size_{it} + \beta_5 Leverage_{it} + \beta_6 ROA_{it} + \mu_i + \epsilon_{it}$$

Model 3: Lagged ESG Model

To explain delayed effects and potential endogeneity, a lagged ESG variable is introduced:

$$TQ_{it} = \alpha + \beta_1 E_{i,t-1} + \beta_2 S_{i,t-1} + \beta_3 G_{i,t-1} + \beta_4 Size_{it} + \beta_5 Leverage_{it} + \beta_6 ROA_{it} + \mu_i + \epsilon_{it}$$

Model 4: Extended Model with Additional Controls

In order to enhance the strength of the empirical analysis, the baseline specification is increased by adding more firm-level variables. In particular, firm growth is included to

capture the growth dynamics that can impact the valuation of firms. Growth is characterised as a rate of growth of the firm's sales (or revenues) per annum and is an indicator of change in the firm's performance over a certain period of time.

Unlike the baseline models, this specification also has year fixed effects, which adjust to macroeconomic shocks and time-specific effects that may affect all firms at the same time and within a given time. This is particularly true in the backdrop of financial markets, where economic conditions are likely to influence the valuation of firms, which is not necessarily the result of firm-specific characteristics.

Growth and time fixed effects add to the explanatory power of the model and allow further examination of the relationship between ESG and firm value.

The extended model can be expressed as follows:

$$TQ_{it} = \alpha + \beta_1 ESG_{it} + \beta_2 Growth_{it} + \beta_3 Size_{it} + \beta_4 Leverage_{it} + \beta_5 ROA_{it} + \mu_i + \gamma_t + \varepsilon_{it}$$

Where,

γ_t represents control for macroeconomic shocks and time-specific shocks.

Model 5: Crisis Interaction Model

To test the hypothesis that the association between firm characteristics and change in performance during economic stress, a crisis dummy variable is introduced to the COVID-19 period (2020-2021). An interaction term between growth and the crisis dummy is also tested to test the hypothesis that the effect of firm growth on performance differs during a crisis. The specified specification allows for a more nuanced understanding of how the behaviour of firms should be different in response to the conditions of economic uncertainty.

The model of crisis interaction is given as follows:

$$TQ_{it} = \alpha + \beta_1 ESG_{it} + \beta_2 Growth_{it} + \beta_3 Crisis_t + \beta_4 (Growth_{it} \times Crisis_t) + \beta_5 Size_{it} + \beta_6 Leverage_{it} + \beta_7 ROA_{it} + \mu_i + \gamma_t + \varepsilon_{it}$$

where,

$Crisis_t$ is a dummy variable equal to 1 for the COVID-19 period (2020–2021) and 0 otherwise.

3.5. Estimation Technique

The Fixed Effects (FE) estimator is used to make the estimates of the models that corrects the time-incremental firm-specific characteristics.

The fixed effects method is desirable because it does not have the omitted variable bias due to unobserved heterogeneity among firms. This is especially significant in ESG research, in which the firm-specific characteristics of corporate culture or management quality might affect the ESG performance as well as the value of the firm. Although more advanced approaches, such as the dynamic panel model (e.g., system GMM), are generally used in ESG literature to resolve the issue of endogeneity, the means used in the given study is a fixed effects model with lagged independent variables, since it is a convenient method to solve the problem of reverse causality and the omitted variable biases.

3.6. Diagnostic Tests

In order to determine the validity of the regression findings, some diagnostic tests are conducted to test some key econometric assumptions to ensure that the regression results are valid. The Variance Inflation Factor (VIF) is also used to investigate multicollinearity since it establishes the degree of correlation of the explanatory variables, as well as assists in determining potential distortion of the coefficient estimates. In addition, testing heteroskedasticity is performed by use of the Breusch-Pagan test, which is used to test whether the variance of the error terms does not change with the number of

observations. Standard errors may be biased, and statistical inference should not be relied upon in the case of heteroskedasticity. Where necessary, corrective action is taken to provide strong and dependable results.

3.7. Robustness Checks

Even though the fixed effects estimator eliminates time-invariant heterogeneity, the standard errors may still be biased as a result of the possible econometric issues such as heteroskedasticity, serial correlation, and cross-sectional dependence. Driscoll-Kraay standard errors are used to deal with these issues, and the standard error offers strong inference when cross-sectional and time-dependent forms are general.

4. Results and Discussion

This section is a summary and commentary on the empirical evidence in the study in a systematic way. A correlation analysis will be carried out to examine the initial correlations, and the analysis will begin with the descriptive statistics to provide a summary of the most significant variables. This is succeeded by delivering the panel regression model results, the aggregate ESG model, the disaggregated ESG components model, the additional factors model, the crisis period model and the lagged ESG specification. Finally, diagnostic tests and strength checks are performed to ensure the validity and reliability of the estimated results.

This gradual approach to the methodology enables determining the relationship between the ESG and the firm value as a whole, and eliminating any possible econometric problems

4.1. Descriptive Statistics

Table 2 reveals the descriptive statistics of the most important variables to be employed in the analysis, such as firm value (Tobin's Q) and ESG performance. The Q value (mean) of the Tobin is 2.664, and the sample average values of the Tobin Q are higher than one, which indicates that the average of the sample firms is undervalued in the market according to the future growth prospects. However, Q of Tobin is highly diffuse, with a standard deviation of 2.191 and a maximum of 23.563.

It means that there are high-growth companies and potential outliers, which is a usual characteristic of market-based metrics of valuation (Deng et al., 2013). The interquartile range (P25 = 1.345, Median = 1.990, P75 = 3.074) also suggests that the distribution of the firms is more or less moderate, with some extreme values that cause the right skewness.

Table 2: Descriptive Statistics of Key Variables

Variables	Mean	SD	Min	25%	Median	75%	Max
TQ	2.664	2.191	0.627	1.345	1.990	3.074	23.563
ESG	60.877	17.139	2.46	49.57	64.05	74.08	91.36

The average of the ESG score is 60.877 with a standard deviation of 17.139, which means that the difference in sustainability performance among firms is a very broad one. The wide interval between the lowest and the highest values (2.46 and 91.36, respectively) shows that there is a lot of heterogeneity in ESG practices in the sample. This variation is crucial to empirical analysis, as it allows establishing the factors of ESG performance that are strongly related to the firm value. The same dispersion in ESG measures has been previously reported in the literature (Berg et al., 2022), indicating inconsistencies in ESG ratings and their connotations in empirical studies.

Distribution-wise, the median ESG score (64.05) has a higher value than the mean, which implies a very slight left-skewness in the ESG performance. The interquartile range (49.57 to 74.08) indicates that the majority of the firms are moderately rated and relatively high in sustainability practices, reflecting the increasing trend of sustainability practices in the big publicly listed firms.

