Impact of environmental, social, and governance (ESG) performance on investment mix. New empirical evidence from non-financial firm in Pakistan

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Abstract

Integrating environmental, social, and governance (ESG) principles into investment decisions has garnered increased attention in the business landscape. This study investigates the intricate interplay between ESG performance and investment patterns (capital vs. environmental) within the corporate setting. It aims to identify the influence of ESG scores on earnings-driven investments (capital investment) and environmental investments, exploring potential trade-offs and implications for corporate decision-making. The analysis sampled nonfinancial sector enterprises in Pakistan from 2015 to 2023. To address endogeneity concerns, the system generalized method of moments (GMM) was employed for regression analysis. The findings revealed a significant positive correlation between ESG performance and earnings-driven investments (capital investment). However, a negative relationship emerged between ESG scores and environmental investments, indicating potential trade-offs between financial profitability and dedicated environmental spending within companies. Other variables, including firm size, debt ratios, cash holdings, and CO2 emissions, also significantly impacted investment patterns. The study's outcomes provide valuable guidance for corporate managers navigating sustainable investment strategies. Emphasizing earnings-driven investments, particularly capital projects with a high ESG focus, could align financial objectives with sustainable practices, enhancing long-term viability and stakeholder trust. The insights from this study contribute to the broader discourse on responsible corporate practices and sustainability. The findings shed light on the complexities of balancing financial objectives with environmental responsibilities, emphasizing the need for a balanced approach that reconciles financial goals with ESG commitments. By dissecting the nuanced relationships between ESG performance and investment decisions, this study offers a novel perspective on the trade-offs companies face between different

types of investments while pursuing ESG performance.
Keywords: ESG, Investment decisions, Capital, Environmental, Performance, ESG score

1: Introduction

In recent years, environmental, social, and governance (ESG) factors have become crucial in investment decisions across many industries (Li, Ba, et al., 2023; Zhang et al., 2022). This increased focus on ESG criteria shows a shift in how corporate performance is evaluated, going beyond just financial metrics (He, et al., 2023). Understanding how ESG performance affects investment strategies, especially in terms of resource allocation within companies, is important. This study looks at the link between ESG-focused investments and the shift in corporate focus from environmental initiatives to capital investments aimed at achieving sustainable, long-term returns. It examines the changing dynamics of investment preferences and the potential trade-offs or synergies between ESG commitments and profit-driven capital investment strategies. By explaining how ESG considerations influence investment decisions, this study offers valuable insights for investors and companies trying to balance sustainable practices with financial returns.

Recently, ESG criteria have become crucial in shaping investment choices as investors see their importance in evaluating a company's long-term success and risk management (Li, Ba, et al., 2023). This increased focus on ESG performance has changed how investors behave, with more of them considering nonfinancial factors alongside traditional financial ones. This study looks at how ESG criteria affect corporate decision-making, especially in how investments are allocated. It explores how focusing on ESG principles shifts corporate attention from environmental investments to capital investments, a strategic move to boost earnings and financial returns.

ESG performance measures how well a company handles environmental, social, and governance areas. The environmental aspect looks at a company's impact on the environment, such as carbon emissions, resource use, waste management, renewable energy, pollution control, and sustainability. Social factors examine the company's relationships and effects on society, including labor practices, employee relations, diversity and inclusion, community involvement, human rights, and product safety. Governance assesses the quality of the company's leadership, internal controls, shareholder rights, transparency, ethical standards, and compliance with laws (Wang, Lin, et al., 2023). The investment mix refers to how funds or resources are allocated to different types of investments in a portfolio, often involving diversification across various asset classes or sectors. In this study, capital investment means allocating funds for acquiring physical assets or long-term investments to boost income or improve company operations (Farooq, et al., 2024). Capital investments include infrastructure development, buying machinery, and acquiring property to increase productivity and profitability. Environmental investments (EINV) are directed toward sustainable initiatives and projects, such as renewable energy sources, eco-friendly technologies, pollution control, and waste reduction programs to lessen the company's environmental impact (Yang, 2023).

This study looks at how a company's ESG performance affects its investment choices, especially whether a strong focus on ESG leads companies to move away from traditional capital investments toward more environmentally focused investments. This shift might

involve changing how resources are allocated, prioritizing sustainability, and balancing profitability with environmental goals. The study analyzed non-financial companies in Pakistan from 2015 to 2023, using a system generalized method of moments (GMM) model for regression analysis. The goal was to understand the relationship between ESG performance and investment allocation in these companies. The key findings revealed that there is a negative correlation between ESG performance and environmental investment. This means that as companies improve their ESG performance, they tend to reduce investments specifically aimed at environmental initiatives.

Conversely, the study found a positive link between ESG performance and capital investment. This means that companies with higher ESG performance tend to invest more in capital projects aimed at generating income and improving operations. This shift from environmental investments to capital investments remained consistent even after considering factors like firm size, debt ratio, cash holdings, and CO2 emissions. Overall, the study highlights a trend among non-financial companies in Pakistan: a strong commitment to ESG leads to more investment in income-generating projects and less in environmental initiatives.

