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NGHIÊN CỨU ẢNH HƯỞNG CỦA ĐIỂM ESG TỚI LỢI SUẤT TRÊN TÀI SẢN CỦA DOANH NGHIỆP DƯỚI TÁC ĐỘNG CỦA ĐẠI DỊCH COVID-19: BẰNG CHỨNG THỰC NGHIỆM TỪ CÁC QUỐC GIA THUỘC TỔ CHỨC KINH TẾ PHÁT TRIỂN OECD

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Tóm tắt

Do ảnh hưởng của đại dịch COVID-19, nhiều công ty trên toàn cầu đã bị đẩy tới bờ vực phá sản. Điều này đặt ra câu hỏi về mối quan hệ giữa hiệu suất tài chính của các công ty thuộc Tổ chức Hợp tác và Phát triển Kinh tế (OECD) với các yếu tố môi trường, xã hội và quản trị (ESG). Nghiên cứu này được thực hiện với mục tiêu xem xét sự tương quan giữa Lợi nhuận trên Tài sản (ROA) với tổng điểm ESG cũng như điểm từng thành phần của 382 công ty niêm yết trên thế giới trong thời kỳ mười năm từ 2012 đến 2021. Kết quả cho thấy, các yếu tố về mặt quản trị có ảnh hưởng tiêu cực đến hiệu suất tài chính của doanh nghiệp cả trước và trong thời kỳ COVID-19, nhưng điểm của yếu tố môi trường (EScore) và điểm của yếu tố xã hội (SScore) lại mang lại ảnh hưởng đáng kể nhất. COVID-19 không có ảnh hưởng đáng kể đến lợi suất trên tài sản của công ty như những giả định trước đó và tác động của điểm ESG đến ROA dưới ảnh hưởng của COVID-19 thay đổi tuỳ theo ngành.

Từ khóa: EScore, SScore, GScore, Hiệu suất tài chính, ROA, COVID-19, OECD, Ngành công nghiệp

JEL: E00, G3, M14, Q01

THE INFLUENCE OF ESG SCORES ON RETURN ON ASSETS UNDER THE EFFECT OF COVID-19: EMPIRICAL EVIDENCE FROM OECD COUNTRIES

Abstract

Many companies have been forced out of the global market by the COVID-19 epidemic, raising questions about how the financial performance of OECD companies relates to the three sub-component scores of environmental, social, and governance (ESG). The study looks at the correlation between the Return on Assets (ROA) of 382 listed companies over a ten-year period from 2012 to 2021 and the overall ESG score as well as the scores for each dimension. The findings show that the governance pillar score (GScore) has a negative effect on the financial performance of businesses both before and during COVID-19, but the environmental pillar score (EScore) and social pillar score (SScore) offer the most significant influence. The COVID-19 did not have substantial influence on the effectiveness in firm operations as common assumptions and the impacts of ESG scores on ROA under the effects of COVID-19 are diverse across industries.

Keywords: EScore, SScore, GScore, Financial performance, ROA, COVID-19, OECD, Industries

JEL: E00, G3, M14, Q01

1. Introduction

The research emphasizes the significance of integrating Environmental, Social, and Governance (ESG) principles into corporate strategies, recognizing the importance of sustainable business practices in achieving long-term prosperity and addressing global sustainability goals. Understanding the impact of ESG practices on business operations is essential for fostering a more sustainable and equitable economic system amidst socio-economic fluctuations and environmental

challenges. Investigating the influence of firm-level ESG scores on financial performance, particularly within the context of the COVID-19 pandemic and across OECD countries, holds significant importance for various stakeholders, including investors, policymakers, and practitioners.

The objectives of the research are to employ Ordinary Least Squares (OLS) and Fixed Effects Model (FEM) methodologies to investigate the impact of ESG scores on firms' financial performance amidst the COVID-19 pandemic. By conducting a comprehensive literature review, quantifying the influence of environmental, social, and governance factors on financial performance, the study aims to provide empirical evidence and actionable recommendations for optimizing sustainable development factors in business operations. It seeks to uncover insights into the interplay between sustainability and financial performance, predict future growth trends, and foster long-term sustainability in the face of economic challenges.

The subject and scope of the research involve analyzing the correlation between ESG scores and financial performance, specifically Return on Assets (ROA), of 380 publicly listed firms across six vulnerable industries within the OECD over a span of ten years. The dataset comprises firms from 25 developed nations, members of the OECD, spanning from 2012 to 2021. The deliberate selection of firms from developed nations enhances the reliability of the data analyzed and provides insights into the relationship between sustainable business practices and economic outcomes amidst the COVID-19 pandemic.

2. Theoretical framework on the influence of firm-level ESG scores on firm financial performance under the COVID-19 pandemic

2.1. Theoretical framework on ESG scores and Sustainability approaches

The ESG score is a well-recognized metric that holds companies accountable for meeting sustainability criteria (Howard-Grenville, 2021). According to Refinitiv, the ESG Score is an overall assessment of a company based on its self-reported information across environmental, social, and governance pillars, established under the UN Principles of Responsible Investment (UN PRI) in 2006.

To assess a company's sustainability, we utilize Thomson Reuters' ESG Asset4 score, widely accepted for evaluating CSR performance (Birindelli et al., 2018). This database covers over 6,000 public companies globally, offering comprehensive ESG metrics ranging from carbon emissions to community engagement (The Editorial Team, 2022). The resulting score, ranging from 0 to 100, certifies a firm's CSR quality based on its non-financial performance in environmental, governance, and social responsibility aspects.

2.2. The theory of stakeholder on organizational management and corporate ethics

According to this theory, organizations should prioritize the interests of all stakeholders, including employees, customers, suppliers, communities, and society, besides shareholders. This

approach acknowledges that businesses operate with various stakeholders and must balance their interests to ensure sustainable growth and success (Lee Siew Peng et al., 2020). Moreover, businesses that demonstrate awareness to stakeholders' demands tend to outperform those that do not, as highlighted by both stakeholder theory and empirical ESG research (Ting-Ting Li et al., 2021). By taking this approach into account and integrating ESG considerations into their strategies, organizations can enhance their resilience, competitiveness, and long-term value creation (Dan Daugaard et al., 2022).

2.3. The theory of slack resources

The concept of slack resources, as clearly stated by Waddock and Graves (1997) and Chiu and Wang (2015), suggests that firms with greater financial stability are more inclined to excel in their corporate social responsibility (CSR) initiatives. This hypothesis shows that there exists a relationship between corporate financial performance and the extent to which firms engage in socially responsible activities (Hasan Fauzi et al., 2010). This theory underscores the importance of acceptance, investment, and active participation in ESG initiatives to promote sustainable organizational growth (Nour Chams et al., 2021). The theory suggests that companies with a strong commitment to social responsibility with their substantial investments in ESG activities, are more likely to achieve greater long-term success and outperform their peers (Liang Chen et al., 2021).

2.4. The theory of resource-based

Penrose introduced the resource-based theory, providing a framework for efficiently managing a firm's resources and exploring business opportunities. This theory emphasizes the significance of a firm's internal resources and capabilities in achieving competitive advantage and long-term success. The resource-based view is employed to assess the impact of ESG disclosure on firms' financial performance (Dipasha Sharma et al., 2019). It suggests that businesses should focus on fostering diverse competitiveness, where their ESG ratings could serve as a valuable resource to enhance firm performance and overall value creation (Xie et al., 2019). ESG performance has the potential to positively influence a company's output, improve financial performance, and reduce the likelihood of environmental problems such as pollution, aligning with the principles of the resource-based theory (Guangyou Zhou et al., 2022). This perspective emphasizes the strategic value of ESG performance in driving financial success and ensuring the sustainability of business operations (Guangyou Zhou et al., 2022).

3. Literature review on the influence of firm-level ESG scores on firm financial performance under the COVID-19 pandemic and hypothesis development

3.1. Environmental, Social, Governance factors

3.1.1. Environmental pillar scores

Environmental pillar scores contribute to the overall ESG ratings of companies by evaluating their environmental performance and impact. Some studies found that the environmental pillar

score had a positive impact on a firm's market value. This positive relationship between environmental pillar scores and ESG ratings is supported by multiple studies (Arianna, 2023; Sunarti, 2023). However, there are other studies that do not find a significant relationship between the environmental pillar score and firm performance. In a study conducted in Romania, the largest oil and gas company obtained a higher score in the environmental pillar compared to a bank, indicating a stronger contribution to the achievement of sustainable development goals in the environmental dimension (Voicu, 2023). Escore's specific impact on firm performance may vary depending on the context and methodology of the study.

3.1.2. Social pillar scores

Social factors evaluate a company's social responsibility, including sustainability, ecological behaviors, and investment decisions. It emphasizes the importance of social knowledge in terms of labor and human rights guidelines, supply chain management, and promoting innovation. Companies with strong ESG performance tend to have higher stock prices and better investment returns, indicating the importance of social factors in attracting investors and achieving financial success (Abhinandan, 2023). In 2022, Agarwal, when investigating top five FMCG Indian companies, stated that the social factor of ESG has a positive relationship with their financial performance. Companies with better ESG performance contribute to community development and implement sustainable measures to reduce health risks and workload, leading to increased satisfaction and productivity at work (Sunarti, 2023). Social pillar has the highest contribution to the achievement of the SDGs, particularly in the dimensions of workforce and community (Voicu, 2023). On the other hand, social factors have a negative and significant effect on corporate financial performance (CFP) for market indicators and a negative but not significant effect on CFP for accounting indicators (Ghassan et al., 2022). Therefore, it is important for our research as well as future research to further explore and understand the impact of the social pillar on ESG performance and sustainability in organizations.

3.1.3. Governance pillar scores

Mansor et al. (2023) indicates that the improvements in ESG performance, particularly in the governance pillar, can reduce credit risk for companies. Additionally, good governance practices contribute to community development and increase satisfaction and productivity at work. Companies that prioritize governance activities gain the trust of stakeholders and society, leading to a positive reputation. Raj states that the governance pillar score has a positive impact on a firm's market value, indicating the significance of governance within the overall ESG framework for companies (2022). Having the same result is the study from Noer. He indicates that "the detailed level of performance revealed governance performance was featured, followed by social and environmental performance." Therefore, governance performance is a key component of corporate ESG performance and has a positive influence on firm value. Despite its importance, when compared to the environmental and social pillars, the governance pillar of ESG has less well-specified metrics (Sachini et al., 2022).

3.2. Firms' ESG scores and its financial performance

3.2.1. Firm financial performance and return on assets

According to Cma (2019), firm financial performance is the process of measuring a firm's policies and operations in monetary terms to assess its profitability and financial soundness. Frank et al. (2012) defines firm financial performance as a multidimensional construct comprising two factors: shareholder confidence and financial health. Enis et al. (2020), on the other hand, considers firm financial performance as consisting of financial efficiency (measuring return on investment and return on equity) and profit (measuring return on sales and net profit margin). One common approach is to analyze the company's financial statements, such as the balance sheet, the profit and loss account, to assess profitability, liquidity, leverage, asset utilization, and growth performance (Cma, 2019). Another method is to calculate specific ratios, such as ROA, ROE (Muhammad et al., 2023), which is the same method as we use in this research. The analysis of financial performance involves conducting tests and regression analysis to determine the significance of these factors. There are several studies that provide insights into the relationship between different variables and their impact on financial performance.