Overall, the descriptive statistics indicate that the data is sufficiently diverse and can be realistically distributed, and, therefore, panel data can be analysed. The aspect that the variability of both the firm value and the ESG performance is present is particularly important in providing the consistency of the regression findings, which will be presented in the future.

4.2. Correlation Analysis

The findings of the Pearson correlation of all the variables used in the analysis are presented in Table 3. The performance of ESG is weakly (= -0.081) negatively related to the value of Tobin Q (= -0.081), indicating that there is no strong contemporaneous

relationship between the performance of ESG and the unconditional firm value. This early result contrasts with the substantial relationship observed later in Model 1, and reveals in the bivariate relationship the existence of omitted variable biases, which will be overcome subsequently when firm-specific effects and control variables are added to decipher the relationship between ESG and firm performance.

Table 3: Correlation Matrix

Variables	**TQ**	**ESG**	**E**	**S**	**G**	**Size**	**Leverage**	**ROA**
TQ	1	-0.081	-0.153	-0.039	-0.049	-0.179	0.001	0.605
ESG	-0.081	1	0.829	0.870	0.685	0.169	0.094	0.009
E	-0.153	0.829	1	0.716	0.336	0.242	0.111	-0.072
S	-0.039	0.870	0.716	1	0.354	0.148	0.126	0.026
G	-0.049	0.685	0.336	0.354	1	0.076	-0.032	0.025
Size	-0.179	0.169	0.242	0.148	0.076	1	-0.140	-0.187
Leverage	0.001	0.094	0.111	0.126	-0.032	-0.140	1	0.068
ROA	0.605	0.009	-0.072	0.026	0.025	-0.187	0.068	1

The most significant point about Table 3 is that the correlation between ESG and each of the components of E (0.829), S (0.870) and G (0.685) is significant. This indicates the composite nature of ESG and confirms that it has been argued in the literature that aggregation is biased (Berg et al., 2022) since aggregation of the different dimensions could obscure their respective effects on firm value. This provides empirical evidence of the decomposition of ESG into its individual pillars in the subsequent regression models (H2-H4).

None of the ESG factors shows significant correlation with Tobin's Q, with coefficients of -0.153 (E), -0.039 (S), among others. This means that the ESG dimensions and firm value correlation cannot be realised at the bivariate level, and it will have to be subjected to multivariate analysis to realise the effects behind it.

On the control variables, the positive correlation between ROA and firm value (0.605) can be explained by the fact that, in the past, there were studies indicating that profitability is one of the determinants of the market value (Deng et al., 2013). The Q of Tobin has a moderately negative correlation with the size of the firm (−0.179), which may partially be explained by diminished growth opportunities of large companies. Leverage and firm value have a very weak correlation (0.001), which implies that the unconditional relationship is weak.

On the whole, pairwise correlations are modest, but multicollinearity is tested formally because correlation is not a sufficiently strong test to establish. This is then confirmed using VIF analysis. Interestingly, the results show the weakness of aggregate ESG indicators and promote the use of disaggregated regression models and panel regression models in subsequent research.

4.3. Regression Analysis

This section describes the analytical results obtained to determine the relationship between the ESG performance and firm value through panel regression models. The analysis began with an aggregate ESG model, followed by a disaggregated examination of each separate pillar, the addition of more variables, then moving towards analysis during the Criss period and concluded with a lagged ESG specification model to capture dynamic effects.

Further, the results are interpreted progressively, which makes it possible to compare the models and identify the differences between the aggregate and pillar-level effects. Moreover, in the analysis, the firm-specific characteristics are managed to make sure that the related predispositions are accounted for.

4.3.1. Model 1: ESG and Firm Value

According to the results of Model 1, which are presented in Table 4, the coefficient of ESG is positive (= 0.009), and the coefficient is statistically significant at 1% level, which indicates that aggregate ESG performance is positively related to firm value.

Table 4: Fixed Effects Regression – Aggregate ESG models

Variables	**Results**
ESG	0.0085***(0.0026)
Size	0 (0)
Leverage	0.0092*** (0.0028)
ROA	0.0792*** (0.0049)
Observations	2029
R^2	0.136

Notes: This table reports the results of fixed effects panel regressions. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

The relatively low R^2 is in line with the previous ESG literature, in which the value of the firm is determined by several non-observable variables, such as market conditions, industry dynamics, and investor sentiment.

This finding helps to confirm Hypothesis H1. The ESG, however, is significant statistically, but the value is not that substantial, and this suggests that it has a limited economic importance. This result is consistent with the most recent literature that suggests that aggregate ESG measures may hide economically significant relationships due to aggregation bias. In particular, Berg et al. (2022) emphasise the heterogeneity of ESG ratings, whereas Mashayekhi et al. (2024) show that combining ESG dimensions can mask the heterogeneous effects of individual pillars.

Even though this ESG coefficient is statistically significant, the results are to be interpreted with caution. The fixed effects model would measure the within-firm variation, but no causality would be ascertained, and the relationship may be influenced by reverse

causality or unobserved time-varying variables. The results are thus to be treated as conditional relationships and not cause and effect.

It is important to note that despite the consideration of these restrictions, the comparatively low magnitude suggests that ESG is not an important factor affecting the valuation of firms in the near future. It also justifies the difference in signs between the correlation and regression analysis and the necessity of multivariate analysis.

Theoretically, this finding demonstrates the conflicting forecasts in stakeholder theory and agency theory. Whereas the stakeholder theory (Freeman, 1984) suggests that the ESG participation enhances the value of the firm, agency theory (Jensen and Meckling, 1976; Krueger, 2015) suggests that the ESG investments may be regarded as managerial overinvestment and so it does not produce immediate financial gains. The relatively small coefficient can therefore be taken to be the net effect of these conflicting forces. Another more interesting reason is about the measure of ESG. According to Berg et al. (2022), aggregate ESG scores are a blend of heterogeneous dimensions, which may have different impacts on firm value across different periods. As a result, the impact of the separate ESG factors may be obscured by a composite index, and the presence of economically significant relationships may be obscured.

The control variables are observed to significantly and statistically positively affect the profitability (ROA) (= 0.0792, p = 0.01), which demonstrates its central role in explaining firm value (Deng et al., 2013). It is also discovered that leverage is positive and significant in this specification (0.0092, p < 0.01), however, its strength is assessed in the models below.

Overall, Table 4 results suggest that the ESG-firm value is a relationship that cannot be adequately captured through an aggregate measure, which therefore promotes a more disaggregated strategy of Model 2. To further bring out this correlation, Figure 3 provides a graphical representation of the correlation between ESG and firm value.