This study contributes to theory by showing a detailed relationship between ESG performance and investment choices. It explains how companies, especially in BRICS countries, adjust their investment strategies based on ESG factors. This extends current corporate finance and sustainability theories, offering insights into how ESG considerations influence investment decisions. By revealing a negative correlation between ESG performance and environmental investment and a positive correlation with capital investment, the study highlights the trade-offs companies make between sustainability initiatives and income-generating investments. This adds to the discussion on balancing profitability and sustainability goals in corporate decision-making. Practically, the study provides specific insights into the relationship between ESG performance and investment mix among non-financial companies in Pakistan, based on empirical analysis from 2015 to 2023.

This study's evidence helps us better understand how ESG factors affect investment choices in emerging economies. By using a system GMM model and considering various factors like company size, debt, cash, and CO2 emissions, the study's findings are more reliable. Even after considering these factors, the relationship between ESG performance and investment remains consistent. The study's results also give practical advice to companies in Pakistan. It shows how focusing on ESG performance can affect investment decisions, helping companies align ESG goals with their overall investment plans. These findings are also important for policymakers. Understanding how ESG performance influences investment can help them create policies that balance sustainability and economic growth. They can encourage environmentally friendly investments without slowing down overall economic development.

The remainder of this paper is structured as follows. Chapter 2 is a theoretical and empirical literature review of ESG performance and investment decisions. Chapter 3 provides research methodology. Chapter 4 gives the data analysis while chapter 5 provide discussion and conclusion.

2: Literature review

2.1 Theoretical review

Some theories support the idea that ESG performance influences the types of investments companies make. For example, stakeholder theory says that businesses should think about everyone affected by their actions, not just shareholders (Freeman, 1984). When a company's ESG performance gets better, it might focus more on investments that make money and also align with what stakeholders care about. These could be projects that help employees or improve the community. Improving ESG can lead to more capital investment, which helps the company make more money and benefits both shareholders and stakeholders. But when it comes to environmental investment, improving ESG might mean companies spend less on specific environmental projects. Instead, they might put resources into capital investments that indirectly help the environment, like using more energy-efficient technologies. Also, when companies focus more on ESG, they might feel less pressure to invest in environmental technologies (Liu, et al., 2024).

The modern portfolio theory (MPT) by Markowitz (1952) helps explain how different factors are related. According to MPT, investors want to balance risk and return. So, when a company's ESG performance improves, it might attract investors who like sustainable investments (Yin, et al., 2023). This could lead companies to put more money into projects that have strong ESG credentials to make more money over the long term. In the case of environmental investment, if a company focuses more on ESG, it might indirectly help the environment with its capital investments. For example, using eco-friendly technologies could mean the company doesn't need to spend as much on separate environmental projects. So, when a company has a strong ESG performance, it tends to spend more on income-driven investments like capital investment and less on environmental-focused projects.

Trade-off theory says that companies often have to balance different goals when deciding where to spend their money (Modigliani & Miller, 1958). When it comes to ESG performance and investment decisions, if a company's ESG performance gets better, it can affect how it decides to invest. With stronger ESG performance, companies might choose projects that make money right away, like capital investments. This makes sense because it satisfies shareholders who want the company to be profitable, and it might attract investors who like sustainable but profitable businesses. But focusing more on capital investments might mean putting less money into specific environmental projects. Companies might prioritize projects that promise quick and clear financial gains to make shareholders happy or boost their financial performance. While these projects might help the environment indirectly, they're not solely focused on environmental goals. So, improving ESG performance could mean putting more money into projects that make money and also have some positive impact on the environment, but it might mean spending less on projects that are solely focused on helping the environment.

According to behavioral finance, investors might prefer companies with strong ESG performance because of social responsibility preferences. This means companies might put more money into projects that boost their ESG status to attract these investors. But at the same time, this bias could mean less spending on environmental projects, as companies choose projects that make money quickly and also align with ESG principles. Resource dependence theory says that better ESG performance could improve a company's

relationships with important resources, like access to money. So, companies might spend more on projects that keep or improve these resource relationships. This could affect environmental investment because companies might focus less on specific environmental projects and more on projects that help the environment indirectly while also meeting other important goals. These theories help us understand how ESG performance affects capital and environmental investment, showing how sustainability and financial decisions are connected.

2.2 Empirical review:

Some studies have looked at how ESG performance affects where companies invest their money. Zhou et al. (2022) studied Chinese companies to see how ESG metrics impact their market value. They found that better ESG performance increases a company's market value, especially for state-owned companies. This higher market value and better company performance mean companies have more money to invest, so they put more into capital projects. Li, Ba, et al. (2023) looked at how ESG ratings affect innovation in Chinese companies. They found that companies with good ESG performance and lots of money to invest are more innovative. They also found that things like the type of industry, how well property rights are protected, how developed the financial sector is in different regions, and things like company size and how much money they have to spend all affect how ESG performance and innovation are linked. Zehir and Aybars (2020) looked at stock portfolios in Europe and Turkey based on ESG scores. Some portfolios did better than the overall market, but they found that overall, there wasn't a clear link between investing in socially responsible companies and how well the portfolios did.