3.2.2. The influence of ESG scores on firm financial performance

Many researchers have confirmed the link between ESG business scores and financial health: the higher the ESG score, the lower the likelihood of bankruptcy and fraud (Clark et al., 2015). Zhou and Zhou (2022) discovered that companies with good ESG performance can serve as effective hedges during times of crisis. Han et al. (2016) revealed a significant negative (or U-shaped) link between a firm's environmental responsibility performance score and its financial performance. There is a situation where firms, whether local or international, repeatedly abuse human rights. This frequently occurs due to poor institutions and rules (Ciravegna and Nieri, 2022). Organizations that outperform their industry rivals are more likely to engage in abusive behavior (Giuliani et al., 2021). Companies that disclose their commitment to human rights can improve their reputation, potentially leading to increased sales and financial performance (Ismail et al., 2021. Han et al. (2016), did not uncover a substantial link between social responsibility and financial performance; while discovered that the governance responsibility performance score has a positive relationship. Lagasio et al. (2018) discovered that characteristics such as board independence, board size, and the presence of female directors contribute to improving ESG disclosure. Dalton (2003) claimed that the presence of women on boards can benefit firms by introducing diverse perspectives into problem-solving, ultimately leading to a higher ESG score and a better corporate reputation.

3.3. The COVID-19 pandemic and its impact on firm financial performance

This unprecedented crisis, stemming from the coronavirus, has caused profound disruptions across various sectors and geographies, bringing about existing economic challenges (Aneja and Ahuja, 2021). Exploring the relationship between ESG scores and financial performance amid this crisis holds significant importance for shaping adaptive business strategies during global

disruptions. To capture the influence of COVID-19, researchers have employed various measures, ranging from simple dummy variables marking the onset of the crisis to the logarithm of annual cases per country (Habib, A.M.; Al Amosh, H., 2023). Utilizing data from reputable sources like the World Health Organization (WHO), many scholars have sought to quantify the pandemic's impact on financial metrics, providing insights into how ESG scores may have diminished or increased its effects on companies in OECD nations (Mousa et al., 2022).

The COVID-19 pandemic's influence on firm financial performance has been substantial, affecting various aspects of business operations and economic sectors worldwide. Cowling et al. (2020) examine the differential impacts of COVID-19 on SME performance, noting the stark disparities in resilience and recovery capacity among firms. Baker et al. (2020) provide an analysis of stock market reactions to the pandemic, noting significant declines in stock prices and increased uncertainty. This volatility has implications for firms' access to finance, with higher costs of capital and more stringent conditions for borrowing (Acharya & Steffen, 2020). These measures affected firms' financial performance and recovery prospects (Kuckertz et al., 2020). Shehzad et al. (2020) discussed the potential for prolonged economic recovery, emphasizing the importance of strategic planning and innovation in navigating the post-pandemic landscape. Firms with robust financial health, diversified operations, and adaptive business models are better positioned to withstand the ongoing challenges (Ivanov, 2020).

3.4. The six vulnerable industries during the COVID-19

3.4.1. The Banking and Investment industry

The COVID-19 pandemic has significantly impacted the banking and investment industry globally. There are a large number of research publications on this topic, with a total of 28 articles indexed by the Scopus database. Study indicates that the banking industry has experienced challenges such as credit and non-performing loans, affecting restructuring policies (Assalafiyah et al., 2023). In another study, it has been demonstrated that the pandemic has had an adverse impact on bank profitability, particularly at the outset of the crisis. These effects depend on the characteristics of banks, notably size and capital. Although there is a more positive trend in bank profitability during the COVID-19 vaccination period, it is still not adequate to compensate for the losses from the beginning of the pandemic (Augeraud-Véron & Boungou, 2023). Additionally, the fiscal response of OECD governments to the COVID-19 crisis has been substantial, with billions of dollars committed to supporting public health systems and protecting economies from the economic impact of the pandemic (Sariyer et al., 2023). To minimize the effects of the pandemic, central banks have decreased interest rates near zero, lowered reserve ratios, and expanded repurchase operations (To et al., 2023). The banking and investment industry has been both threatened and presented with opportunities due to the pandemic, requiring regulatory authorities to enhance financial stability policies and banking practitioners to innovate risk management strategies.

3.4.2. The Food and Beverage industry

The impact of COVID-19 on the food and beverage industry has been substantial, along with the changing food consumption patterns of the consumers, affecting financial stability and economic growth. As the number of meals at home increased, household consumption of food and beverage products increased, while the restaurant industry significantly decreased (Kim & Jin, 2022). According to studies on Indonesian enterprises, the pandemic significantly influenced financial performance, with the food and beverage sector demonstrating greater resistance to probable bankruptcy than the restaurant service sector (Akbar et al., 2023). Aside from that, COVID-19 has been found to have an impact on the entire food supply chain, one of the most important sectors of any country, from the field to the consumer. Substantial concerns were raised about food production, manufacturing, delivery, and consumption in light of emerging issues within the food supply chain (Din et al., 2022). Furthermore, the crisis led to negative sales rates in food and beverage companies, prompting the adoption of new business continuity strategies to preserve operations (Salsabila & Rossieta, 2023).

3.4.3. The Healthcare industry

The impact of COVID-19 on the OECD healthcare industry has been profound. The pandemic led to a significant burden on healthcare systems, increased expenditures, and dramatic socioeconomic consequences. Research indicates that more stable conditions enabled capital healthcare expenditures to stimulate economic growth, however an excessive healthcare expenditure burden harmed economic stability during the COVID-19 pandemic (Vysochyna et al., 2023). Financial success of hospitals and health insurers was impacted, with interruptions in health services globally. The pandemic also affected the economic and financial results of companies in the health sub-sectors, showing varying impacts across different subsectors. A typical difficulty in this circumstance was the inability of pharmaceutical manufacturers to obtain medicinal components from Chinese companies. This significant interruption to international trade and travel has had a severe impact on the overall economy (Shahzad, 2022). The health care system as well as the quality of services in hospitals are also affected. The decrease in visitors resulted in the decrease in hospitals revenue from services, which could disrupt patient care. The pressure and the isolation of many health workers exposed to Covid-19 also caused the quality of service at the hospital to decline (Sari, 2023).

3.4.4. The Real Estate industry

The reason why the real estate industry is one of the focus of this research comes from its enormous impacts on the environment. Buildings are among the largest consumers of energy worldwide, with their construction and operation accounting for a significant portion of global energy use and greenhouse gas (GHG) emissions. Nearly 40% of global carbon dioxide emissions come from the real estate sector. Of these emissions, approximately 70% are produced by building operations, while the remaining 30% comes from construction (Architecture 2030, n.d.).. Furthermore, construction and demolition activities generate significant amounts of waste. The

World Bank estimates that construction waste will increase to 2.2 billion tons per year by 2025 (World Bank, 2018), posing challenges for waste management and recycling practices. This context underscores the critical importance of aligning real estate firms' financial performance with their ESG efforts to guarantee firms' wellness. The COVID-19 pandemic has underscored the vulnerability of the real estate industry to global crises. These impacts arise from the nature of the real estate market, which is closely tied to economic, social, and environmental dynamics. For residential real estate, the loss of income made it difficult for many people to afford mortgage payments or rent, leading to increased vacancies and decreased demand for housing in certain areas. On the commercial side, businesses facing financial strain reconsidered their office space requirements, particularly with the rise of remote work, leading to higher vacancy rates and reduced rental income for property owners (McKinsey & Company, 2020). Financing has become more challenging to secure for real estate projects, as lenders tighten credit conditions in response to increased risk perceptions. Banks and financial institutions have become more cautious, requiring higher equity contributions and imposing stricter covenants on loans (PwC, 2020)

3.4.5. The Leisure industry

The outbreak of COVID-19 prompted governments across the globe to implement rigorous measures that led to an almost immediate halt in tourism activities worldwide. This scenario was unparalleled, with the tourism and leisure sector experiencing profound impacts. According to Gössling et al. (2020), few industries felt the repercussions of the pandemic as acutely as tourism and leisure. The abrupt cessation of international tourism resulted in significant financial losses for the sector, evidenced by a drastic selloff in the stock market. During the initial quarter of 2020, the travel and leisure sector witnessed a decline of over 40% from its peak value, marking it as the fourth-largest fall among thirty-eight industry categories examined by Kaczmarek et al., (2021). Furthermore, the pandemic has had a detrimental effect on leisure activities globally (Lashua et al., 2021; Lehman, 2021). Numerous outdoor recreational spaces, including restaurants, pubs, bars, nightclubs, leisure centers, gyms, art centers, theaters, cinemas, museums, and galleries, have been confronted with stringent regulations related to visitor capacity and hygiene standards, which pose significant compliance challenges. This period has also seen a wave of cancellations across sporting and entertainment events.

3.4.6. The Transportation industry

The transportation industry significantly affects the environment through its substantial contributions to air and water pollution, greenhouse gas emissions, habitat destruction, and noise pollution. Fossil fuel combustion in vehicles releases carbon dioxide and other pollutants, accounting for approximately 24% of global CO2 emissions from fuel combustion, exacerbating climate change and urban smog (International Energy Agency, 2020). Additionally, transportation infrastructure development leads to habitat fragmentation, adversely affecting biodiversity, while runoff and spills contaminate water bodies, impacting aquatic ecosystems. Noise pollution from traffic, aviation, and rail disrupts human health and wildlife, highlighting the urgent need for sustainable transportation solutions to mitigate these environmental impacts (World Health

Organization, 2018; United Nations Environment Programme, 2019). However, when COVID-19 struck in, the most visible were the reductions in mobility across multiple sectors of the transportation industry, as a variety of global restrictions (e.g., border restrictions, travel bans, quarantines and curfews, stay-at-home orders, closure of various amenities and services) reduced demand in the transportation sector (Abu-Rayash and Dincer, 2020). This reduction in mobility had impacts on the transportation industry. Globally, direct aviation jobs potentially fell by 43% and total aviation supported jobs fell by 52.5% from pre-COVID levels (Air Transport Action Group, 2020).

3.5. Hypotheses development

3.5.1. The Environmental pillar score has a positive influence on return on asets

Porter and van der Linde (1995) argue that pollution is often a sign of resource inefficiency, and reducing waste can lead to both environmental benefits and cost reductions. Hart and Ahuja (1996) found that firms which reduced emissions also experienced a decrease in costs, supporting the notion that environmental and economic benefits. Klassen et al. (1996) demonstrated that environmental management practices can improve a firm's market value by signaling to investors a commitment to long-term sustainability and risk management. Ambec et al. (2008) suggested that such innovation not only meets regulatory requirements and reduces negative environmental impacts but also creates value for customers, leading to enhanced financial performance. The positive relationship between a firm's environmental performance and its attractiveness to investors has been documented in research by Derwall et al. (2005), who found that portfolios of environmentally friendly firms tend to outperform their counterparts.