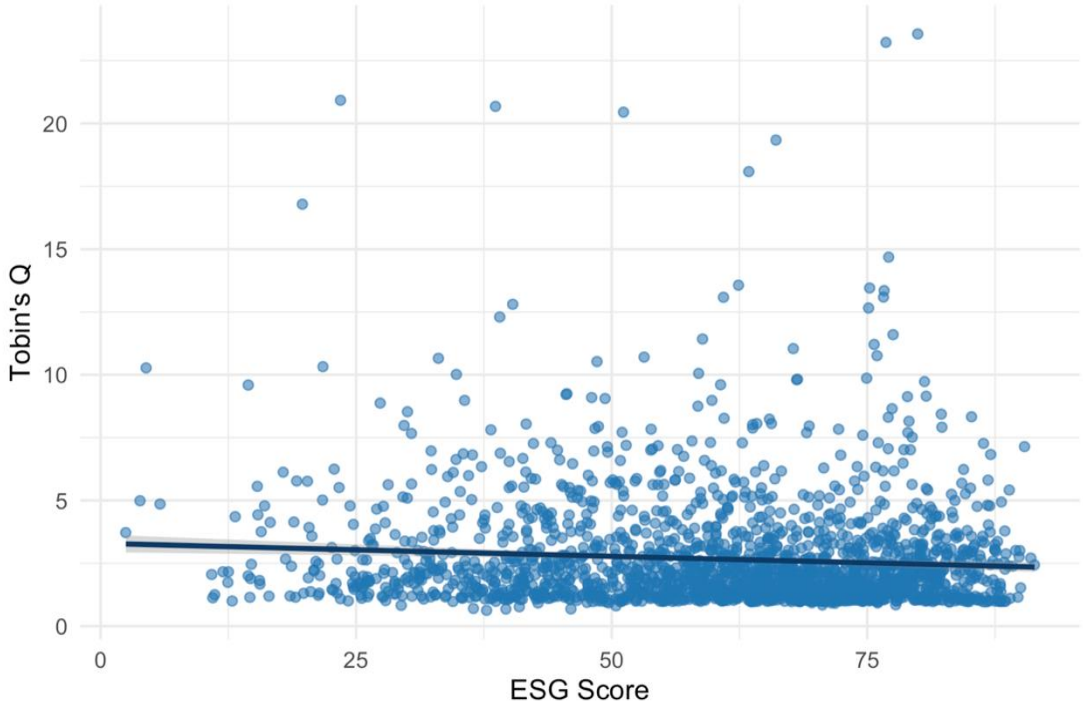

Figure 3: **ESG and Firm value (Source: Author's own data & regression-based illustration)**

According to Figure 3, there appears to be no linear relationship between ESG and firm value, and the data is widely dispersed, and the fitted regression line is nearly straight. This graphical result aids in supporting the relatively small magnitude of the ESG coefficient in Table 4 and validates the observation that aggregate ESG affects firm value with a consistently positive but economically insignificant impact in most model formulations.

4.3.2. Model 2: ESG Components and Firm Value

Table 5 shows the results of Model 2 and provides a more specific insight into the relationship between the ESG-firm value by disaggregating the overall ESG score into the separate components of the overall score.

The findings reveal that the impact of the social (S) factor is positive and significant (= 0.010, p < 0.01), and the impact of the environmental (E) and governance (G) factors is not significant. This confirms Hypothesis H3, but not Hypotheses H2 and H4.

This result also provides a suggestion that the effect of governance may be smaller in large and well-regulated firms such as those in the S&P 500, where the state of governance practices is relatively standardised and already reflected in the firm value. The level of cross-sectional dispersion may be reduced in governance mechanisms in such situations, which minimises their perceived impact on firm value. It also coincides with the recent body of research that emphasises the importance of the elements related to stakeholders in the creation of values (Yuen et al., 2022; Kouzez et al., 2024).

Table 5: Fixed Effects Regression Results – ESG Pillars Model

Variables	estimate	std.error	statistic	P value	significance
E	0.001	0.002	0.275	0.784	
S	0.010	0.003	3.464	0.001	***
G	-0.002	0.002	-1.104	0.270	
Size	0.000	0.000	-0.181	0.856	
Leverage	0.009	0.003	3.404	0.001	***
ROA	0.079	0.005	16.191	0.000	***

Notes: This table reports the results of fixed effects panel regressions. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

The importance of the social aspect implies that the aspects related to the stakeholders are directly more appreciated by the market. This observation is congruent with the stakeholder theory (Freeman, 1984) that emphasises the significance of relations with both employees and customers as well as communities in value creation. It is also correlated with the empirical findings by Deng et al. (2013) and Servaes and Tamayo (2013) who show that the better stakeholder-engaged companies are, the more likely they are to have a high market valuation.

However, the environmental (= 0.001, p > 0.10) and governance (= -0.002, p > 0.10) elements do not have significant impacts. That means that they may not have a direct impact on firm value. Porter and van der Linde (1995) and the benefits are reaped over a longer time period so environmental investments are likely to incur upfront expenses. Similarly, the agency issues are essentially mitigated by governance benefits and resulting in transparency (Jensen and Meckling, 1976; Krueger, 2015), which will not always be immediately reflected in market prices.

Interestingly, the findings are relevant in realising the comparatively ineffective economic effect of aggregate ESG that is evident in the case of Model 1. The fact that the ESG coefficient in Table 4 is significant but its value is small suggests that the impacts of the pillars may be pooled, and as such, the positive impact of the social dimension is weakened.

This can support the argument that composite measures of ESG may conceal economically meaningful relationships (Berg et al., 2022). The only control variable that is strongly positive and highly significant (0.079, p < 0.01) is ROA, which substantiates its argument as an important determinant of firm value. The leverage also has a positive and significant relatedness (= 0.009, p < 0.01), though its stability is also taken into consideration in the robustness tests.

In general, the findings in Table 5 show that ESG is not a unified concept and that the influence on the value of the firm is mainly social in nature. This highlights the need to disaggregate ESG measures in the empirical analysis. To further indicate the various impacts of the ESG factors, Figure 4 presents the estimated coefficients of the environmental, social and governance variables.