Kotsantonis et al. (2016) wanted to see how companies focusing on ESG initiatives often do better than their competitors. They found that these companies tend to have advantages over others, leading to better returns for investors. This shows that ESG-focused companies not only perform well financially but also attract long-term investors and benefit from operating more efficiently and expanding their market. Chen, Li, Xu, et al. (2023) looked at how ESG performance affects the cost of getting money for Chinese companies. They found that when companies have strong ESG performance, it costs less for them to get money from selling shares. This means they can get more money, which helps them invest more. They also found that ESG performance helps reduce market risk and makes it easier for companies to spread out their investments, which also lowers the cost of getting money. Al-Hiyari et al. (2023) studied how ESG performance relates to how well companies invest in emerging economies. They found that companies with good ESG performance tend to invest more efficiently. They also found that having a diverse board of directors can affect how much ESG performance helps companies invest efficiently, especially in places where companies tend to invest too much.

Bai et al. (2022) looked at how ESG performance affects Chinese companies' ability to get financing. They found that strong ESG performance not only helps companies get money more easily but also attracts institutional investors, which is seen positively by the market. However, this effect is less strong in industries related to primary resources like farming or mining. They also found that institutional investors have different preferences for ESG, especially in companies that are not state-owned and in industries like services and

manufacturing. Naeem et al. (2022) studied how ESG performance affects financially sensitive companies in industries that affect the environment a lot. They found that companies with better ESG performance tend to do better financially, showing higher returns and having a higher value compared to their costs. They also found that this effect is stronger in developed countries than in countries that are still growing economically. The same effect of ESG performance on capital investment can be expected because these decisions are closely linked.

Khalil et al. (2022) looked at how different types of innovation affect companies' financial value and their impact on the environment across ten Asian countries. They found that while traditional innovation helps companies make more money, it also harms the environment by increasing carbon emissions. On the other hand, investing in environmental innovation not only boosts financial performance but also helps the environment, showing the importance of eco-friendly practices for both market success and reducing environmental harm. Zhou et al. (2023) studied how ESG performance affects sustainability and innovation in the manufacturing sector in Bangladesh. They found that companies with better ESG performance tend to be more innovative and sustainable, showing that ESG initiatives play a crucial role in making companies more sustainable. Tan and Zhu (2022) looked at how ESG ratings affect green innovation in Chinese companies listed on the A-share market. They found that higher ESG ratings are linked to more green innovation, and these ratings help companies innovate by reducing financial constraints. Li, Lian, and Xu (2023) created a theory showing how corporate ESG performance affects the effects of green innovation in Chinese companies listed on the A-share market from 2012 to 2020. They found that there are significant effects within industries, with industrial companies facing constraints but non-industrial ones benefiting from ESG-driven green innovation, ultimately leading to better sustainability practices among peer companies.

Wang et al. (2022) looked at how ESG performance affects how efficiently Chinese companies invest over the period 2011–2020. They found that companies with strong ESG performance tend to invest more efficiently. Erdogan et al. (2023) studied how a company's involvement in ESG activities affects how efficiently it invests. They looked at 1094 companies across 21 European countries from 2002 to 2019 and found a significant positive link between overall ESG engagement and investment efficiency. These studies have shed light on how ESG performance impacts various aspects of how companies behave and perform. They've looked at things like market value, innovation, financing constraints, and investment efficiency. However, one area that hasn't been explored much is how ESG factors specifically affect a company's investment choices, especially when it comes to how much they invest in capital projects versus environmental projects. So, the current research aims to fill this gap by developing some hypotheses.

H1

ESG performance has a significant positive effect on capital investment.

H2

ESG performance has a significant negative effect on environmental investment.

4: Research Methodology

4.1 Data and sample:

We studied non-financial companies in Pakistan from 2015 to 2023. We used a detailed dataset of 60 companies with 2400 observations to conduct thorough analysis. To make sure our results were reliable and to account for any changes because of the COVID-19 pandemic, we split the data into two periods: before COVID (2015–2019) and after COVID (2020–2023). This helped us see if there were any differences in relationships before and after the pandemic, making our study more dependable. By focusing on companies in Pakistan, which play a significant role in the country's economy and have different economic, social, and environmental characteristics, we aimed to provide a comprehensive analysis. These companies vary in their size and scope, giving us a broader understanding of how ESG considerations affect investment decisions in different situations. We collected data for our study from the annual reports and ESG reports of these companies.

4.2 Variables description:

4.2.1 Dependent variables:

In our research, we're looking at something called the investment mix, which includes capital investment and environmental investment. To measure capital investment, we use a ratio. This ratio tells us how much a company is investing in its capital assets compared to its total assets. It's calculated by taking all the money a company spends on things like machinery, equipment, or infrastructure over a certain period, and dividing it by the company's total assets. This ratio helps us see what portion of a company's resources is going towards long-term assets compared to its overall assets. A higher ratio means more resources are being put into capital investments, which could mean the company is planning for long-term growth. A lower ratio suggests less investment in long-term assets relative to the company's total assets. We got this method from studies by Honda (2023) and Farooq et al. (2024).