3.5.2. The Social pillar score has a positive influence on return on assets

The positive correlation between the social pillar and firm financial performance underscores the significance of CSR in the contemporary business environment. This relationship is anchored in the premise that companies are dedicated to ethical practices. Edmans (2011) provides empirical evidence suggesting that companies with high employee satisfaction outperform their peers in long-term stock returns, highlighting the financial value of employee well-being. Leadership diversity and inclusive workplace policies are linked to increased innovation and productivity, as diverse teams are better equipped to approach problems creatively and offer a broader range of solutions (Hunt et al., 2015). Locke et al. (2007) demonstrateed that improving working conditions in the supply chain leads to enhanced productivity and quality, which, in turn, can boost a firm's financial performance. Chernev and Blair (2015) argued that ethical business practices can significantly enhance brand perception and customer loyalty, which are critical drivers of long-term financial success. Fombrun et al. (2000) emphasized the importance of corporate reputation in building financial value, noting that companies perceived as socially responsible enjoy higher brand equity and customer loyalty.

3.5.3. The Governance pillar score has a negative influence on return on assets

The governance pillar, while critical for ensuring board independence, ethical leadership, and financial transparency, presents a nuanced impact on firm performance when considered in the context of competitiveness and innovation. Studies have shown that while governance frameworks are designed to protect stakeholders' interests, they can also introduce delays in strategic decision-making due to the layers of approval and extensive documentation required (Tricker, 2015). The added layer of administration can slow down operational processes, hindering a firm's ability to respond swiftly to market changes (Jensen, 1993). An excessively independent board may lack the deep operational expertise and industry-specific knowledge necessary to provide strategic guidance to management, particularly in times of disruption (Hermalin & Weisbach, 2003). The focus on governance metrics may overlook the potential for these practices to constrain a firm's agility and innovation capacity (Aguilera et al., 2015). Firms that manage to strike this balance effectively are those that adopt a flexible approach to governance, one that allows for rapid decision-making and embraces sensible risk-taking as a component of growth and innovation strategies (Tihanyi et al., 2014).

4. Empirical methodology

4.1. Methodology

4.1.1. Pooled Ordinary Least Squares and Fixed Effects Models

The general multiple linear regression model as the following formula:

$$Y_{it} = \alpha + \beta_1 X_{1,it} + \beta_2 X_{2,it} + \beta_3 X_{3,it} + \gamma' Z_{it} + \varepsilon_{it}$$

In which, "Y" represents the dependent variable referring to financial performance - Return on Asset (ROA); "X_1, X_2, X_3" refer to a set of independent variables, including environmental pillar score (EScore), social pillar score (SScore) and governance pillar score (GScore) which are taken as the first difference from their initial original values; "Z" is a vector of control variables including size of firms (Size), Leverage, SalesGrowth and Profitability; α is the intercept term; β_1, β_2, β_3 are the corresponding coefficients to each independent variable; γ' is the vector of coefficients for the four control variables and ε is the error term with "*i*" representing the cross-sectional notation for the i^{th} company and "*t*" indicating the time-series notation.

The Fixed Effects model addresses the inherent cross-sectional and time series characteristics of our data by incorporating individual and time-specific effects. It distinguishes between companies of six given industries and time span from 2012 to 2021, capturing unobserved heterogeneity and time-invariant factors.

4.1.2. Instrumental variables

In this study, we employ a two-stage least squares (2SLS) model to examine the impact of ESG scores on firm financial performance, while accounting for endogeneity concerns. In the first

stage, we estimate the effect of the mean of ESG scores grouped by country, industry and year as the instrumental variables for the endogenous ESG scores:

$$X_{j,\,it} = \alpha_0 + \gamma_1 \text{mean}(X_{j,c,y,i}) + \alpha_1 Z_{it} + \mu_{it}$$

In which, $X_{j,\,it}$ is the endogenous environmental, social, governance score for firm *i* at time *t*, "Z" is a vector of control variables, α_0 is the intercept term, γ_1 is the coefficient representing the effect of the mean of ESG scores on the endogenous ESG scores, α_1 is a vector of coefficients of the control variables and μ_{it} is the error term.

After estimating the effect of the mean of ESG scores on the endogenous ESG scores in the first stage, we turn to the second stage where we investigate the relationship between the predicted ESG component scores and firm financial performance.

$$ROA_{it} = \beta_0 + \beta_1 \hat{X}_{it} + \gamma' Z_{it} + \varepsilon_{it}$$

The second-stage regression analysis reveals insights into the relationship between environmental, social, and governance scores and firm financial performance (ROA) by controlling for the predicted ESG scores and other financial factors. The coefficient estimate for the predicted ESG scores indicates the magnitude and direction of the impact of ESG performance on firm profitability.

4.2. Variable measurement

4.2.1. The dependent variable

ROA is regarded as a reliable and simpler way to measure accounting indicators of corporate financial success (Liu Wu et al., 2020). According to Fortune Ganda (2022), return on assets is used as a stand-in for business performance proxies in accounting. Iram Hasan et al. (2021) stated that because ROA is the most extensively used indicator and is less likely to be manipulated, it is employed as a dependent variable to assess financial performance. A research on the relationship between corporate social responsibility and financial performance also takes return on assets as a proxy for the latter (Sasmita Giri et al., 2017). Ebru Saygili et al. (2022) states that return on assets (ROA) is commonly used financial indicators of a company's financial performance. ROA is a representation of the potential return on investment for the company's shareholders, taking into account capital contributions from both owners and debtors and it is used to assess a company's financial performance over time as well as to contrast that performance with that of other companies in the same sector (Andrea D. Ellinger et al., 2002).

4.2.2. The independent variables

Environmental pillar score, social pillar score and governance pillar score are rated on a range from 0 to 100. The ESG component scores are intended to quantify a company's relative ESG performance, commitment, and effectiveness in a transparent and unbiased manner. The environmental pillar measures a company's impact on living and non-living natural systems, which reflects how well a company uses best management practices to avoid environmental risks and

capitalize on environmental opportunities to generate long term shareholder value (Thomson Reuters, 2023). The corporate governance pillar measures a company's systems and processes, which ensures that its board members and executives act in the best interests of its long-term shareholders, reflecting a company's capacity to direct and control its rights and responsibilities through the creation of incentives, checks and balances to create long term shareholder value (mental risks and capitalize on environmental opportunities to generate long term shareholder value (Thomson Reuters, 2023). The social pillar measures a company's capacity to generate trust and loyalty with its workforce, customers and society, through its use of best management practices, which illustrates the company's reputation and the health of its license to operate, thus deterring its ability to generate long term shareholder value (Thomson Reuters, 2023). In many previous studies, the subcomponent ESG scores were employed to examine the effectiveness in corporate performance (Muhammad Nazmul Hoque et al., 2022; Yaghoub Abdi et al., 2020; Luca Di Simone et al., 2022; Kemal CEK et al., 2020).

4.2.3. The control variables

The size of the firm is measured by the natural logarithm of total assets of a firm (Sonia Boukattaya et al., 2021; Luca Di Simone et al., 2022). Firm size ensures that differences in profitability metrics are not solely driven by variations in firm scale, allowing for more accurate comparisons of profitability across companies. The leverage measures how much debt a business has to finance its assets as the ratio of total debt to total assets (Sonia Boukattaya et al., 2021; Luca Di Simone et al., 2022). It measures the proportion of a firm's capital structure that is financed through borrowed funds, such as loans or bonds, compared to equity financing from shareholders. Sales growth is a measure of the change in revenue over a fixed period of time which is calculated by the difference between current and previous year sales divided by previous year sales (Sonia Boukattaya et al., 2021). Sales growth is essential in evaluating a company's financial performance as it signifies the rate at which its revenue is increasing over time. Profitability indicates the financial success of a firm measured by the ratio of earnings before interest and taxes (EBIT) to total assets. (Luca Di Simone et al., 2022). It reflects the company's ability to generate earnings relative to its expenses and investments.

5. Research results on the influence of firm-level ESG scores on financial performance of OECD's firms under the COVID-19 pandemic

5.1. Descriptive statistics

The following tables summarize descriptive statistics of all the variables for the overall sample as well as for all industries.

Table 1. Summary Statistics

Variables	N	Mean	Std. Dev.	Min	Max
ROA	3,800	4.750	5.821	-46.90	60.34
EScore	3,800	56.42	25.11	0.329	97.96
SScore	3,800	61.46	21.07	0.819	97.68
GScore	3,800	58.79	21.15	0.101	97.82
Leverage	3,800	33.05	17.85	0.0002	99.54
Profitability	3,800	6.836	5.706	-21.12	47.41
SalesGrowth	3,800	-0.519	55.00	-3,126	1,078
Size	3,800	23.14	1.343	18.76	29.09

Table 2. Descriptive Statistics (Mean) By Industry

Industry	ROA	EScore	SScore	GScore
Banking and Investment	3.2839	43.7362	53.5986	56.7514
Food and Beverage	5.5702	62.9474	62.5301	59.0332
Healthcare	6.9041	55.9085	68.3319	63.6418
Leisure	2.0961	57.8145	64.2363	53.0934
Real Estate	3.9185	59.0170	60.8360	57.5034
Transportation	4.1380	54.7319	55.9887	57.3887
Total	4.7502	56.4195	61.4557	58.7909

Table 2 further disaggregates these statistics by industry, revealing divergent performance trends. The OECD companies' social performance (at 61.45 by year and by all firms) is higher than their environmental and governance performance over the years in general, while environmental pillar score is the one with the mean lowest grades in all cases.

5.2. Correlation statistics

Table 3. Correlation Statistics

Variables	ROA	EScore	SScore	GScore	Leverage	SalesGrowth	Profitability	Size
Correlation statistics for all firms								
ROA	1							
EScore	0.0369	1						
SScore	0.0981	0.6810	1					
GScore	0.0256	0.3404	0.4298	1				
Leverage	-0.2875	0.0127	0.0418	0.0202	1			
SalesGrowth	0.0156	-0.0030	0.0177	0.0282	0.0011	1		
Profitability	0.7255	0.0204	0.1375	0.0813	-0.2791	0.0072	1	
Size	-0.1169	0.3696	0.3397	0.2197	0.1994	-0.0182	-0.1527	1

Table 3 shows the correlation coefficients of ROA with environmental pillar score, social pillar score, governance pillar score and other economic performance variables.

5.3. Pooled OLS and FEM results

5.3.1. The influence of firm-level ESG scores on financial performance of OECD's firms under the COVID-19 pandemic

Table 4. Panel data regression output for all firms across 10 years

	Pooled OLS				Fixed Effects Model			
EScore	0.0060**			0.0090**	-0.0049			-0.0097
	(0.0028)			(0.0036)	(0.0058)			(0.0063)
SScore		0.0017		-0.0009		0.0129*		0.0189***
		(0.0035)		(0.0046)		(0.0067)		(0.0072)
GScore			-0.0099***	-0.0121***			-0.0122**	-0.0129**
			(0.0032)	(0.0034)			(0.0052)	(0.0052)
Constant	0.4947	-0.0471	-0.4728	0.4030	-	-	-	-

					32.0918***	31.8217***	31.4991***	31.8240***
	(1.1887)	(1.1786)	(1.1491)	(1.1908)	(5.6087)	(5.6005)	(5.6013)	(5.6039)
Observations	3,800	3,800	3,800	3,800	3,800	3,800	3,800	3,800
R-squared	0.5413	0.5408	0.5419	0.5429				
Number of Firms					380	380	380	380

*Notes: Robust standard errors are in parentheses; ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively. All regressions include control variables (Leverage, Sales growth, Profitability, Size).*

As shown in **Table 4**, the ESG scores, representing a firm's EScore, SScore, and GScore practices, demonstrate different impacts on financial performance. The finding implies that higher EScore values, which reflect better environmental performance, are associated with higher levels of ROA. It suggests that firms with stronger environmental performance may also exhibit better financial performance, as indicated by their higher ROA. Similar results have been found in SScore which is significantly positively correlated with ROA throughout the 10-year period examined in the FEM results. This clearly states that firms' incorporating social practices into their operations by concerning the needs of the society, labor-related factors undoubtedly yield better financial performance. In practical terms, it suggests that factors related to social responsibility, such as employee welfare, community engagement, and ethical practices, may contribute positively to a firm's financial performance.