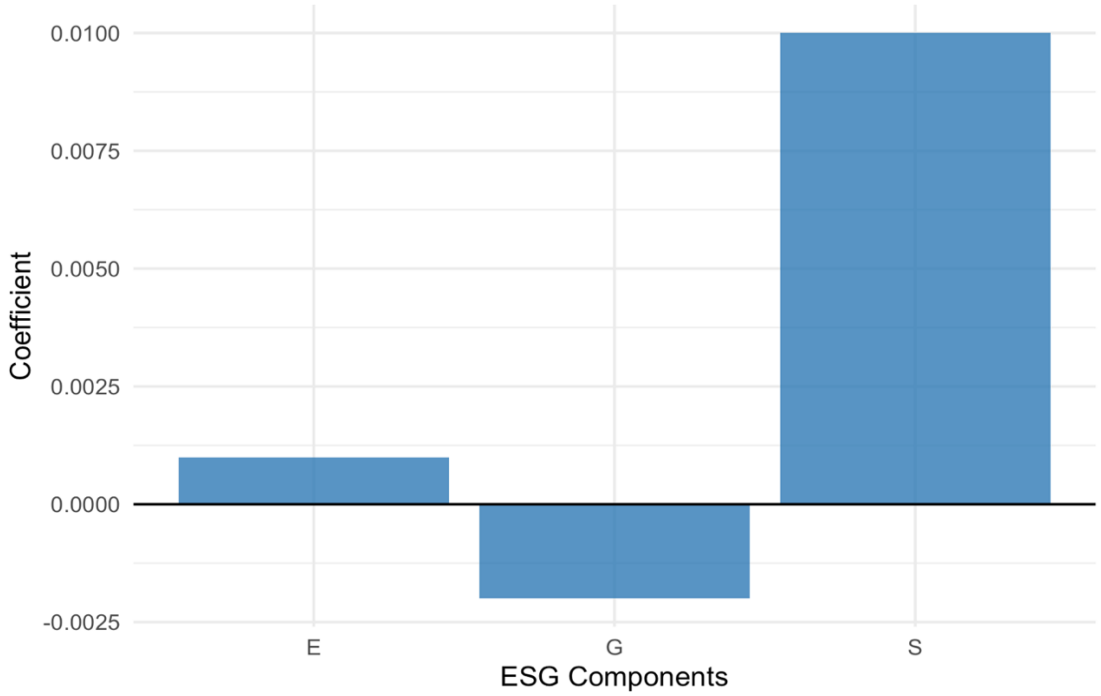

Figure 4: Individual E, S, G Components' impact (Source: Author's own data & regression-based illustration)

As Figure 4 shows, the social component has a much more positive impact compared to the environmental and governance components, which have close to zero coefficients. This graphic presentation justifies the regression results reported in Table 5, where the social dimension is the only important variable that has a statistically significant impact on firm value. Interestingly, the figure allows preventing a potential misunderstanding of the results, by making clear that the overall weak effect of aggregate ESG is due to the compensating effect of the constituent parts, which reinforces the notion that ESG should be analysed disaggregated.

Also, the outcome assists in explaining why the aggregated ESG has a weak effect on financial performance, as the effects of other pillars overshadow the positive effect of the social aspect.

4.3.3 Extended Model with Additional Controls

The results of the extended fixed effects model are presented in Table 6. The model incorporates additional firm-level controls, including firm growth, alongside year fixed effects to account for macroeconomic shocks.

Table 6: Fixed effect regression results – extended ESG model with additional controls and year fixed effects.

Variable	Coefficient	Std_Error	t_value	p_value	Significance
ESG	0.0123	0.0038	3.2533	0.0012	***
Growth	0.1669	0.1946	0.8579	0.3912	
Size	-0.1807	0.1538	-1.1748	0.2404	
Leverage	-1.8191	0.4464	-4.0754	0.0001	***
ROA	0.0460	0.0077	6.0172	0.0000	***
Year 2015	-0.0949	0.2453	-0.3869	0.6989	
Year 2016	-0.1350	0.2455	-0.5497	0.5827	
Year 2017	0.0627	0.2469	0.2540	0.7996	
Year 2018	-0.0218	0.2480	-0.0878	0.9301	
Year 2019	0.0963	0.2514	0.3830	0.7018	
Year 2020	0.3458	0.2556	1.3526	0.1765	
Year 2021	0.5723	0.2591	2.2091	0.0274	**
Year 2022	0.0566	0.2615	0.2164	0.8288	
Year 2023	0.1902	0.2643	0.7196	0.4719	
Year 2024	0.4768	0.2659	1.7928	0.0733	*

Notes: This table reports the results of fixed effects panel regressions. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

The findings indicate that ESG performance has a positive and statistically significant impact on firm value. The value of the coefficient of ESG is positive (= 0.0123), and significant at the 1% level ($p < 0.01$) so that, the higher the ESG score of a firm, the higher its market value, as indicated by the Tobin Q. This finding is in line with the theoretical assumption that sustainable business practices positively affect the firm reputation, risk mitigation and investor confidence.

The growth (though positive, 0.1669) is not significant, which means that growth does not play such a strong direct role in the firm value in this model. This can imply that short-term growth is not equally rewarded by investors, or growth impacts are already reflected by other firm attributes.

The coefficient of firm size is negative and statistically insignificant, which suggests that large firms might not necessarily be more valued after taking into consideration firm-specific fixed effects. Conversely, the leverage has a negative and significant impact ($\beta = -1.819$, $p < 0.001$), which implies that the higher the level of debt, the lower the value of the firm, presumably because of the greater financial risk.

The positive and significant impact of profitability (ROA) on firm value (0.0460, $p < 0.001$) is confirmed, showing that more profitable firms are more highly valued in the market. Concerning the effects of time, the majority of year dummy variables are statistically not significant, indicating that there is not much variation in the value of firms between years after adjusting for the firm-specific variables. The coefficient of the year 2021 is, however, positive and significant, and this could be as a result of post-pandemic recovery impacts on financial markets.

It is important to note that the sign of leverage has altered compared to the past models, such that in this particular extended model that is used, it is negative. Therefore, it is suggested that the inclusion of additional variables and time effects, higher financial risk is related to lower firm value, that the estimation previously derived with a positive value, could have been affected by omitted variable bias. Since the sign and significance of leverage differs depending on the specifications of the regression they can be assumed to depend on the model specification.

In general, the extended model affirms the strength of the positive ESG-firm value relationship and the significance of financial structure and profitability on the determination of firm valuation.

4.3.4 Crisis Interaction Model

To test the hypothesis of the relationship between firm characteristics and the change of performance in the economic stress environment further, the model will involve a crisis dummy variable (because it is the COVID-19 period (2020-2021)) and an interaction between growth and crisis dummy. By including this interaction term, it is possible to test the hypothesis that the effect of the growth of firms on performance in crisis and non-crisis periods varies. The results are presented in Table 7.