We measured environmental investment by looking at the ratio of spending on environmental research and development (R&D) compared to total expenditures. This helps us see how much of a company's overall spending goes towards developing eco-friendly technologies or solutions. Environmental R&D spending includes money spent on things like renewable energy, waste management, reducing carbon emissions, and making production methods more eco-friendly. By expressing environmental investment as a ratio of total spending, we can see what portion of a company's expenses is specifically focused on environmental innovation. A higher ratio means more resources are being put into developing eco-friendly technologies, showing a commitment to sustainability. On the other hand, a lower ratio suggests less spending on environmental R&D, indicating less focus on improving environmentally friendly practices. We used a similar method as Chen, Li, Xu, et al. (2023) and Yang (2023).

4.2.2 Independent variable:

ESG (Environmental, Social, and Governance) performance is a significant factor in our study, representing how well a company handles environmental sustainability, social responsibility, and governance practices. We break down this broad concept into three parts: environmental performance, governance performance, and social performance. Environmental performance

looks at how a company deals with environmental risks and tries to be eco-friendly. It considers things like carbon emissions, energy efficiency, and waste management. Governance performance focuses on how well a company is run. It checks if the company has a good governance structure, transparent financial reporting, and follows ethical standards. Social performance measures a company's impact on society and how it interacts with different groups. It considers things like how it treats its employees, engages with the community, and ensures product safety. We used information from recent studies to help us measure ESG performance, including research by Al-Hiyari et al. (2023), Chen, Li, Zeng, & Zhu (2023), and Yin et al. (2023).

In the world of sustainable business, we have two important measures: Environmental Investment and ESG (Environmental, Social, and Governance) Performance. Environmental Investment focuses on money spent on research and development (R&D) for eco-friendly technologies. It's calculated by looking at how much a company spends on environmental R&D compared to its total spending. This helps us see how committed a company is to developing eco-friendly solutions. On the other hand, ESG Performance is broader. It looks at a company's operations in terms of environmental sustainability, social responsibility, and governance practices. We measure ESG by breaking it down into sub-indices for environmental, social, and governance factors, using εζαdifferent measures to evaluate each. This gives us a comprehensive view of how responsible a company is. While Environmental Investment focuses only on R&D spending for environmental sustainability, ESG Performance goes further, looking at not just the environmental impact but also social engagement and governance standards. They're both important for sustainability, but they measure different aspects of a company's practices.

Table 1. Variables of study.

Acronyms	Variables	Measurement	Role	Reference
CAP	Capital investment	Capital expenditures/total assets	Dependent	(Ajide & Ibrahim, 2021; Biddle et al., 2024; Farooq et al., 2024)
EINV	Environmental investment	Environmental R&D expenditures/total expenditures	Dependent	(Biddle, et al., 2024; Farooq et al., 2024; Yang, 2023)
ENS	Environmental performance	Environment Pillar Score	Independent	Zhang, et al. (2022)
GNS	Governance performance	Governance Pillar Score	Independent	Zhang, et al. (2022)
SPS	Social performance	Social Pillar Score	Independent	Zhang, et al. (2022)
FRS	Firm size	Log (total assets)	Control	Farooq, et al.

Acronyms	Variables	Measurement	Role	Reference
				(2024)
DER	Debt ratio	Total debt/total assets	Control	Farooq, et al. (2024)
COH	Cash holdings	Cash & cash equivalents/total assets	Control	Honda (2023)
CO2	CO2 emissions	CO2 Equivalents Emission Total	Control	Farooq, et al. (2023)

Source: previous studies.

4.3 Methodology and econometric models:

To explain how the variables are connected, the study creates the following equations.

$$CAP_{it} = \beta_0 + \gamma_1 CAP_{it} + \alpha_1 ENS_{it} + \alpha_2 GNS_{it} + \alpha_3 SPS_{it} + \beta_1 FRS_{it} + \beta_2 DER_{it} + \beta_3 COH_{it} + \beta_4 CO2_{it} + \varepsilon_{it} \quad \text{(eq.1)}$$

$$EINV_{it} = \beta_0 + \gamma_1 CAP_{it-1} + \alpha_1 ENS_{it} + \alpha_2 GNS_{it} + \alpha_3 SPS_{it} + \beta_1 FRS_{it} + \beta_2 DER_{it} + \beta_3 COH_{it} + \beta_4 CO2_{it} + \varepsilon_{it} \quad \text{(eq.2)}$$

Equation (1) and Equation (2) are regression models where the independent variables on the right side are used to predict or explain the dependent variables. In these equations:

CAP represents capital investment
EINV represents environmental investment
ENS is the environmental score
GNS is the governance score
SPS is the social score
FRS represents firm size
DER is the debt ratio
COH represents cash holdings
CO2 represents CO2 emissions

The goal of these models is to evaluate how changes in these explanatory variables (like environmental, governance, and social scores, along with financial metrics and CO2 emissions) affect capital and environmental investments. The models also account for differences across companies (i) and over time (t). The symbols α, β, and γ are coefficients or parameters for each variable in the equation, showing the size and direction of their impact on the dependent variables.