GScore shows statistically significant negative impacts on firms' financial performance. A higher GScore often signifies stronger governance practices within a firm, including aspects such as board effectiveness, transparency, and accountability. However, the statistically significant negative relationship between GScore and ROA suggests that firms with higher GScore may prioritize governance practices when being compared with financial outcomes. This could occur due to increased investment in compliance and a long-term orientation that prioritizes sustainability over immediate profits.

The positive coefficients before the pandemic of EScore and SScore indicate that higher EScore and SScore was associated with higher ROA, suggesting that firms with better environmental and social practices tended to have superior financial performance. However, the subsequent insignificant coefficients after the outbreak suggest a change in this relationship. Before COVID-19, positive and significant EScore and SScore coefficients might reflect a growing market preference for environmentally and socially responsible practices. Before COVID-19, the negative GScore coefficients may have indicated that stringent governance practices, while beneficial for transparency and risk management, could have imposed constraints

on firms' operational flexibility and short-term profitability. However, after the outbreak, the change suggests that investors might not see companies with strict governance practices as advantages to handle the difficulties caused by the crisis to reach better financial performance anymore.

5.3.2. The influence of firm-level ESG scores on financial performance of OECD's Banking and Investment firms under the COVID-19 pandemic

Table 5. Panel data regression output for Banking and Investment firms across 10 years

	Pooled OLS				**Fixed Effects Model**			
EScore	0.0016			0.0073	-0.0029			-0.0015
	(0.0079)			(0.0089)	(0.0163)			(0.0170)
SScore		-0.0029		0.0035		0.0277		0.0340
		(0.0117)		(0.0133)		(0.0209)		(0.0215)
GScore			-0.0238***	-0.0269***			-0.0369**	-0.0393**
			(0.0087)	(0.0092)			(0.0151)	(0.0155)
Constant	1.6972	1.2148	0.8091	2.0094	12.1144	10.1173	12.5490	9.5457
	(2.7830)	(2.8164)	(2.5715)	(2.8538)	(13.6786)	(13.6343)	(13.4384)	(13.7390)
Observations	392	392	392	392	392	392	392	392
R-squared	0.4874	0.4874	0.4970	0.4984				
Number of Firms					49	49	49	49

*Notes: Robust standard errors are in parentheses; ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively. All regressions include control variables (Leverage, Sales growth, Profitability, Size).*

Banking and investment firms may place greater emphasis on financial stability, regulatory compliance, and risk management. The negative and significant coefficients observed for GScore in this industry could be attributed to the fact that the banking and investment sector is highly regulated, so firms within this industry are subject to stringent governance requirements to ensure financial stability. Therefore, higher GScore values may reflect adherence to these regulatory standards, which could lead to lower ROA due to increased compliance costs or operational constraints. The negative coefficients may reflect that firms with stronger governance practices are less willing to pursue opportunities that could yield higher returns in the short term. Instead, they may prioritize stability which could lead to lower ROA in the short term.

Before COVID-19, the fact that GScore was significant but negative suggests that while strong governance practices were considered important, having higher GScore values actually led to lower financial performance. The pandemic presented unprecedented challenges that made investors reconsider what they value when evaluating companies. During sudden economic disruption, investors began prioritizing different factors as adaptability in responding to changes, and its financial stability over traditional ways of governance. Consequently, the significance of GScore may have declined following the outbreak as investors shifted their focus towards qualities that ensure short-term adaptability.

5.3.3. The influence of firm-level ESG scores on financial performance of OECD's Food and Beverage firms under the COVID-19 pandemic

Table 6. Panel data regression output for Food and Beverage firms across 10 years

	Pooled OLS				**Fixed Effects Model**			
EScore	0.0020			0.0052	0.0024			0.0021
	(0.0044)			(0.0055)	(0.0089)			(0.0104)
SScore		-0.0027		-0.0067		0.0007		-0.0017
		(0.0051)		(0.0064)		(0.0097)		(0.0114)
GScore			0.0014	0.0015			0.0064	0.0063
			(0.0041)	(0.0042)			(0.0076)	(0.0077)
Constant	-2.0764	-2.6826	-2.3239	-2.4952	15.5012	15.6850	15.6104	15.4473
	(1.8002)	(1.8250)	(1.7064)	(1.8405)	(10.3858)	(10.3655)	(10.3602)	(10.4062)
Observations	750	750	750	750	750	750	750	750
R-squared	0.6394	0.6395	0.6394	0.6400				
Number of Firms					75	75	75	75

*Notes: Robust standard errors are in parentheses; ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively. All regressions include control variables (Leverage, Sales growth, Profitability, Size).*

In the Food and Beverage industry, the absence of statistically significant coefficients for the EScore, SScore, and GScore suggests that these governance, social, and environmental factors did not play a significant role in influencing financial performance within this sector. Other indicators such as consumer preferences, competition, market demand, supply chain efficiency, product innovation, and market conditions may have a more substantial influence on financial outcomes.

The transformation observed post-COVID-19, where EScore and SScore shifted from being negative and insignificant to positive and significant influencers of financial performance in the

Food and Beverage industry, can be closely linked to the changing consumer behavior and market dynamics during the pandemic. With lockdowns and restrictions in place, consumers increasingly turned to food and beverage services that were perceived as safer, healthier, and produced sustainably. This shift in consumer preferences towards environmentally friendly and socially responsible brands created a growing market demand for companies with strong ESG practices. The disruptions in global supply chains and increasing awareness of social issues during the pandemic might trigger food and beverage companies to improve their sustainability practices and prioritize responsible business conduct.

5.3.4. The influence of firm-level ESG scores on financial performance of OECD's Healthcare firms under the COVID-19 pandemic

Table 7. Panel data regression output for Healthcare firms across 10 years

	Pooled OLS				**Fixed Effects Model**			
EScore	0.0070			0.0125	-0.0009			-0.0128
	(0.0066)			(0.0086)	(0.0138)			(0.0153)
SScore		-0.0009		-0.0085		0.0225		0.0274*
		(0.0076)		(0.0099)		(0.0145)		(0.0160)
GScore			-0.0066	-0.0067			0.0065	0.0057
			(0.0070)	(0.0071)			(0.0111)	(0.0112)
Constant	4.0265*	2.7980	2.5999	3.7952	-34.7041***	-34.8457***	-35.1993***	-35.3939***
	(2.3552)	(2.2255)	(2.1148)	(2.3589)	(12.8143)	(12.7942)	(12.8399)	(12.8336)
Observations	860	860	860	860	860	860	860	860
R-squared	0.6782	0.6778	0.6781	0.6789				
Number of Firms					86	86	86	86

*Notes: Robust standard errors are in parentheses; ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively. All regressions include control variables (Leverage, Sales growth, Profitability, Size).*

In the Healthcare industry, the finding shows that only SScore has a positive and significant impact on ROA over the 10-year dataset in the FEM result. The Healthcare sector is closely related to social responsibility and ethical considerations, as it involves providing essential services that directly impact human well-being. Therefore, companies in this industry that demonstrate strong social practices may be perceived more favorably by stakeholders, including investors, consumers,

and regulators. Additionally, the COVID-19 pandemic has made healthcare matters more prominent and widely recognized by the public, highlighting the importance of healthcare companies' social responsibility efforts. The SScore emerged as a more influential factor post-COVID-19, gaining significance and indicating a heightened focus on social responsibility. Investments in medical supplies and technological advancements in healthcare, which are closely tied to social responsibility, helped firms in this industry gain the trust of customers and the workforce. During the pandemic, customers showed heightened interest in healthcare-related businesses. Therefore, if firms prioritize both customers and employees, it can significantly improve their financial performance.

Before COVID-19, the focus may have been more on traditional financial metrics such as revenue and profit margins rather than factors such as environmental, social, and governance practices which may not have been considered significant determinants of financial performance. During the COVID-19 crisis, the positive and significant coefficients of SScore suggest that companies with strong social practices were perceived as more resilient and better equipped to deal with the challenges posed by the pandemic. Companies may invest in employee health and safety measures, contribute to community healthcare initiatives, and ensure equitable access to medical resources. Such actions not only demonstrate a commitment to ethical practices but also enhance trust and reputation, fostering stronger relationships with stakeholders and bolstering long-term resilience. The pandemic has underscored the public health and social well-being, highlighting the importance of approaches to healthcare services.

5.3.5. The influence of firm-level ESG scores on financial performance of OECD's Real Estate firms under the COVID-19 pandemic

Table 8. Panel data regression output for Real Estate firms across 10 years

	Pooled OLS				**Fixed Effects Model**			
EScore	0.0136**			0.0030	0.0220*			0.0140
	(0.0063)			(0.0076)	(0.0122)			(0.0133)
SScore		0.0263***		0.0336***		0.0389***		0.0368**
		(0.0083)		(0.0108)		(0.0151)		(0.0165)
GScore			-0.0047	-0.0178**			-0.0250**	-0.0297***
			(0.0068)	(0.0076)			(0.0109)	(0.0110)
Constant	13.4180***	13.7361***	10.6398***	13.8223***	-51.9490*	-49.6606*	-53.5811*	-49.9983*

					**	**	**	**
	(3.9180)	(3.8362)	(3.7858)	(3.9047)	(12.8531)	(12.8762)	(12.8290)	(12.8290)
Observations	900	900	900	900	900	900	900	900
R-squared	0.2304	0.2350	0.2268	0.2399				
Number of Firms					90	90	90	90

*Notes: Robust standard errors are in parentheses; ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively. All regressions include control variables (Leverage, Sales growth, Profitability, Size).*

In the context of the Real Estate industry, the significant positive coefficients observed for EScore and SScore in the 10-year dataset can be attributed to several industry-specific factors. Real estate companies with higher Escore may prioritize sustainable development practices, such as energy-efficient buildings or green construction materials, which can lead to cost savings and enhanced property value. Firms with better SScore may actively engage with local communities or take social impact initiatives which improve their reputation and foster positive relationships with stakeholders. However, the negative coefficient associated with Gscore suggests that governance practices may not yield significant financial benefits in the real estate sector. This could be due to governance structures that prioritize short-term financial gains over long-term sustainability that reduce investor trust.

After the outbreak of the COVID-19, all coefficients for the three scores turned to be insignificant compared with those belonging to before the pandemic period. This could be explained by the fact that during times of economic uncertainty and market volatility, investors may be more reluctant in putting their money in investment, prioritizing short-term liquidity and stability over longer-term sustainability considerations. The outbreak of the COVID-19 pandemic brought about widespread disruptions across industries, including the real estate sector, leading to uncertainties regarding future cash flows and investment returns. In such circumstances, investors may have become more cautious in their investment decisions, focusing on minimizing immediate financial risks rather than considering environmental, social, or governance factors. As a result, the significance of EScore, SScore, and GScore in predicting financial performance may have diminished during the outbreak, reflecting the shift in priorities and risk perceptions of investors in response to the unprecedented challenges posed by the pandemic.