Table 7: Fixed effects regression results – Crisis interaction model

Variable	Coefficient	Std_Error	t_value	p_value	Significance
ESG	0.0123	0.0038	3.2492	0.0012	***
Growth	0.1416	0.2372	0.5968	0.5508	
Crisis	0.5603	0.2671	2.0981	0.0362	**
Size	-0.1816	0.1540	-1.1792	0.2386	
Leverage	-1.8113	0.4486	-4.0382	0.0001	***
ROA	0.0461	0.0077	6.0157	0.0000	***
Year 2015	-0.0971	0.2457	-0.3953	0.6927	
Year 2016	-0.1365	0.2458	-0.5552	0.5789	
Year 2017	0.0621	0.2471	0.2515	0.8015	
Year 2018	-0.0222	0.2482	-0.0893	0.9289	
Year 2019	0.0946	0.2517	0.3760	0.7070	
Year 2020	-0.2173	0.1434	-1.5154	0.1300	
Year 2022	0.0572	0.2617	0.2185	0.8271	
Year 2023	0.1891	0.2645	0.7151	0.4747	

Year 2024	0.4756	0.2662	1.7867	0.0743	*
Growth:Crisis	0.0740	0.3956	0.1872	0.8516	

Notes: This table reports the results of fixed effects panel regressions. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

The results show that ESG performance remains positive and statistically significant (β = 0.0123, p < 0.01), confirming the robustness of the ESG–firm value relationship even after accounting for crisis conditions. This suggests that sustainable firms continue to be valued more highly by investors, irrespective of economic uncertainty.

The crisis dummy variable is found to be positive and significant (= 0.5603, p < 0.05), meaning that the average firm valuation was greater during the time of crisis, which results in some re-pricing of the company value through market or policy actions, or by re-pricing the sector during the COVID-19 pandemic.

The growth of firms is not statistically significant in the specification, which is in line with the results of the extended model. More to the point, the growth × crisis (Growth x Crisis) interaction term is not significant (p > 0.10). This implies that there is no significant difference between the impact of firm growth on firm value during crisis and non-crisis periods. That is, growth and valuation have a stable relationship, irrespective of the economic conditions.

The control variables are in line with the past findings. The negative and significant influence of leverage on firm value and the positive and highly significant impact of profitability (ROA) maintain the validity of the model. In general, the results indicate that although the period of crisis directly affected firm value, it did not change the correlation between firm growth and firm value significantly. Notably, even in times of economic uncertainty, ESG performance continues to be a significant factor in determining the firm's value.

The observation is consistent with the literature on ESG and firm resilience to crisis. As earlier literature shows, companies that have good ESG results, particularly in the social dimension, will be more robust during a crisis, due to good stakeholder trust development and reduction of downside risk (e.g., Lins et al., 2017). In this case, the positive ESG coefficient during the crisis period indicates that investors may put more premium on responsible and trustworthy firms in the state of heightened uncertainty, which validates the role of ESG as a stabilising factor.

In an attempt to bring out more of the impact of the crisis period on firm value, Figure 5 shows the distribution of the Tobin's Q in crisis and non-crisis periods.

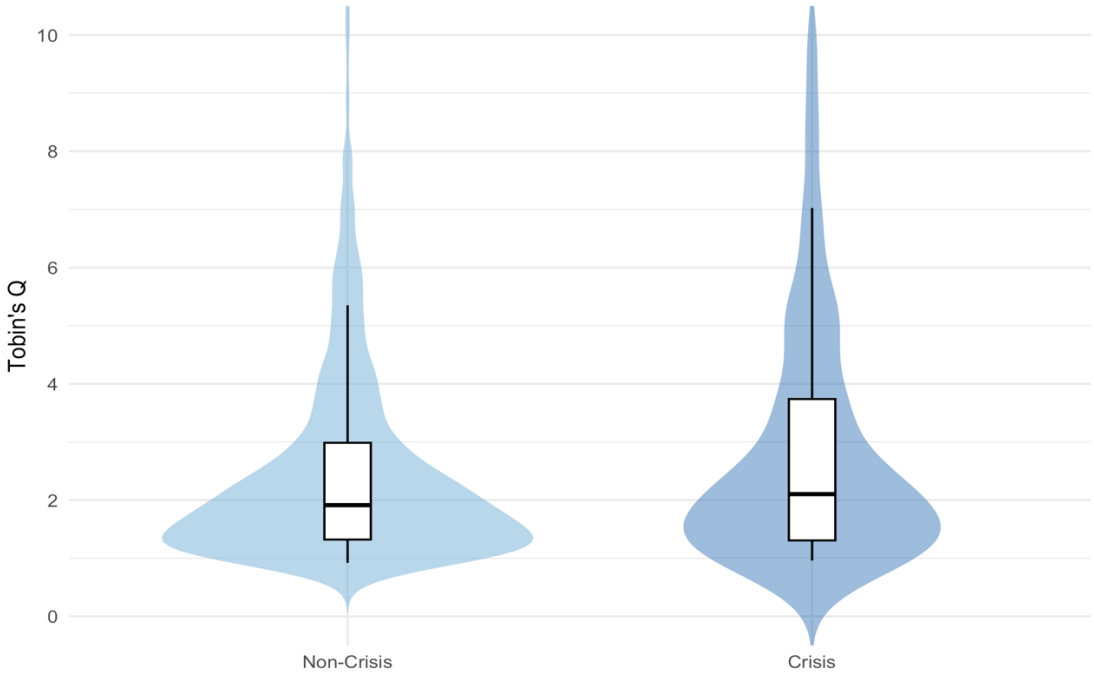

Figure 5: Distribution of Tobin's Q During Crisis and Non-Crisis Periods(Source: Author's illustration based on data)

The figure shows that the median firm value appears slightly higher during the crisis period compared to non-crisis years. Additionally, there is a broader dispersion of the distribution in the crisis period, which shows that there is more variability in firm valuation. This visual information confirms the regression results, according to which the crisis dummy variable was seen to positively and significantly affect the firm value. All in all,

the figure is a complement to the empirical outcomes as it gives a vivid graphical picture of the way in which firm valuation changed throughout the time of economic ambiguity.

4.4. Diagnostic Tests and Robustness

It is important to test the validity of the underlying econometric assumptions prior to interpreting the regression results so that the estimated coefficients can be relied upon. Being a common practice in a panel data approach (Wooldridge, 2010), a series of diagnostic tests is carried out.

To ensure that the explanatory variables are not over-correlated, first, multicollinearity is verified by using the Variance Inflation Factor (VIF). Second, the Breusch-Pagan test is applied to determine whether there is the existence of heteroskedasticity exists, and this may bias the standard errors and disrupt the statistical inference. Since there is the likelihood of violation, then strong estimation using Driscoll-Kraay standard errors is done to justify heteroskedasticity, serial correlation and cross-sectional dependence. This stepwise procedure will ensure that the results provided are both statistically and meaningfully valid.

4.4.1. Multicollinearity

The Variance Inflation Factor (VIF) of each of the independent variables included in the regression models is reported in Table 8. The results reveal that all the VIFs are much smaller than the traditional cut-off of 5, and the largest value is that of the environmental variable (E = 2.205).

Table 8: Variance Inflation Factor Results

Variables	vif_values
E	2.205
S	2.150
G	1.173

Size	1.126
Leverage	1.058
ROA	1.052

This means that there is no multicollinearity in the model, and the estimates of the coefficients are not influenced by the high degree of correlation among explanatory variables. The less-than-high VIF values are quite interesting in light of the high pair-wise correlation between ESG and its components considered above in Table 3. Despite these correlations, the results of VIF show that multicollinearity is not an important econometric issue in the regression model.