The methodology of this study includes several steps to ensure the analysis is reliable and valid. First, the study checks for cross-sectional dependencies in the data using various econometric techniques. These techniques include the Breusch-Pagan LM test (Breusch & Pagan, 1980). This test determines if there is any dependency among the different entities or cross-sectional units (like companies). The results are presented in Table 2. Significant p-values from these tests indicate cross-sectional dependency among the entities. Next, the study examines endogeneity within the model. Endogeneity occurs when independent

variables are correlated with the error term, potentially biasing the results. The study uses the Wald test to check for endogeneity. The results, shown in Table 3, suggest the presence of endogeneity (i.e., significant results), indicating that some independent variables might be endogenous. This finding means a different modeling approach is needed to address this issue.

Table 2. Cross-section dependence test

Test	Statistics	d.f.	Probability
Breusch-Pagan LM	603857.800	79,714	0.034

Note: the significant p-values ($p \leq 0.05$) from all tests reject the null hypothesis and indicate the presence of cross-sectional dependency.
Source: self-calculation on STATA

Table 3. Endogeneity test.

Test	Value	d.f.	Probability
F-statistic	379.283	(7, 1271)	0.031
Chi-square	268.826	7	0.004
Normalized Restriction (=0)			
C (1)		0.375	0.130
C (2)		2.550	0.003
C (3)		0.030	0.001
C (4)		0.402	0.000
C (5)		−0.026	0.001
C (6)		0.065	0.033
C (7)		0.215	0.061

Note: The significant probability values ($p \leq 0.10$) reveals the presence of endogeneity.
Due to the identification of endogeneity in the model, the study uses the system generalized method of moments (GMM) model. The System GMM model, introduced by Arellano & Bover (1995), is a dynamic panel data estimation technique that addresses endogeneity by using lagged values of variables as instruments. This method provides robust estimation when endogeneity is present in the data. GMM is particularly useful for dynamic panel data models, which analyze data with both time-series and cross-sectional dimensions. It effectively handles issues related to time dynamics, such as lagged effects and unobserved individual differences. By using lagged variables as instruments, GMM helps address the correlation between independent variables and the error term, a common problem in panel data analysis that can bias estimates. This method helps produce consistent estimates by mitigating

endogeneity concerns. In this study, where endogeneity has been identified, the System GMM model incorporates lagged variables as instruments to provide more reliable estimates. GMM is suitable for dynamic panel data and is robust to various data-related issues, making it an effective choice for addressing endogeneity and producing accurate results in this context. Similar research themes have been explored using the system GMM model by Chen and Xie (2022) and Razak et al. (2023).

By following these methodological steps, the study aims to ensure the reliability of the analysis by addressing issues like cross-sectional dependencies and endogeneity. Using the System GMM model, which was chosen because of the identified endogeneity, helps provide more accurate and reliable estimates while accounting for potential biases in the data.

5. Data analysis:

5.1 Descriptive and correlation analysis:

Table 4 provide the descriptive analysis of the variables provides insight into their central tendencies and ranges. The mean value of capital investment (CAP) is 0.335, with a range from 0.001 to 0.903, indicating the average capital expenditures made by enterprises on acquiring capital assets. Environmental investment (EINV) has a mean value of 0.251, with values spanning from 0 to 0.894, reflecting the environmental commitment of the sampled enterprises. The scores for environmental (ENS), governance (GNS), and social (SPS) performance range from 56 to 60 on average, with variations from 6.81 to 97.54 across different entities. For the control variables, firm size (FRS) has an average value of 8.079, ranging from 5.679 to 10.325, showing minimal variation. The debt ratio (DER) averages 0.278, fluctuating between 0.001 and 0.903. Cash holdings (COH) average 0.127, with a range from 0.003 to 0.893. CO2 emissions have an average of 2.781, ranging from 0 to 3.510. These mean values provide a snapshot of the typical levels and the variation observed in each variable. Table 5 presents the correlation analysis among the variables. Additionally, a multicollinearity test was conducted, and the resulting Variance Inflation Factor (VIF) values are shown at the bottom of Table 5. The VIF values confirm that there are no multicollinearity issues among the variables.

Table 4. Descriptive analysis.