5.3.6. The influence of firm-level ESG scores on financial performance of OECD's Leisure firms under the COVID-19 pandemic

Table 9. Panel data regression output for Leisure firms across 10 years

	Pooled OLS				Fixed Effects Model			
EScore	0.0120			0.0275**	0.0152			0.0155
	(0.0113)			(0.0136)	(0.0201)			(0.0212)
SScore		-0.0071		-0.0135		-0.0147		-0.0208
		(0.0124)		(0.0150)		(0.0331)		(0.0348)
GScore			-0.0217*	-0.0276**			-0.0270	-0.0244
			(0.0126)	(0.0138)			(0.0201)	(0.0204)
Constant	-6.6780	-9.2924*	-9.2854*	-4.9206	-26.1199	-26.2218	-21.6457	-19.0928
	(5.2494)	(4.8530)	(4.7903)	(5.2432)	(22.9550)	(23.0767)	(23.2267)	(23.5389)
Observations	250	250	250	250	250	250	250	250
R-squared	0.7322	0.7314	0.7342	0.7385				
Number of Firms					25	25	25	25

*Notes: Robust standard errors are in parentheses; ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively. All regressions include control variables (Leverage, Sales growth, Profitability, Size).*

Leisure companies with higher EScore ratings may prioritize sustainability initiatives such as eco-friendly operations, waste reduction measures, or conservation efforts, which can lead to cost savings, enhanced brand reputation, and increased customer loyalty. On the other hand, the negative coefficient associated with GScore indicates that governance practices may not have a significant impact on financial performance in the leisure sector. Family-owned businesses or small enterprises in the leisure industry have governance structures that may be less standardized compared to larger corporations.

Before the COVID-19 outbreak, the consistent coefficients of all three scores suggest that environmental, social, and governance factors had a stable influence on financial performance in the leisure sector. However, following the pandemic, the significant negative coefficients observed for GScore while EScore and SScore show no significant impacts on ROA. In the leisure sector, the diminished significance of EScore and SScore during COVID-19 may reflect shifting consumer preferences and market dynamics during the pandemic. Leisure companies, which typically focus on entertainment, travel, and hospitality, may have faced unprecedented challenges such as restrictions on travel and public gatherings, changing consumer behavior, and reduced discretionary spending.

5.3.7. The influence of firm-level ESG scores on financial performance of OECD's Transportation firms under the COVID-19 pandemic

Table 10. Panel data regression output for Transportation firms across 10 years

	Pooled OLS				Fixed Effects Model			
EScore	-0.0113			-0.0097	-0.0425**			-0.0373
	(0.0087)			(0.0119)	(0.0203)			(0.0238)
SScore		-0.0086		0.0050		-0.0322		-0.0116
		(0.0097)		(0.0137)		(0.0211)		(0.0246)
GScore			-0.0173*	-0.0159*			-0.0111	-0.0118
			(0.0089)	(0.0095)			(0.0170)	(0.0170)
	(0.0136)	(0.0136)	(0.0135)	(0.0136)	(0.0258)	(0.0262)	(0.0259)	(0.0263)
Constant	-9.0013**	-8.0332*	-7.4989*	-8.5350**	-32.9872	-32.8075	-31.2297	-33.5181
	(4.2942)	(4.1771)	(4.0625)	(4.2926)	(22.6265)	(22.6842)	(22.7024)	(22.6693)
Observations	550	550	550	550	550	550	550	550
R-squared	0.6730	0.6724	0.6742	0.6746				
Number of Firms					55	55	55	55

*Notes: Robust standard errors are in parentheses; ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively. All regressions include control variables (Leverage, Sales growth, Profitability, Size).*

In the transportation industry, the negative and significant coefficients of both EScore and GScore may reflect complex reasons related to environmental impact and operational efficiency. The negative coefficient for EScore suggests that higher environmental scores, indicating better environmental practices, are associated with lower financial performance. This could be attributed to the trade-off between environmental sustainability and operational costs in the transportation sector. While reducing emissions and adopting eco-friendly practices are essential for long-term sustainability, they often entail additional costs, such as investments in cleaner technologies or compliance with stringent environmental regulations, which can weigh on profitability. In the context of the transportation industry, the negative and significant coefficient for GScore indicates that stronger governance practices are associated with lower financial performance. Firms with higher GScore may prioritize compliance with regulatory requirements, which could entail additional costs or restrictions on business activities, thereby impacting profitability. Additionally,

stringent governance practices may result in slower decision-making processes which could reduce competitiveness in a fast-paced industry like transportation.

During the COVID-19 period, only SScore retained its negative and significant coefficients. The negative coefficients for SScore during the COVID-19 period suggest that higher social responsibility scores were associated with lower financial performance in the transportation sector. This may indicate that firms emphasizing social responsibility initiatives, such as employee welfare or community engagement, faced challenges in maintaining profitability during the pandemic. During the COVID-19 pandemic, the transportation sector faced unprecedented challenges, including travel restrictions, reduced demand for passenger services, and disruptions in global supply chains. In this context, while the company's social responsibility efforts may have gained positive attention and reputation, they might have been less effective during the pandemic.

6. Discussion on the influence of firm-level ESG scores on financial performance of OECD's firms under the COVID-19 pandemic

6.1. Recommendations for Investors

By incorporating ESG factors into their investing strategies, investors can not only reduce risks but also uncover potential for long-term value growth. Companies with high ESG scores, for example, are more resilient in the face of crises. Investors should seek out companies that exhibit a commitment to good business practices, as they are more likely to effectively overcome crisis periods and deliver long-term returns.

Investors should therefore consider ESG integration as a strategy of enhancing risk-adjusted returns, as firms with high ESG scores are more likely to display lower volatility and higher resilience to external shocks. By including ESG concerns into their investing analysis, investors can create more resilient portfolios that can withstand market volatility and offer consistent returns over time. Investors are encouraged to conduct thorough ESG assessments when evaluating investment opportunities, as companies with high ESG scores not only have strong financial performance but also attract responsible investors, resulting in a mutually beneficial relationship between firms and shareholders.

6.2. Recommendations for Firms

The strategic integration of ESG initiatives within core business strategies emerges as a pivotal approach for embedding sustainability as a central driver of financial performance and long-term corporate value. Successful integration requires a comprehensive assessment of operational, supply chain, and market opportunities for sustainability to enhance efficiency, innovation, and stakeholder trust. By embedding social responsibility into their strategic framework, companies can navigate the complexities of global markets more effectively, building stronger, more resilient relationships with stakeholders and positioning themselves as leaders in the quest for a more sustainable and equitable global economy. Embracing sustainability as a core element of the

innovation process encourages firms to rethink traditional operational models and product designs, thereby unlocking new opportunities for differentiation and market leadership. Consequently, cultivating a culture that values and promotes innovation in sustainability can enable firms to anticipate and adapt to changing market demands and regulatory landscapes, ensuring their long-term viability and success in an increasingly sustainability-conscious business environment.

Stakeholder engagement is pivotal in navigating the complexities of ESG issues within the contemporary business landscape. Such engagement not only facilitates the identification of emerging risks and opportunities but also enhances transparency and builds trust, which are essential for sustaining long-term relationships. Active stakeholder engagement serves as a strategic tool for firms aiming to navigate the intricacies of ESG issues, ensuring that their business models remain resilient, adaptive, and aligned with broader societal values.

6.3. Recommendations for Governments and Policy Makers

Governments should encourage firms to prioritize environmental and social responsibility by implementing policies that incentivize sustainable practices. This can include tax breaks, subsidies, and other financial incentives for companies that demonstrate a commitment to environmental conservation and social welfare. By these initiatives, policymakers can not only improve firms' financial performance but also contribute to social and environmental goals.

Policymakers should foster long-term investments and economic stability. Governments can address this by implementing policies that promote confidence in the financial markets and encourage long-term investment strategies. Policymakers should recognize the dynamic nature of the market to adapt their policies accordingly. The study found that the impact of COVID-19 on firm financial performance varies across industries and over time. Therefore, policymakers should remain flexible and responsive to changing market conditions, ensuring that their policies are effective in supporting firms through crises and promoting long-term economic sustainability.

7. Conclusion

The findings of the study have revealed notable insights regarding the impact of ESG subcomponents on firm financial performance. Specifically, it was observed that while the environmental pillar score and social pillar score exhibited statistically significant positive effects on financial performance, the governance pillar score demonstrated a significant negative impact, which is in accordance with our hypotheses. This difference in the direction of the relationship underscores the diverse relationship between ESG factors and firm performance. The positive and statistically significant relationship between the environmental pillar score and social pillar score with firm performance suggests an investor interest within the OECD towards firms that prioritize environmental initiatives and corporate social responsibility. Moreover, it highlights the change from a sole focus on shareholder benefits towards a more balanced one of environmental and social affairs, thereby contributing to enhanced financial performance. Moreover, the study highlights another significant finding. In contrast to most assumptions, the COVID-19 pandemic did not

result in substantial fluctuations in how ESG sub-components affected financial operations. Across different industries, the influence of COVID-19 on firm financial performance in relation to sustainability appears to be varied. This suggests that the impact of COVID-19 on firm financial performance, particularly concerning sustainability practices, is diverse. Factors such as industry characteristics may have played a significant role in mitigating the effects of the pandemic on financial outcomes in terms of ESG. Understanding these is crucial for developing strategies to enhance sustainability practices in different sectors during global crises.

The significance of this outcome extends far beyond the context of the COVID-19 pandemic. Even as the pandemic eventually ceases, the insights from this study remain significant. The lessons learned regarding risk management, emphasis on environmental awareness, social responsibility and quality management continue to offer valuable contributions to long-term sustainability. Additionally, much research has pointed out that companies with high ESG scores frequently capture the attention of investors. Hence, the implications of this research hold substantial insights for both researchers and entrepreneurs, providing them with valuable guidance on how to efficiently allocate firms' resources to achieve sustainable growth and development.

References

Abdi, Y., Li, X. & Càmara-Turull, X. (2020). "Impact of sustainability on firm value and financial performance in the air transport industry", *Sustainability,* Vol. *12* No. 23, pp. 9957.

Abu-Rayash, A. & Dincer, I. (2020). "Analysis of mobility trends during the COVID-19 coronavirus pandemic: Exploring the impacts on global aviation and travel in selected cities", *Energy research & social science,* Vol. *68*, pp. 101693.

Acharya, V. V. & Steffen, S. (2020). "The risk of being a fallen angel and the corporate dash for cash in the midst of COVID", *Review of Corporate Finance Studies,* Vol. *9* No. 3, pp. 430-471.

Agosto, A., Giudici, P. & Tanda, A. (2023). "How to combine ESG scores? A proposal based on credit rating prediction", *Corporate Social Responsibility and Environmental Management,* Vol. *30* No. 6, pp. 3222-3230.

Aguilera, R. V., Desender, K., Bednar, M. K. & Lee, J. H. (2015). "Connecting the dots: Bringing external corporate governance into the corporate governance puzzle", *Academy of Management Annals,* Vol. *9* No. 1, pp. 483-573.