Methodologically, this increases the reliability of the estimated coefficients and validity of the inference made using Model 2. It also validates that the value of the social (S) variable is not affected by the collinearity it has with other ESG variables, but actually, there is a relationship with the value of firms.

4.4.2. Heteroskedasticity

The findings of the Breusch–Pagan test of heteroskedasticity are presented in Table 9. The test value is 52.195, which has a statistically significant value ($p < 0.01$), hence indicating there is heteroskedasticity in the regression model.

Table 9: Breusch - Pagan test for Heteroskedasticity

Test	Statistic	DF	P_Value
Breusch-Pagan	52.195	6	< 0.01

This finding indicates that the assumption of constant error variance is not being satisfied, and in this case, they will make biased standard errors and unreliable statistical inference in the absence of this information. These issues in a panel data environment are highly common, in particular, where firms are different in their organisation, or are not even the same in size, risk, and operational characteristics.

The heteroskedasticity has no econometric effect on the coefficient estimates, but affects the level of significance and precision. Therefore, the use of traditional standard errors may give a false conclusion with regard to hypothesis testing.

This finding is consistent with the above methodological framework to justify the use of strong estimation techniques. Under this relationship, the analysis that will be carried out below will be done using Driscoll-Kraay standard errors to ensure that the inference is not invalidated by the heteroskedasticity and any other potential panel data issues.

4.4.3. Robust Standard Errors

The robust regression results using Driscoll–Kraay standard errors are presented in Table 10. In general, the results are quite similar to the baseline estimates in Table 4 that confirms the consistency of the main results.

Table 10: Regression Results for Robustness (Driscoll-Kraay Standard Errors)

Variable	Estimate	Std_Error	t_value	p_value	Significance
E	0.001	0.002	0.367	0.714	
S	0.010	0.003	3.682	0.000	***
G	-0.002	0.003	-0.698	0.485	
Size	0.000	0.000	-0.687	0.492	
Leverage	0.009	0.006	1.618	0.106	
ROA	0.079	0.016	4.890	0.000	***

Notes: This table reports the results of fixed effects panel regressions. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

In particular, the social (S) variable is positive and statistically significant (= 0.010, $p < 0.01$), which adds to the previous argument in favour of Hypothesis H3. The fact that this outcome has held true in varying specifications suggests that it is not because social

performance is heteroskedastic or cross-sectional dependent that the relationship between social performance and firm value exists, but rather, it is a powerful economic impact. It is based on the earlier studies (Servaes and Tamayo, 2013; Deng et al., 2013), in which the authors highlight the importance of the relationships with the stakeholders in the rise in the value of the firm.

The environmental (E) and governance (G) variables on the other hand are not significant in statistical terms as is the case in the baseline model. Though earlier studies are inclined to acknowledge the role of governance as one of the key issues affecting the performance of firms, the recent literature suggests that the effect of governance may be context- or firm valuation-driven particularly in the developed markets where the institutional frameworks are well-established (Ji et al., 2022; Athari et al., 2024). This may have been the cause of lack of any significant contemporaneous effect in this study. This also goes to reject Hypotheses H2 and H4 indicating that these dimensions do not directly affect firm value.

The other notable difference is that the leverage variable becomes non-significant when the estimation is robust ($p > 0.10$), but it is significant as seen in Table 5. This demonstrates that the historical significance may have been because of heteroskedasticity or model peculiarity rather than a fixed economic association.

The effect of profitability (ROA) is also positive (= 0.079, $p < 0.01$), which confirms that it is one of the main determinants of firm value and is in line with the literature (Deng et al., 2013).

Overall, Table 8 findings contribute to the analysis being more believable, since the results indicate that the main conclusion, i.e. the dominance of the social component, is not sensitive to various specifications of the standard error. This helps to draw a conclusion that ESG is not a coherent construct, and its impact on the value of the firm is largely dependent on the stakeholder-related factors.

4.5. Lagged ESG Model

In a bid to explore the dynamic characteristics of the relationship between the ESG and the firm value, a lagged ESG variable is introduced. Further, the results are reported in Table 11.

Table 11: Lagged ESG Regression Results

Variables	estimate	std.error	statistic	p.value	Significance
ESG_lag	0.0085	0.0026	3.2947	0.0010	**
Size	0.0000	0.0000	-0.2581	0.7964	
Leverage	0.0092	0.0028	3.3076	0.0010	***
ROA	0.0792	0.0049	16.2652	0.0000	***
R^2 : 0.136					
Adj. R^2 : 0.047					
F-stat : 72.45 (p-value: < 0.01)					

Notes: This table reports the results of fixed effects panel regressions. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

The lagged ESG coefficient has a positive value that is statistically significant (= 0.0085, $p < 0.01$) indicating that it is true that the ESG performance has a lagging effect on the firm value. This finding is the opposite of Model 1 (Table 4), where ESG is statistically, but the economic insignificance, whereas the lagged model suggests the effect of ESG to be persistent over time, and not contemporaneous.

This result is a strong argument in support of the thesis that ESG performance assists in value creation in the firm in a long-term and dynamic process. Recent studies are also beginning to devote more attention to the fact that ESG investments do not bring immediate benefits, but they are accrued over time, in particular, in the form of reputation building and trust in the stakeholders, as well as improved risk management (Eccles et al., 2014; Bikmetova and Pirinsky, 2026).

This observation shows that ESG investments do not generate short-term returns in the market but enhances value to the firms over time. The resource-based approach (Barney, 1991) can be used to explain this trend since it is the skills associated with ESGs, such as reputation, stakeholder trust and organisational culture, which are intangible resources that create long-term competitive edge.

This finding is empirically in line with that of Eccles et al. (2014) which states that high sustainability practices performed by companies perform better in the long-run, rather than in the short-run. It is also one of the contributing factors to the reconciliation of mixed evidence stated in the literature (Friede et al., 2015), meaning that the relationship between ESG performance is highly time-contingent.

Control variables are like those of other models. The positive impact of ROA is still high (ROA = 0.0792, p = 0.01) and significant, which confirms that it is among the determinants of the firm value. The leverage appears to be positive and significant (= 0.0092, p = 0.01) as well, though past results of robustness suggest that one should take the relationship with caution.

This model explains almost 13.6 per cent of firm value (R 2 = 0.136) and the overall model is also statistically significant (F-statistic = 72.45, $p < 0.01$), indicating that the model has good explanatory power when analysing panel data.