Variables	Mean	Median	Max.	Min.	Std. Dev.	Skewness	Kurtosis
CAP	0.335	0.303	0.903	0.001	0.250	0.323	1.936
EINV	0.251	0.185	0.894	0.000	0.214	1.142	3.512
ENS	56.908	59.010	97.410	6.810	20.581	−0.287	2.361
GNS	57.310	59.920	97.540	5.530	21.276	−0.244	2.110
SPS	60.327	61.450	96.860	1.230	19.604	−0.452	2.776
FRS	8.079	7.994	10.325	5.679	0.904	0.207	2.164
DER	0.278	0.271	0.903	0.001	0.192	0.430	2.607
COH	0.127	0.103	0.893	0.003	0.098	0.041	3.452

Variables	Mean	Median	Max.	Min.	Std. Dev.	Skewness	Kurtosis
CO2	2.781	2.6703	3.510	0.000	0.307	0.956	3.784

Acronyms: CAP = capital investment, EINV = environmental investment, ENS = environmental score, GNS = governance score, SPS = social score, FRS = firm size, DER = debt ratio,COH = casholdings, CO2 = carbon dioxide emission

Table 5. Correlation analysis.

Variables	CAP	EINV	ENS	GNS	SPS	FRS	DER	COH	CO2
CAP	1.000								
EINV	−0.065	1.000							
ENS	0.012	0.009	1.000						
GNS	−0.014	0.026	0.195	1.000					
SPS	−0.044	−0.013	0.551	0.275	1.000				
FRS	0.020	−0.014	0.284	0.062	0.175	1.000			
DER	0.209	−0.040	−0.013	−0.005	−0.003	−0.035	1.000		
COH	−0.190	−0.024	0.013	0.097	−0.018	−0.108	−0.162	1.000	
CO2	0.313	−0.020	0.030	−0.001	0.045	0.272	0.004	0.001	1.000
Multicollinearity test									
VIF	3.681	3.881	4.002	3.321	2.919	3.041	4.004	3.881	2.818

Acronyms:
CAP = capital investment, EINV = environmental investment, ENS = environmental score, GNS = governance score, SPS = social score, FRS = firm size, DER = debt ratio, COH = cash holdings, CO2 = carbon dioxide emission

5.2 Regression analysis:
The main regression analysis in table 6 shows the impact of various independent variables on the respective dependent variables. In Model 1, where capital investment is the dependent variable, the coefficients for ESG performance—Environmental (ENS), Governance (GNS), and Social (SPS) performance scores—show significant positive impacts on capital investment decisions. This means that better scores in these areas are linked to higher capital investment. For the control variables, firm size (FRS) and debt ratio (DER) also have significant positive relationships with capital investment, though the strength and direction of their impacts vary. In contrast, cash holdings (COH) and CO2 emissions are negatively

associated with capital investment, suggesting that companies with higher cash reserves or CO2 emissions tend to invest less in capital assets. In Model 2, where environmental investment is the dependent variable, the ENS, GNS, and SPS scores have significant negative impacts. This indicates that higher scores in these areas are linked to lower environmental investment. Both models account for industry-specific effects and have high explanatory power, as shown by the adjusted R-squared values. The standard errors of the regression are low, indicating precise estimates. Some autocorrelation (AR) in the error terms is present, but the Hansen Test results show no specification errors in the models.

able 6. Effect of ESG performance on investment mix.

Variables	**System GMM (generalized method of moments)**			
	Capital investment as DV		**Environmental investment as DV**	
	Coefficients	**Probability**	**Coefficients**	**Probability**
Constant	0.669***	0.000	0.215***	0.000
CAP & EINV (-1)	0.321***	0.000	0.134***	0.000
ENS	0.122***	0.000	−0.094***	0.000
GNS	0.379**	0.075	−0.425***	0.000
SPS	0.667***	0.014	−0.428***	0.035
FRS	0.517***	0.000	0.225**	0.054
DER	0.255***	0.000	0.215*	0.104
COH	−0.586***	0.000	0.1407	−0.178
CO2	−0.266***	0.000	0.640***	0.000
Years fixed effect	Yes		Yes	
Industry fixed effect	Yes		Yes	
No. of Observations	2400		2400	
Adjusted R^2	0.391		0.386	
S.E. of regression	0.050		0.041	
AR (1)	0.166		0.169	
AR (2)	0.009		0.021	
Hansen Test	0.213		0.391	

Acronyms: CAP = capital investment, EINV = environmental investment, ENS = environmental score, GNS = governance score, SPS = social score, FRS = firm size, DER = debt ratio, COH = cash holding, CO2 = carbon dioxide emission

Note: *, **, *** report the level of variable significance at 1 %, 5 %, and 10 % relatively.

5.3 Robustness analysis:

The sample is divided into two periods: pre-COVID (2015–2019) and post-COVID (2020–2023), allowing for separate regression analyses. The results show notable differences in the coefficient patterns between these periods. In the pre-COVID period, the estimated coefficients (shown in Table 7) display consistent patterns and significance levels, indicating stable relationships between predictors and outcomes during this time. However, in the post-COVID period (shown in Table 8), there are slight changes in the signs and significance levels of the coefficients. These changes suggest shifts in investment behaviors or influencing factors after the onset of the COVID-19 pandemic. These shifts highlight the need to closely examine the evolving dynamics between variables in the post-COVID era.

Table 7. Robustness analysis-effect of ESG performance on investment mix before COVID.