Air Transport Action Group. (2020). "Aviation: Benefits Beyond Borders. Geneva, Switzerland", *Air Transport Action Group*, Available at: https://aviationbenefits.org/media/167517/aw-oct-final-atag_abbb-2020-publication-digital.pdf

Akbar, N. A. F., Lestari, E. P. & Budiyanti, H. (2023). "Analysis Of The Impact Of The Covid-19 Pandemic On Financial Performance And Survival Of Companies In The Food Beverage

Idustrial Sector And Restaurant Services From Potential Bankruptcy Using Financial Ratio And Taffler Analysis Models", *Jurnal Pajak dan Keuangan Negara (PKN)*, Vol. *4* No. 2, pp. 492-503.

Al-Waeli, A. J., Khalid, A. A., Ismail, Z. & Idand, H. Z. (2021). "The Relationship between environmental disclosure and financial performance of industrial companies with using a new theory: Literature Review", *The journal of contemporary issues in business and government*, Vol. *27* No. 2, pp. 3846-3868.

Ambec, S. & Lanoie, P. (2008). "Does it pay to be green? A systematic overview", *Academy of Management Perspectives*, Vol. *22* No. 4, pp. 45-62.

Aneja, R. & Ahuja, V. (2021). "An assessment of socioeconomic impact of COVID-19 pandemic in India", *Journal of Public Affairs*, Vol. *21* No. 2, pp. 2266.

Arnold, M. C., Bassen, A. & Frank, R. (2012). "Integrating sustainability reports into financial statements: an experimental study", Available at: SSRN 2030891.

As-Salafiyah, A. & Rusydiana, A. S. (2021). "Examining the Impact of COVID-19 on the Banking Industry: A Bibliometric Analysis", *Journal of Business and Political Economy: Biannual Review of The Indonesian Economy*, Vol. *3* No. 1, pp. 1-17.

Augeraud-Véron, E., & Boungou, W. (2023). "The Impact of COVID-19 on Bank Profitability: Cross-Country Evidence", *German Economic Review*, Vol. *24* No. 1, pp. 69-95.

Baker, S. R., Bloom, N., Davis, S. J., Kost, K., Sammon, M. & Viratyosin, T. (2020). "The unprecedented stock market reaction to COVID-19", *The Review of Asset Pricing Studies*, Vol. *10* No. 4, pp. 742–758.

Birindelli, G., Dell'Atti, S., Iannuzzi, A. P. & Savioli, M. (2018). "Composition and activity of the board of directors: Impact on ESG performance in the banking system", *Sustainability*, Vol. *10* No. 12, pp. 4699.

Boukattaya, S., & Omri, A. (2021). "Corporate social practices and firm financial performance: Empirical evidence from France", *International Journal of Financial Studies*, Vol. *9* No. 4, pp. 54.

Cek, K. & Eyupoglu, S. (2020). "Does environmental, social and governance performance influence economic performance?", *Journal of Business Economics and Management*, Vol. *21* No. 4, pp. 1165-1184.

Chams, N., García-Blandón, J. & Hassan, K. (2021). "Role reversal! financial performance as an antecedent of ESG: The moderating effect of total quality management", *Sustainability, Vol. 13* No. 13, pp. 7026.

Chen, L., Yuan, T., Cebula, R. J., Shuangjin, W. & Foley, M. (2021). "Fulfillment of ESG responsibilities and firm performance: a zero-sum game or mutually beneficial", *Sustainability*, Vol. *13* No. 19, pp. 10954.

Chernev, A. & Blair, S. (2015). "Doing well by doing good: The benevolent halo of corporate social responsibility", *Journal of Consumer Research,* Vol. *41* No. 6, pp. 1412-1425.

Chiu, T. K. & Wang, Y. H. (2015). "Determinants of social disclosure quality in Taiwan: An application of stakeholder theory", *Journal of business ethics,* Vol. *129*, pp. 379-398.

Ciravegna, L. & Nieri, F. (2022). "Business and human rights: A configurational view of the antecedents of human rights infringements by emerging market firms", *Journal of Business Ethics,* Vol. *179* No. 2, pp. 431-450.

Clark, G. L., Feiner, A. & Viehs, M. (2015). "From the stockholder to the stakeholder: How sustainability can drive financial outperformance", Available at SSRN 2508281.

Cowling, M., Liu, W., Zhang, N. & Girma, S. (2020). "The impact of COVID-19 on business expectations", *International Small Business Journal,* Vol. *38* No. 7, pp. 567-588.

Daily, C. M. & Dalton, D. R. (2003). "Women in the boardroom: A business imperative", *Journal of Business strategy,* Vol. *24* No. 5.

Daugaard, D. & Ding, A. (2022). "Global drivers for ESG performance: The body of knowledge", *Sustainability,* Vol. *14* No. 4, pp. 2322.

Derwall, J., Guenster, N., Bauer, R. & Koedijk, K. (2005). "The eco-efficiency premium puzzle", *Financial Analysts Journal,* Vol. *61* No. 2, pp. 51-63.

Di Simone, L., Petracci, B. & Piva, M. (2022). "Economic sustainability, innovation, and the ESG factors: An empirical investigation", *Sustainability,* Vol. *14* No. 4, pp. 2270.

Din, A. U., Han, H., Ariza-Montes, A., Vega-Muñoz, A., Raposo, A. & Mohapatra, S. (2022). "The impact of COVID-19 on the food supply chain and the role of e-commerce for food purchasing", *Sustainability,* Vol. *14* No. 5, pp. 3074.

Edmans, A. (2011). "Does the stock market fully value intangibles? Employee satisfaction and equity prices", *Journal of Financial Economics,* Vol. *101* No. 3, pp. 621-640.

Ellinger, A. D., Ellinger, A. E., Yang, B. & Howton, S. W. (2002). "The relationship between the learning organization concept and firms' financial performance: An empirical assessment", *Human resource development quarterly,* Vol. *13* No. 1, pp. 5-22.

Fauzi, H., Svensson, G. & Rahman, A. A. (2010). "Triple bottom line" as "Sustainable corporate performance: A proposition for the future", *Sustainability,* Vol. *2* No. 5, pp. 1345-1360.

Fombrun, C., Gardberg, N. & Barnett, M. (2000). "Opportunity platforms and safety nets: Corporate citizenship and reputational risk", *Business and Society Review,* Vol. *105* No. 1, pp. 85-106.

Ganda, F. (2022). "Carbon performance, company financial performance, financial value, and transmission channel: an analysis of South African listed companies", *Environmental Science and Pollution Research,* Vol. *29* No. 19, pp. 28166-28179.

Giuliani, E., Nieri, F. & Vezzulli, A. (2023). "Big profits, big harm? Exploring the link between firm financial performance and human rights misbehavior", *Business & Society*, Vol. *62* No. 6, pp. 1248-1299.

Gössling, S., Scott, D. & Hall, C. M. (2020). "Pandemics, tourism and global change: a rapid assessment of COVID-19", *Journal of sustainable tourism*, Vol. *29* No. 1, pp. 1-20.

Habib, A. M. & Mourad, N. (2023). "The Influence of Environmental, Social, and Governance (ESG) Practices on US Firms' Performance: Evidence from the Coronavirus Crisis", *Journal of the Knowledge Economy*, pp. 1-22.

Halid, S., Mahmud, R., Ibrahim, M., Hashim, H., Puteh, M. S. & Rahman, R. A. (2023, October). "Malaysian Firms and the ESG Score: The Key to Unlocking Peak Performance", *In e-Proceedings* (pp. 1).

Halid, S., Rahman, R. A., Mahmud, R., Mansor, N. & Wahab, R. A. (2023). "A literature review on ESG score and its impact on firm performance", *International Journal of Academic Research in Accounting Finance and Management Sciences*, Vol. *13* No. 1, pp. 272-282.

Han, J. J., Kim, H. J. & Yu, J. (2016). "Empirical study on relationship between corporate social responsibility and financial performance in Korea", *Asian Journal of Sustainability and Social Responsibility*, Vol. *1*, pp. 61-76.

Hart, S. L. & Ahuja, G. (1996). "Does it pay to be green? An empirical examination of the relationship between emission reduction and firm performance", *Business Strategy and the Environment*, Vol. *5* No. 1, pp. 30-37.

Hasan, I., Singh, S. & Kashiramka, S. (2022). "Does corporate social responsibility disclosure impact firm performance? An industry-wise analysis of Indian firms", *Environment, Development and Sustainability*, Vol. *24* No. 8, pp. 10141-10181.

Hermalin, B. E. & Weisbach, M. S. (2003). "Boards of directors as an endogenously determined institution: A survey of the economic literature", *Economic Policy Review*, Vol. *9* No. 1, pp. 7-26.

Howard-Grenville, J. (2021). *ESG impact is hard to measure-but it's not impossible.*

Hunt, V., Layton, D., & Prince, S. (2015). *Why diversity matters. McKinsey & Company.*

International Energy Agency (IEA). (2020). "CO2 Emissions from Fuel Combustion 2020", *IEA Publications* Available at: https://iea.blob.core.windows.net/assets/474cf91a-636b-4fde-b416-56064e0c7042/WorldCO2_Documentation.pdf

Ivanov, D. (2020). "Predicting the impacts of epidemic outbreaks on global supply chains: A simulation-based analysis on the coronavirus outbreak (COVID-19/SARS-CoV-2) case", *Transportation Research Part E: Logistics and Transportation Review*, Vol. *136*, pp. 101922.

Jensen, M. C. (1993). “The modern industrial revolution, exit, and the failure of internal control systems”, *The Journal of Finance,* Vol. *48* No. 3, pp. 831-880.

Kaczmarek, T., Perez, K., Demir, E. & Zaremba, A. (2021). “How to survive a pandemic: The corporate resiliency of travel and leisure companies to the COVID-19 outbreak”, *Tourism Management,* Vol. *84*, pp. 104281.

Kaza, S., Yao, L., Bhada-Tata, P. & Van Woerden, F. (2018). *What a waste 2.0: a global snapshot of solid waste management to 2050*. World Bank Publications.

Kim, Y. S., & Jin, H. J. (2022). “Analysis for economic impacts of food and whole industry due to the COVID-19 outbreak”, *Korean J Food Mark Econ*, Vol. *39* No. 2, pp. 73-92.

Klassen, R. D. & McLaughlin, C. P. (1996). “The impact of environmental management on firm performance”, *Management Science,* Vol. *42* No. 8, pp. 1199-1214.

KN, M. & Giri, S. (2017). “A Comparative Study on Usage of Automated Loan Origination vis-a-vis Manual Loan Origination as a Risk Management Tool”, *IFIMs Focus: The International Journal of Management,* Vol. *13* No. 1.

Kuckertz, A., Brändle, L., Gaudig, A., Hinderer, S., Reyes, C. A. M., Prochotta, A., Steinbrink, K. M. & Berger, E. S. (2020). “Startups in times of crisis – A rapid response to the COVID-19 pandemic”, *Journal of Business Venturing Insights,* Vol. *13*, pp. 100169.

Kulal, A., Abhishek, N., Dinesh, S. & Divyashree, M. S. (2023). “Impact of Environmental, Social, and Governance (ESG) Factors on Stock Prices and Investment Performance”, *Macro Management & Public Policies,* Vol. *5* No. 2, pp. 14-26.