Overall, Table 11 reveals that the correlation between the ESG performance and firm value is rather strong and that this effect is time-lagged, rather than contemporaneous. This highlights the necessity to take the time dynamics of economic impacts of ESG into account and it justifies the fact that ESG as a long-term strategic investment cannot be discussed as a short-term value generator. To further highlight this difference, Figure 6 compares both the estimated coefficients of contemporaneous and lagged ESG.

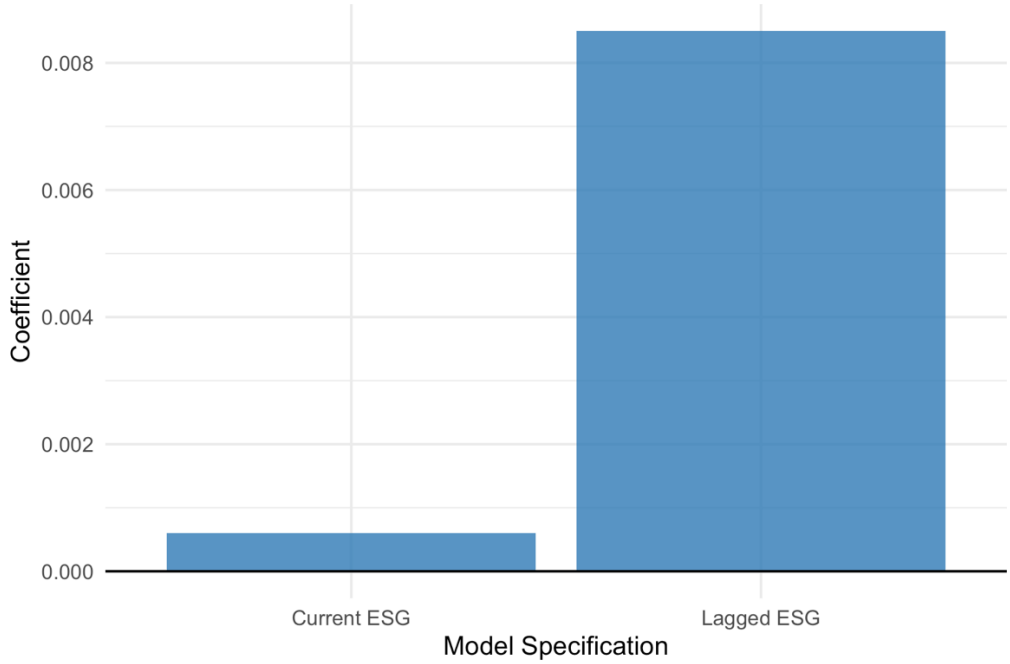

Figure 6: Current vs Lagged ESG Effect on Firm Value (Source: Author's own data & regression-based illustration)

As illustrated in Figure 6, the contemporaneous ESG coefficient is nearly zero as compared to the lagged ESG coefficient, which is evidently positive. This graphical presentation complements the regression findings that ESG does not have a strong immediate effect on the value of a firm, but a stronger effect in the long run. The figure, thus, intuitively supports the dynamic relationship, as identified in Table 11 and reinforces the interpretation that ESG investments create long-term value and not short-term market responses.

5. Limitations and Future Research

Although some substantial insights are provided in this study about the ESG-firm value relationship, yet identifying limitations and further research about the topic is noteworthy. This chapter discusses the main constraints during the analysis and provides further direction for future research to increase the robustness and generalizability.

5.1. Limitations

Although this study offers some useful insights into the relationship between ESG, firm characteristics, and firm performance, there are a number of limitations that one must consider.

5.1.1 Endogeneity and Causality

One of the major limitations of this study is associated with the identification and the failure to determine causal relationships. Though the introduction of fixed effect models to cope with the presence of unobserved time-invariant firm characteristics is quite effective in eliminating endogeneity to a certain extent, it is not effective in eliminating it totally. Especially, the question of reverse causality is still relevant, as more resources and interest in ESG activities may be possessed by those companies that have higher market valuation or better financial results. This establishes a reciprocity between ESG performance and firm value, and it is hard to ascertain which is the cause-and-effect relationship.

Also, there can be omitted variable bias because of time-varying variables not measured, such as the quality of management, corporate strategy, innovation, or changes in market conditions. All these can concurrently affect the ESG performance and firm value and result in biased estimates of the coefficient even in the fixed effects model.
Although the lagged ESG variables partially solve the issues of contemporaneity, they still do not address the problem of endogeneity in its full extent because the dynamic

feedback effects can be experienced in the future. Moreover, ESG scores are sensitive to measurement error, as was previously reported in earlier studies (Berg et al., 2022) and can also result in the attenuation effect of the estimated relationships.

The findings of this study are, therefore, associative rather than causal. Future studies can be enhanced in identification by using more sophisticated econometric designs, including instrumental variable designs, difference-in-differences designs, or dynamic panel estimators, including system GMM, that are more appropriate to endogeneity and causal inference.

5.1.2 Data Availability and Sample Size

The introduction of other control variables, especially firm growth, makes the sample size smaller since the sample has been reduced by the loss of some of the observations. This is not unusual when analysing panel data, but can result in sample selection bias, in situations when the missing values are not randomly sampled across time and firms. As an example, the practice of ESG or financial performance can be systematically different between incomplete reporting companies, which may also affect the representativeness of the sample. This means that the findings might not be valid and generalizable. The remedy to this would be either more than two data sources in the future or imputation methods to enhance coverage of data and sample homogeneity.

5.1.3 Measurement of Variables

The other constraint is associated with the measurement of key variables. The proxies employed in this research might not be able to reflect the theoretical constructs. A case in point is in the revenue-based metrics that are used in quantifying firm growth, which might not be sufficient to quantify other aspects of growth, like market expectations or investment opportunities. In the same spirit, the rating agencies can be imprecise in ESG scores measurement, as pointed out by Berg et al. (2022), which can add noise and

diminish comparability. The financial ratios can also exhibit differences in industries, and this restrains cross-firm comparability. Future studies can enhance the accuracy of measurement through the addition of more proxies, multi-dimensional measures or using more ESG data providers to be more robust.

5.1.4 Model Specification and Missing Variables

Even though the empirical models have a number of control variables and year fixed effects, the risk of omitted variable bias cannot be completely eliminated. Specifically, the quality of corporate governance, degree of innovation, managerial capabilities or industry-specific motivators can be viewed as time-changing drivers of ESG performance and firm value. Unless these factors have been included appropriately to get the right estimated coefficients, they can be biased. Moreover, linear specification can be invalid for possibly nonlinear relationships between ESG and firm value. Future studies can use the model to add more firm-level and macroeconomic variables and the nonlinear or interaction effects in order to capture the complexity of the relationship.

5.1.5 Crisis-Specific Limitations

This research paper focuses its crisis analysis on the COVID-19 period (2020-2021), which is a unique global shock. Although the findings will give an insight on the behaviour of companies today, it might not be relevant to other crises. In future studies, various phases of a crisis would be taken into consideration to ascertain the uniformity of the effects.