Variables	**System GMM (generalized method of moments)**			
	Capital investment as DV		**Environmental investment as DV**	
	Coefficients	**Probability**	**Coefficients**	**Probability**
Constant	0.002***	0.060	0.013***	0.033
CAP & EINV (-1)	0.986***	0.000	0.967***	0.000
ENS	1.940***	0.047	−0.118***	0.000
GNS	2.145***	0.006	−0.118***	0.000
SPS	1.510***	0.008	−0.192***	0.000
FRS	0.481***	0.022	0.110***	0.002
DER	0.286***	0.006	0.116***	0.011
COH	−0.826***	0.000	0.611**	0.057
CO2	−0.423***	0.042	0.924***	0.002
Industry fixed effect	Yes		Yes	
No. of Observations	2100		2100	
Adjusted R^2	0.399		0.388	
S.E. of regression	0.042		0.112	
AR (1)	0.138		0.203	

Variables	**System GMM (generalized method of moments)**			
	Capital investment as DV		**Environmental investment as DV**	
	Coefficients	**Probability**	**Coefficients**	**Probability**
AR (2)	0.000		0.001	
Hansen Test	0.205		0.125	

Acronyms: CAP = capital investment, EINV = environmental investment, ENS = environmental score, GNS = governance score, SPS = social score, FRS = firm size, DER = debt ratio, COH = cash holdings, CO2 CO2 emissions.
Note: *, **, *** report the level of variable significance at 1 %, 5 %, and 10 % relatively.
Instrument specification: CAP(-2) ENS(-1) GNS(-1) SPS(-1) FRS(-1) DER(-1) COH(-1) CO2(-1).

Table 8. Robustness analysis-effect of ESG performance on investment mix after COVID.

Variables	**System GMM (generalized method of moments)**			
	Capital investment as DV		**Environmental investment as DV**	
	Coefficients	**Probability**	**Coefficients**	**Probability**
Constant	0.126***	0.007	0.192***	0.008
CAP & EINV (-1)	0.918***	0.000	0.919***	0.000
ENS	0.062***	0.028	0.399	0.541
GNS	2.871	0.282	−1.291	0.780
SPS	0.053***	0.021	−0.073***	0.022
FRS	0.072***	0.007	0.048	0.399
DER	0.088***	0.016	−0.006	0.228
COH	−0.082***	0.031	−0.012***	0.028
CO2	−0.552***	0.024	0.178*	0.094
Industry fixed effect	Yes		Yes	
No. of Observations	300		300	

Variables	System GMM (generalized method of moments)			
	Capital investment as DV		Environmental investment as DV	
	Coefficients	Probability	Coefficients	Probability
Adjusted R^2	0.190		0.188	
S.E. of regression	0.022		0.129	
AR (1)	0.280		0.133	
AR (2)	0.004		0.006	
Hansen Test	0.128		0.195	

Acronyms: CAP = capital investment, EINV = environmental investment, ENS = environmental score, GNS = governance score, SPS = social score, FRS = firm size, DER = debt ratio, COH = cash holdings, CO2 CO2 emissions.
Note: *, **, *** report the level of variable significance at 1 %, 5 %, and 10 % relatively.
Instrument specification: CAP(-2) ENS(-1) GNS(-1) SPS(-1) FRS(-1) DER(-1) COH(-1) CO2(-1).

6. Discussion, conclusion, limitation, and future:

6.1 Discussion:

This study looks at how ESG (Environmental, Social, and Governance) performance affects different types of investments, like capital investment and environmental investment. We used a system GMM model for our analysis, and the results are shown in Table 6. The findings show that better ESG performance, including higher ESG scores, is linked to more capital investment. Higher ESG scores, especially in governance and social areas, suggest that a company has good management and engages well with stakeholders. This can boost investor confidence and lead to more equity financing (Chen, Li, Zeng, & Zhu, 2023). More equity financing can then increase capital investment because investors often prefer companies with strong governance and social responsibility, and they are more likely to fund projects that bring quick financial returns, which are considered capital investments. Additionally, focusing on governance and social aspects in ESG scores might be more aligned with immediate financial gains (Shin et al., 2023). Capital investments usually provide quicker returns compared to environmental projects, which take longer to pay off. Therefore, companies that aim to meet short-term financial goals might invest more in capital projects, which helps improve their ESG scores.

On the flip side, the analysis reveals a downside to having a good ESG performance: it's associated with less investment in environmental initiatives. This happens because companies often have to choose between spending money on financial obligations or on environmental projects, especially when they have limited funds. When a company has high ESG scores, it might mean that they're more focused on meeting their financial obligations,

which could mean they don't put as much money into environmental investments. Additionally, pressure from investors or markets that care more about short-term profits can push companies to prioritize investments that make money quickly, like earning-based projects, instead of environmental ones, even if their ESG scores are good (Hsu & Chen, 2023). This outside influence can lead companies to pick projects that bring in money right away, which means they might invest less in environmental projects. Even though it seems contradictory, the negative link between ESG scores and environmental investment might be because companies are trying to balance making money with reaching their sustainability goals. In simpler terms, companies struggle to find the right balance between making money and being environmentally friendly. This can result in them choosing projects that make money quickly over ones that benefit the environment in the long run, even if they have good ESG scores.