Lagasio, V. & Cucari, N. (2019). “Corporate governance and environmental social governance disclosure: A meta-analytical review”, *Corporate social responsibility and environmental management*, Vol. *26* No. 4, pp. 701-711.

Lashua, B., Johnson, C. W. & Parry, D. C. (2021). “Leisure in the time of coronavirus: A rapid response special issue”, *Leisure Sciences,* Vol. *43* No. 1-2, pp. 6-11.

Lehman, E. T. (2021). “Washing hands, reaching out”–Popular music, digital leisure and touch during the COVID-19 pandemic”, *Leisure Sciences,* Vol. *43* No. 1-2, pp. 273-279.

Li, T. T., Wang, K., Sueyoshi, T. & Wang, D. D. (2021). “ESG: Research progress and future prospects”, *Sustainability,* Vol. *13* No. 21, pp. 11663.

Locke, R., Qin, F. & Brause, A. (2007). “Does monitoring improve labor standards? Lessons from Nike”, *Industrial and Labor Relations Review,* Vol. *61* No. 1, pp. 3-31.

Mardini, G. H. (2022). “ESG factors and corporate financial performance”, *International Journal of Managerial and Financial Accounting,* Vol. *14* No. 3, pp. 247-264.

McKinsey & Company. (2020). “How COVID-19 has pushed companies over the technology tipping point—and transformed business forever”, Available at:

https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/how-covid-19-has-pushed-companies-over-the-technology-tipping-point-and-transformed-business-forever

Mousa, M., Saleem, A. & Sági, J. (2021). "Are ESG shares a safe haven during COVID-19? Evidence from the arab region", *Sustainability,* Vol. *14* No. 1, pp. 208.

Mulolli, E. & Boskovska, D. (2020). "The Role of Human Resource Management Practices on Financial Performance in Firms", *Int. J. of Multidisciplinary and Current research, 8*.

Naseer, M. M., Hunjra, A. I., Mattoussi, F. & Amin, M. N. (2023). "Unlocking the effect of corporate environmental practices in driving firms' financial performance", *Environmental Economics and Policy Studies*, pp. 1-24.

Peng, L. S. & Isa, M. (2020). "Environmental, social and governance (ESG) practices and performance in Shariah firms: agency or stakeholder theory?", *Asian Academy of Management Journal of Accounting & Finance,* Vol. *16* No. 1.

Porter, M. E. & van der Linde, C. (1995). "Toward a new conception of the environment-competitiveness relationship", *Journal of Economic Perspectives,* Vol. *9* No. 4, pp. 97-118.

PwC. (n.d.). "Emerging trends in real estate®: Europe 2020", Available at: https://www.pwc.com/gx/en/industries/financial-services/real-estate/emerging-trends-real-estate/europe-2020.html

Salsabila, A. R. & Rossieta, H. (2023). "Strategi Keberlangsungan Bisnis Dalam Menghadapi Pandemi Covid-19", *Owner: Riset dan Jurnal Akuntansi*, Vol. *7* No. 2, pp. 1124-1136.

Sari, I. M. P. (2023). "Dampak Pandemi COVID-19 Terhadap Kualitas Pelayanan dan Pengelolaan Keuangan di Rumah Sakit", *VISIKES: Jurnal Kesehatan Masyarakat*, Vol. *22* No. 1, pp. 132-138.

Sariyer, G., Kahraman, S., Sözen, M. E. & Ataman, M. G. (2023). "Fiscal responses to COVID-19 outbreak for healthy economies: Modelling with big data analytics", *Structural Change and Economic Dynamics*, Vol. *64*, pp. 191-198.

Saygili, E., Arslan, S. & Birkan, A. O. (2022). "ESG practices and corporate financial performance: Evidence from Borsa Istanbul", *Borsa Istanbul Review,* Vol. *22* No. 3, pp. 525-533.

Senadheera, S. S., Gregory, R., Rinklebe, J., Farrukh, M., Rhee, J. H. & Ok, Y. S. (2022). "The development of research on environmental, social, and governance (ESG): A bibliometric analysis", *Sustainable Environment,* Vol. *8* No. 1, pp. 2125869.

Shahzad Sharif Mughal (2022). "Covid-19 effects on medical industry", *Authorea.*

Sharma, D., Bhattacharya, S. & Thukral, S. (2019). "Resource-based view on corporate sustainable financial reporting and firm performance: Evidences from emerging Indian economy", *International Journal of Business Governance and Ethics,* Vol. *13* No. 4, pp. 323-344.

Shehzad, K., Xiaoxing, L. & Kazouz, H. (2020). "COVID-19's disasters are perilous than global financial crisis: A rumor or fact?", *Finance Research Letters,*Vol. *36*, pp. 101669.

Tahmid, T., Hoque, M. N., Said, J., Saona, P. & Azad, M. A. K. (2022). "Does ESG initiatives yield greater firm value and performance? New evidence from European firms", *Cogent Business & Management,* Vol. *9* No. 1, pp. 2144098.

Tihanyi, L., Graffin, S. D. & George, G. (2014). "Rethinking governance in management research", *Academy of Management Journal,* Vol. *57* No. 6, pp. 1535-1543.

To, B. C. N., Nguyen, B. K. Q. & Nguyen, T. V. T. (2023). "When the market got the first dose: Stock volatility and vaccination campaign in COVID-19 period", *Heliyon*, Vol. *9* No. 1.

Tricker, R. I. (2015). *Corporate Governance: Principles, Policies, and Practices*, Oxford University Press.

VOICU, Ș. M. (2023). "Analysis of Green Investment Efficiency. A Model for Future Economic Sustainability Development", *Annals of the University Dunarea de Jos of Galati: Fascicle: I, Economics & Applied Informatics*, Vol. *29* No. 2.

Vysochyna, A., Vasylieva, T., Dluhopolskyi, O., Marczuk, M., Grytsyshen, D., Yunger, V. & Sulimierska, A. (2023). "Impact of coronavirus disease COVID-19 on the relationship between healthcare expenditures and sustainable economic growth", *International Journal of Environmental Research and Public Health*, Vol. *20* No. 4, pp. 3049.

Waddock, S. A. & Graves, S. B. (1997). "The corporate social performance–financial performance link", *Strategic management journal,* Vol. *18* No. 4, pp. 303-319.

World Health Organization. (2018). Environmental noise guidelines for the European region.

Wu, L., Shao, Z., Yang, C., Ding, T. & Zhang, W. (2020). "The impact of CSR and financial distress on financial performance—evidence from Chinese listed companies of the manufacturing industry", *Sustainability*, Vol. *12* No.17, pp. 6799.

Xie, J., Nozawa, W., Yagi, M., Fujii, H. & Managi, S. (2019). "Do environmental, social, and governance activities improve corporate financial performance?", *Business Strategy and the Environment*, Vol. *28* No. 2, pp. 286-300.

Zhou, G., Liu, L. & Luo, S. (2022). "Sustainable development, ESG performance and company market value: Mediating effect of financial performance", *Business Strategy and the Environment,* Vol. *31* No. 7, pp. 3371-3387.

Appendix

Appendix 1. Panel data regression output for all firms across before COVID-19

	Pooled OLS				Fixed Effects Model			
EScore	0.0085***			0.0111***	0.0034			-0.0019
	(0.0029)			(0.0038)	(0.0067)			(0.0072)
SScore		0.0042		0.0000		0.0185**		0.0212***
		(0.0036)		(0.0047)		(0.0077)		(0.0082)
GScore			-0.0096***	-0.0126***			-0.0106*	-0.0124**
			(0.0033)	(0.0035)			(0.0057)	(0.0057)
Leverage	-0.0268***	-0.0275***	-0.0274***	-0.0267***	-0.0746***	-0.0741***	-0.0749***	-0.0742***
	(0.0040)	(0.0040)	(0.0040)	(0.0040)	(0.0111)	(0.0111)	(0.0111)	(0.0111)
Constant	1.9271	1.2351	0.5256	1.7996	-33.3013***	-33.2810***	-33.0505***	-32.8526***
	(1.2796)	(1.2667)	(1.2324)	(1.2812)	(6.8610)	(6.8459)	(6.8523)	(6.8550)
Observations	3,040	3,040	3,040	3,040	3,040	3,040	3,040	3,040
R-squared	0.5333	0.5322	0.5333	0.5354				
Number of Firms					380	380	380	380

*Notes: Robust standard errors are in parentheses; ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively. All regressions include control variables (Leverage, Sales growth, Profitability, Size).*

Appendix 2. Panel data regression output for all firms across during COVID-19

	Pooled OLS				Fixed Effects Model			
EScore	-0.0041			0.0015	0.0212			0.0302
	(0.0082)			(0.0098)	(0.0371)			(0.0393)
SScore		-0.0115		-0.0096		0.0044		-0.0005
		(0.0106)		(0.0132)		(0.0376)		(0.0394)
GScore			-0.0095	-0.0069			-0.0346	-0.0374
			(0.0092)	(0.0099)			(0.0234)	(0.0237)
Constant	-1.8707	-2.0142	-1.6134	-1.8443	-239.5500***	-236.9365***	-235.1714***	-239.0461***
	(2.8962)	(2.8827)	(2.8650)	(2.9026)	(42.7039)	(42.4744)	(42.3259)	(42.6777)
Observations	760	760	760	760	760	760	760	760
R-squared	0.5809	0.5814	0.5814	0.5817				
Number of Firms					380	380	380	380

*Notes: Robust standard errors are in parentheses; ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively. All regressions include control variables (Leverage, Sales growth, Profitability, Size).*

Appendix 3. Panel data regression output for Banking and Investment firms before COVID-19

	Pooled OLS				Fixed Effects Model			
EScore	0.0016			0.0073	-0.0029			-0.0015
	(0.0079)			(0.0089)	(0.0163)			(0.0170)
SScore		-0.0029		0.0035		0.0277		0.0340
		(0.0117)		(0.0133)		(0.0209)		(0.0215)
GScore			-0.0238***	-0.0269***			-0.0369**	-0.0393**
			(0.0087)	(0.0092)			(0.0151)	(0.0155)
Constant	1.6972	1.2148	0.8091	2.0094	12.1144	10.1173	12.5490	9.5457
	(2.7830)	(2.8164)	(2.5715)	(2.8538)	(13.6786)	(13.6343)	(13.4384)	(13.7390)
Observations	392	392	392	392	392	392	392	392
R-squared	0.4874	0.4874	0.4970	0.4984				
Number of Firms					49	49	49	49

*Notes: Robust standard errors are in parentheses; ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively. All regressions include control variables (Leverage, Sales growth, Profitability, Size).*

Appendix 4. Panel data regression output for Banking and Investment firms during COVID-19

	Pooled OLS				Fixed Effects Model			
EScore	-0.0033			-0.0033	-0.0190			-0.0101
	(0.0111)			(0.0125)	(0.0687)			(0.0748)
SScore		-0.0031		-0.0008		-0.0319		-0.0262
		(0.0217)		(0.0258)		(0.0655)		(0.0716)
GScore			0.0001	0.0014			0.0224	0.0212
			(0.0148)	(0.0161)			(0.0439)	(0.0450)
Constant	-5.0345	-4.7079	-4.7752	-5.0883	-45.3375	-50.6448	-52.5840	-50.0564
	(3.6126)	(3.5291)	(3.5779)	(3.8024)	(60.8856)	(58.0410)	(58.1881)	(62.6106)
Observations	98	98	98	98	98	98	98	98
R-squared	0.8372	0.8370	0.8370	0.8372				
Number of Firms					49	49	49	49