The potential interpretation of such findings also might be elaborated within the framework of the increasing amount of evidence on the topic of the ESG and business resilience during the economic turmoil. Previous research, including Broadstock et al. (2021) and Albuquerque et al. (2020) demonstrates that more resilient companies post-crisis are more sustainable in their ESG and are more stable and less volatile in their

performance. This is primarily explained by the fact that the relations between the stakeholders are strengthened, the corporate image is improved, and risk management practices related to the ESG engagement can be developed.

In that respect, the fact that the valuation of firms increased during the COVID-19 period might be related to the change in investor preference towards the more sustainable and resilient firms. The importance of ESG characteristics has become even greater to investors as a sign of long-term stability and reduced downside risk. But the effect of growth and crisis did not show any significant interaction, which is an indicator that in the midst of the crisis, the general market conditions were generally affected, but the core relationship between firm growth and valuation was the same. This proves the fact that the benefits of ESG might not rely on the relations of short-term growth under the influence of economic stress.

5.1.6 ESG-Specific Scope

Although the current study considers ESG as both aggregate and its sub-elements, the more extended models are more concerned with the variables of financial control, which can constrain the specific study of ESG. In particular, the interplay between the ESG dimensions and firm characteristics, i.e. size, industry, or the point of the firm's development, is not a well-researched topic. It might not be as heterogeneous as the influence of ESG variables on the value of firms in the various scenarios. Subsequent research could also examine these associations and examine how the relative variables of environmental, social and governance aspects also differ amongst firms, industries and economies.

5.2 Future Research

Based on the conclusions and shortcomings of this research, it is possible to outline a number of future research directions.

Firstly, more sophisticated econometric methods like instrumental variables or dynamic panel models (e.g. system GMM) could be applied to the endogeneity issues in future research. This would assist in coming up with a more effective causal relationship between ESG, firm characteristics and firm performance.

Second, the most important variables can be further measured through the assistance of additional research. An example is that other proxies might be used to measure growth (e.g. revenue growth or market-based measures), and liquidity might be measured by more accurate financial measures. On the same note, a deeper examination of the elements of ESG, such as the environment, social and governance, would enlighten us more about the factors that motivate the performance of firms.

Third, industry-specific effects and cross-country comparisons can be included in future research. The regulatory environments, market structures and institutional settings may have an impact on the relationship between ESG performance, and a larger data sample would be able to improve the generalizability of the findings.

Fourth, one may speak more about the role of crisis conditions with references to various kinds of economic shocks that are included in a financial crisis or geopolitical break. This would enable the researchers to observe whether changes in the behaviour of the current firms that are currently being experienced in the COVID-19 period can be compared to the ones that were experienced in the situation of the various crisis scenarios.

Fifth, the nonlinear and dynamic relationships between ESG and the performance of firms can be studied in the future. To demonstrate this, the impact of ESG can differ based on the size of the firm, its development stage, or market situation, and even more versatile modelling techniques are able to provide new data.

Lastly, the qualitative or mixed-methodology can be used as a supplement to the quantitative results to examine the managerial decision making, stakeholder response and strategic ESG implementation in a more specific way.

Overall, the future study can substantially influence the conclusions of this paper with the help of a more complicated research design, a longer scope of data, and addition of the new dimensions of the ESG and firm performance relationship.

6. Conclusion

This paper has explored the connection between ESG and firm performance in an empirical model that has been discussed in detail, considering firm-specific financial attributes, time and crisis-related factors. Following the foot path of the above literature that confirms a fairly positive correlation between ESG and the performance of companies (Aguinis and Glavas, 2012; Friede, Busch and Bassen, 2015), the paper develops on this argument by including the extra financial controls and the development of these relations in the context of economic stress.

The empirical findings show that the positive and statistically significant effect of ESG performance on the value of the firm is positive and suggests that the higher the score of the ESG performance, the higher the value of the firm in the market. Nevertheless, this coefficient is not high and suggests that ESG is not the only predictor of the firm valuation, but one of the factors.

The disaggregated analysis also indicates that the social (S) dimension of the value of firms is more critical and that the environmental (E) and governance (G) dimensions do not have major effects. This proves the significance of the aspects, which are stakeholder-based, including employee relations and corporate reputation, in developing the image of the market.

The significant positive correlation between profitability (ROA) and firm value has been proven to be sensitive to firm-specific features, and this proves the significance of the value of profitability as a variable affecting the market value. The effects of leverage on models vary with model specifications, both with positive and negative results. It is non-significant in the robust estimation, which means that the effect of the robust estimation is model design sensitive and should be considered carefully.

The positive but statistically insignificant influence of firm growth on firm value is located in the fact that the increase in firm value does not necessarily occur immediately after the growth of the firm in the short run.

The inclusion of variables associated with crisis also gives more information on the behaviour of firms under economic stress. The findings suggest that the COVID-19 experience positively and significantly impacts the firm value, as well as reflects the change in the general market dynamics, policy responses or investor expectations throughout this period. Growth and crisis relationship, however, is not statistically significant; that is, the impact of growth of a firm on firm value is not significantly different in the crisis period and the non-crisis period.

The findings can be connected to existing research on ESG and resilience of firms (Broadstock et al., 2021; Albuquerque et al., 2020) and indicate that the role of ESG and firm-specific aspects depends on the overall economic context and is different.

In general, the discussion shows that firm value is defined by a set of ESG performance, financial fundamentals, and macroeconomic factors. In spite of the fact that ESG is a significant but economically insignificant factor, conventional financial indicators like profitability and leverage still exert a significant impact on firm valuation.

In a practical sense, the findings suggest that businesses should be more targeted on ESG as opposed to viewing it as a homogenous entity. In particular, it was identified that social aspects, such as employee relations, customer engagement, and corporate reputation, correlate with the firm value most of all, which is why stakeholder-oriented initiatives can be more value-relevant. The implications for investors are significant since the findings indicate the inefficacy of aggregate ESG scores, as they may obscure important differences between the components of ESG. The more disaggregated analysis can therefore provide the correct result of firm valuation. The implications of the results as a policy-maker are that standardisation and transparency in the ESG reporting should be

improved to improve comparability and reduce measurement discrepancies in companies.

Lastly, the research contributes to the literature on the topic of ESG and firm value by incorporating issues of sustainability, money and crisis-associated concerns into a cohesive empirical model and showing the dynamic and complex state of the firm valuation.

In conclusion, the research paper provides insight into the ESG firm value literature, as it integrates the variables of sustainability, financial, and crisis-related variables into one empirical model, which shows the dynamism and complexity of the firm valuation. The results point to the fact that ESG leads to firm value in a long-term and stakeholder-related manner, but not immediate market impacts.

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