Before this study, no research had directly looked at how ESG performance relates to the types of investments companies make. However, Al-Hiyari and his team (2023) did find that better ESG performance is linked to more efficient capital investments. This study goes a step further by not only confirming their discovery but also looking at how ESG performance affects environmental investments. In other words, we're adding something new by studying how ESG performance influences both capital and environmental investments. This helps us get a better grasp of how ESG practices affect different types of investments companies make. When we look at the factors that could influence capital investment, we find some interesting patterns. First off, bigger companies tend to invest more in capital assets. This makes sense because they usually have more money and resources to tackle big projects or expansions. Also, companies with more debt tend to put more money into capital investments. This could be because they use borrowed money to finance long-term projects, especially when they need outside funding to grow. On the flip side, companies that have a lot of cash on hand tend to invest less in capital assets. Having a lot of cash might mean they're being cautious or they prefer to keep their money liquid, so they don't spend as much on big projects. Similarly, companies that produce a lot of CO2 emissions tend to invest less in capital assets. This suggests they might be focusing more on environmental efforts and spending less on big projects that could increase their emissions.

When it comes to investing in environmental projects, we see some interesting trends. First, bigger companies tend to put more money into environmental initiatives. This makes sense because they have more money and resources to spend on things like sustainability programs and eco-friendly technologies. Similarly, companies with more debt often invest more in environmental projects. Having more debt means they have access to extra money, which they can use to invest in environmentally friendly practices to comply with regulations or improve their operations. Now, the idea that companies with higher CO2 emissions invest more in environmental projects might seem strange at first. But it could mean that these companies are trying to reduce their environmental impact. So, they might be spending money on projects to lower their emissions, switch to cleaner technologies, or meet their corporate responsibility goals.

This research highlights how ESG performance, financial measures, and investment choices are all connected in a complicated way. The surprising link between ESG scores and environmental investments suggests that we need to be more careful in how we balance

making money with protecting the environment. The changes we've seen since COVID-19 show that things are always evolving, and it's important to be flexible with investment strategies when things change. These findings give useful advice for people involved in sustainable investing, helping them understand the complexities of making investment decisions in a fast-changing business world.

6.2 Conclusion:

This study looks at how ESG performance affects where companies invest their money. We studied non-financial companies in Pakistan from 2015 to 2023 and used a special model to analyze the data. Our findings show that ESG scores have a big impact on where companies put their investments. Companies with higher ESG scores tend to invest more in things like buildings and equipment (capital investment), but they invest less in environmental projects (EINV). This shows that companies have to make tough choices between making money and spending on environmental efforts. Factors like how big a company is, how much debt it has, how much cash it holds, and its CO2 emissions also play a big role in where it invests money. We noticed changes in investment behaviors before and after COVID-19, which tells us that companies need to be flexible with their strategies when things change. The way we analyzed the data and the fact that there were no problems with the analysis show that our findings are reliable. These findings are helpful for people who make decisions about investing, showing that it's important to balance making money with taking care of the environment in a world that's always changing.

6.3 Recommendation:

Here are some practical suggestions based on the study's findings. First, it's a good idea to encourage companies to use clear and standardized ways of reporting their environmental, social, and governance (ESG) efforts. This will make it easier for investors to compare different companies and see how well they're doing in terms of sustainability. Second, we should find ways to reward companies for investing in environmental projects. This could involve giving them tax breaks, offering them grants, or providing subsidies for eco-friendly initiatives. By doing this, we can encourage companies to put more money into projects that help the environment. Another suggestion is for company managers to think about ESG factors when making decisions. This means considering things like governance and social responsibility, but also making sure to prioritize environmental sustainability just as much as making money. By doing this, companies can find a balance between making profits and doing what's best for the environment. It's also important for companies to be aware of the risks of only focusing on making money right away and ignoring environmental investments. To make sure they stay successful in the long run, companies should come up with flexible strategies that take both financial concerns and environmental responsibilities into account. Corporate managers can make their companies stronger by paying more attention to investments that make money, like big projects, especially in a world where people care a lot about ESG. This helps companies make both money and do good things for the world, which builds trust with everyone involved. These suggestions help make investing in sustainable ways easier while dealing with the complicated issues we talked about in this study. If we follow these suggestions, we can make sure that making money goes hand in hand with taking

care of the environment and society, making businesses stronger and more resilient in the long run.

6.4 Limitation and future direction:

This study looked at specific things during a limited time, so the findings might not apply to all industries or places. Also, it's hard to measure how well companies are doing in terms of ESG because there are different ways to do it, which might have affected our study. In the future, we should study how ESG, money stuff, and investing are different in different industries. Also, different industries might act differently when it comes to considering ESG stuff in their investments. It would be a good idea to see how well investments that focus on ESG actually work out in terms of making money and helping the environment and society. This would give us real proof of whether it's worth considering ESG stuff when making investments.

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