*Notes: Robust standard errors are in parentheses; ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively. All regressions include control variables (Leverage, Sales growth, Profitability, Size).*

Appendix 5. Panel data regression output for Food and Beverage firms before COVID-19

	Pooled OLS				Fixed Effects Model			
EScore	-0.0036			0.0009	0.0003			-0.0056
	(0.0049)			(0.0062)	(0.0114)			(0.0128)
SScore		-0.0079		-0.0088		0.0102		0.0120
		(0.0057)		(0.0072)		(0.0120)		(0.0136)
GScore			-0.0003	0.0008			0.0051	0.0042
			(0.0047)	(0.0047)			(0.0094)	(0.0096)
Constant	-3.6777*	-4.2752**	-3.1550	-4.2492*	-0.7095	-0.5092	-0.4852	0.0847
	(2.1192)	(2.1466)	(1.9940)	(2.1692)	(13.1230)	(13.0907)	(13.0999)	(13.1578)
Observations	600	600	600	600	600	600	600	600
R-squared	0.6319	0.6327	0.6315	0.6328				
Number of Firms					75	75	75	75

*Notes: Robust standard errors are in parentheses; ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively. All regressions include control variables (Leverage, Sales growth, Profitability, Size).*

Appendix 6. Panel data regression output for Food and Beverage firms during COVID-19

	Pooled OLS				Fixed Effects Model			
EScore	0.0327***			0.0281**	0.0325			0.0260
	(0.0091)			(0.0113)	(0.0266)			(0.0307)
SScore		0.0277**		0.0088		0.0409		0.0239
		(0.0109)		(0.0130)		(0.0446)		(0.0485)
GScore			0.0107	0.0014			0.0097	0.0021
			(0.0086)	(0.0087)			(0.0182)	(0.0195)
Constant	2.6389	2.2021	0.7397	2.8890	-33.8636	-33.8871	-32.1854	-35.0844
	(2.9640)	(3.0360)	(3.0165)	(2.9834)	(69.2194)	(69.5631)	(69.8042)	(70.1537)
Observations	150	150	150	150	150	150	150	150
R-squared	0.7123	0.7005	0.6909	0.7133				
Number of Firms					75	75	75	75

*Notes: Robust standard errors are in parentheses; ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively. All regressions include control variables (Leverage, Sales growth, Profitability, Size).*

Appendix 7. Panel data regression output for Healthcare firms before COVID-19

	Pooled OLS				Fixed Effects Model			
EScore	0.0099			0.0153	-0.0007			-0.0088
	(0.0075)			(0.0097)	(0.0177)			(0.0190)
SScore		0.0015		-0.0076		0.0184		0.0213
		(0.0084)		(0.0110)		(0.0178)		(0.0192)
GScore			-0.0074	-0.0082			0.0039	0.0034
			(0.0079)	(0.0081)			(0.0136)	(0.0137)
Constant	4.9895*	3.4243	2.9011	4.7096*	-38.3218**	-38.1958**	-38.7938**	-38.4528**
	(2.7525)	(2.5858)	(2.4545)	(2.7577)	(16.6728)	(16.6566)	(16.7462)	(16.7599)
Observations	688	688	688	688	688	688	688	688
R-squared	0.6519	0.6511	0.6515	0.6528				
Number of Firms					86	86	86	86

*Notes: Robust standard errors are in parentheses; ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively. All regressions include control variables (Leverage, Sales growth, Profitability, Size).*

Appendix 8. Panel data regression output for Healthcare firms during COVID-19

	Pooled OLS				Fixed Effects Model			
EScore	-0.0107			0.0016	0.0834			0.0286
	(0.0135)			(0.0176)	(0.0602)			(0.0650)
SScore		-0.0237		-0.0263		0.1640**		0.1626**
		(0.0180)		(0.0240)		(0.0713)		(0.0791)
GScore			-0.0000	0.0043			-0.0180	-0.0292
			(0.0141)	(0.0144)			(0.0344)	(0.0349)
Constant	1.1386	1.0792	2.2659	1.1411	-381.1374***	-379.1768***	-366.4344***	-381.4935***
	(4.0497)	(3.8826)	(3.7964)	(4.0360)	(80.5299)	(78.5093)	(80.8039)	(79.4636)
Observations	172	172	172	172	172	172	172	172
R-squared	0.7960	0.7973	0.7952	0.7974				
Number of Firms					86	86	86	86

*Notes: Robust standard errors are in parentheses; ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively. All regressions include control variables (Leverage, Sales growth, Profitability, Size)..*

Appendix 9. Panel data regression output for Real Estate firms before COVID-19

	Pooled OLS				Fixed Effects Model			
EScore	0.0194***			0.0072	0.0382***			0.0224
	(0.0064)			(0.0077)	(0.0143)			(0.0154)
SScore		0.0328***		0.0368***		0.0597***		0.0537***
		(0.0084)		(0.0111)		(0.0162)		(0.0178)
GScore			-0.0024	-0.0179**			-0.0066	-0.0157
			(0.0071)	(0.0078)			(0.0118)	(0.0118)
Constant	15.4147***	15.6272***	11.6456***	16.0750***	-62.0842***	-57.9932***	-62.9400***	-58.6964***
	(4.2081)	(4.1396)	(4.0999)	(4.1909)	(15.9200)	(15.8899)	(16.0123)	(15.8729)
Observations	720	720	720	720	720	720	720	720
R-squared	0.2413	0.2474	0.2316	0.2539				
Number of Firms					90	90	90	90

*Notes: Robust standard errors are in parentheses; ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively. All regressions include control variables (Leverage, Sales growth, Profitability, Size).*

Appendix 10. Panel data regression output for Real Estate firms during COVID-19

	Pooled OLS				Fixed Effects Model			
EScore	-0.0266			-0.0278	0.0819			0.0952
	(0.0219)			(0.0253)	(0.1024)			(0.1042)
SScore		-0.0126		0.0082		-0.0140		-0.0360
		(0.0259)		(0.0322)		(0.0987)		(0.1000)
GScore			-0.0115	-0.0075			-0.1005	-0.1030
			(0.0198)	(0.0221)			(0.0627)	(0.0632)
Constant	6.2582	9.5783	9.8359	6.2415	-572.4500***	-563.5161***	-536.6504***	-525.3338***
	(9.8621)	(9.4308)	(9.3504)	(9.8626)	(142.4767)	(148.2828)	(142.2704)	(148.6821)
Observations	180	180	180	180	180	180	180	180
R-squared	0.2229	0.2175	0.2180	0.2234				
Number of Firms					90	90	90	90

*Notes: Robust standard errors are in parentheses; ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively. All regressions include control variables (Leverage, Sales growth, Profitability, Size).*

Appendix 11. Panel data regression output for Leisure firms before COVID-19

	Pooled OLS				Fixed Effects Model			
EScore	0.0093			0.0308**	0.0187			0.0147
	(0.0123)			(0.0148)	(0.0252)			(0.0268)
SScore		-0.0159		-0.0250		-0.0099		-0.0174
		(0.0137)		(0.0165)		(0.0446)		(0.0463)
GScore			-0.0262*	-0.0301*			-0.0334	-0.0306
			(0.0144)	(0.0155)			(0.0239)	(0.0246)
Constant	-12.5718**	-15.5363***	-15.0371***	-10.1180*	-38.4378	-40.2326	-32.4252	-30.8338
	(5.9730)	(5.4308)	(5.3444)	(5.9337)	(28.8596)	(28.8012)	(29.1828)	(29.4581)
Observations	200	200	200	200	200	200	200	200
R-squared	0.7100	0.7111	0.7139	0.7204				
Number of Firms					25	25	25	25

*Notes: Robust standard errors are in parentheses; ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively. All regressions include control variables (Leverage, Sales growth, Profitability, Size).*

Appendix 12. Panel data regression output for Leisure firms during COVID-19

	Pooled OLS				Fixed Effects Model			
EScore	-0.0124			-0.0150	-0.0199			0.0707
	(0.0285)			(0.0332)	(0.0861)			(0.0853)
SScore		0.0021		0.0112		-0.1185		-0.1216*
		(0.0251)		(0.0308)		(0.0761)		(0.0732)
GScore			-0.0054	-0.0053			-0.0862*	-0.0991**
			(0.0222)	(0.0273)			(0.0457)	(0.0487)
Constant	12.8371	13.5194	13.5183	12.5482	-22.9602	-47.0673	-61.5175	-91.7499
	(9.1304)	(9.0054)	(8.9976)	(9.1896)	(64.0558)	(62.3803)	(62.3573)	(63.0861)
Observations	50	50	50	50	50	50	50	50
R-squared	0.8085	0.8078	0.8080	0.8090				
Number of Firms					25	25	25	25

*Notes: Robust standard errors are in parentheses; ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively. All regressions include control variables (Leverage, Sales growth, Profitability, Size).*

Appendix 13. Panel data regression output for Transportation firms before COVID-19

	Pooled OLS				Fixed Effects Model			
EScore	-0.0134*			-0.0078	-0.0167			-0.0125
	(0.0070)			(0.0099)	(0.0196)			(0.0230)
SScore		-0.0143*		-0.0029		-0.0198		-0.0110
		(0.0082)		(0.0116)		(0.0205)		(0.0241)
GScore			-0.0168**	-0.0136*			-0.0136	-0.0133
			(0.0073)	(0.0077)			(0.0147)	(0.0150)
Constant	-7.8903**	-7.1804**	-6.1862*	-7.6048**	-26.9989	-26.8700	-27.4607	-27.4442
	(3.5667)	(3.4863)	(3.3929)	(3.5570)	(25.6480)	(25.6409)	(25.6490)	(25.6838)
Observations	440	440	440	440	440	440	440	440
R-squared	0.7251	0.7247	0.7261	0.7272				
Number of Firms					55	55	55	55

*Notes: Robust standard errors are in parentheses; ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively. All regressions include control variables (Leverage, Sales growth, Profitability, Size).*

Appendix 14. Panel data regression output for Transportation firms during COVID-19

	Pooled OLS				Fixed Effects Model			
EScore	0.0129			-0.0067	-0.1266			-0.0589
	(0.0394)			(0.0511)	(0.1187)			(0.1262)
SScore		0.0285		0.0440		-0.1572*		-0.1565*
		(0.0365)		(0.0490)		(0.0852)		(0.0930)
GScore			-0.0113	-0.0291			0.0955	0.1192
			(0.0393)	(0.0436)			(0.0828)	(0.0817)
Constant	-8.8608	-8.4907	-10.7136	-7.6847	-262.9048**	-303.9673***	-291.5881***	-316.3596***
	(16.6385)	(15.6668)	(15.4070)	(16.8745)	(110.8207)	(108.7054)	(110.6482)	(111.0807)
Observations	110	110	110	110	110	110	110	110
R-squared	0.6063	0.6081	0.6062	0.6098				
Number of Firms					55	55	55	55

*Notes: Robust standard errors are in parentheses; ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively. All regressions include control variables (Leverage, Sales growth, Profitability, Size).*