

Non-linearity between ESG and Firm Value, Risk, and Performance: A Comparison of Developing and Developed Markets

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Article History:

Submitted: December 11, 2023

Revised: March 22, 2024

Accepted: March 27, 2024

Published online: March 30, 2024

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ABSTRACT

Purpose- This study examines the non-linearity in the relationship of ESG with firm-specific variables (firm value, risk, and performance). It also compares the findings of developing and developed markets to evaluate whether these relationships depend on the type of markets.

Study Design/methodology/approach- The study tests the data from an international sample divided into developed and developing markets. The sample comprises 585 companies from 11 countries, selected based on market capitalization. 8,052 unbalanced observations are collected from 2008 to 2021. Quantile regression is used to examine non-linearity.

Findings- The estimation outputs show that ESG demonstrates: (1) a non-linear relationship between firm risk and value in developed markets and a linear relationship in developing markets; and (2) a non-linear relationship in both developing and developed markets between firm performance. Finally, the study also shows evidence that the impact of ESG on firm value, risk, and performance in developing and developed markets is different.

Research Practical Implications- For policy-setting institutions, the practical implications of the study highlight the need for catering to institutional settings and market conditions when setting standards or policies regarding ESG. Additionally, the non-linearity of ESG and firm risk in developing markets can impact ESG portfolios and investment strategies for investors.

Originality/value- Examination of non-linearity between ESG and firm-specific factors has not been performed holistically. Additionally, a direct comparison between the developed and developing markets is also lacking in the current literature. This study attempts to address these gaps.

Keywords: ESG, Non-linearity, Firm Value, Firm Risk, Systematic Risk, Firm Performance

JEL Classification Codes: G30, G32, G34, Q01, Q56

1 | INTRODUCTION

Sustainability has become quite a popular topic recently, considering the increasing awareness of investors and policymakers over the environmental and social impact of corporations. As such, the concept of wider stakeholder accountability for firms, as advocated by the Stakeholder theory ([Freeman et al., 2010](#)),

becomes quite relevant for this concept. Considering the importance of this concept for the modern business environment, scholars have thoroughly examined the relationship between Environmental, Social, and Governance (ESG) impact and other economic and financial variables. However, ESG is a complex construct, and the results and findings show inconsistencies. For example, the findings of country-specific studies show different evidence than international samples. Similarly, the findings of developed versus developing markets also increase the obscurity over the impact of ESG on economic and financial variables. For example, recent literature shows evidence of a non-linear relationship between ESG and firm performance ([Farah et al., 2021](#); [Pu, 2023](#)). Similarly, as highlighted by recent meta-analyses and bibliometric studies over ESG and firm-specific variables ([Huang & finance, 2021](#); [Khan & Finance, 2022](#); [Li et al., 2021](#)), international and country-specific studies show diverging results.

From a theoretical perspective, specifically referring to the spillovers and synergies caused due to the investment in three ESG pillars ([Duan et al., 2023](#); [Taghvaei et al., 2022](#); [Taghvaei et al., 2023](#)), as a firm increases its investment in the ESG activities, the realized benefits should amplify. Therefore, ESG factors should demonstrate a non-linear relationship with firm-specific variables like performance, value, and risk. However, this aspect has only been marginally examined in the literature. Additionally, considering the arguments set forth by ([Fan, Wei, & Xu, 2011](#)), regarding the importance of institutional and market settings when examining complex relationships, it needs to be established if country-specific samples are better in giving insights over international pooled samples when considering the impact of ESG on firm-specific variables.

1.1 | Objective of the study

Therefore, this study attempts to fill these identified gaps by examining non-linearity in the relationship of ESG with firm-specific variables (firm value, risk, and performance) and compares the findings of developing and developed markets to determine if these relationships depend on the type of markets.

More specifically, the study has two primary objectives. First, to examine the non-linearity of ESG with firm-specific factors by taking a holistic approach (that is, considering firm value, risk, and performance simultaneously). And second, to examine if the findings differ for developing and developed markets. To achieve these objectives, the study attempts to answer two questions: Does ESG demonstrate a non-linear relationship with firm-specific factors like value, risk, and performance? Are the nature and significance of these relationships different for developing and developed markets?

The findings of the study confirm that ESG demonstrates a non-linear relationship with firm value, firm performance, and firm risk. The findings also show evidence that the relationship between these variables differs in developing and emerging markets. These findings have both theoretical and practical implications for scholars and practitioners, respectively. From a theoretical perspective, the study adds to the available literature by connecting Stakeholder theory and Institutional theory and advocates for the top-down approach proposed by ([Fan et al., 2011](#)), which states that the relationship of financial and economic variables in emerging and developed markets contrast due to different institutional and market settings. From a practical perspective, the study findings provide guidance to regulators and practitioners, by showing evidence of non-linearity in the relationship of ESG with firm-specific variables.

2 | LITERATURE REVIEW

Sustainability and sustainable development are quite popular in the modern business environment. Although these concepts are used interchangeably now, these were formally linked with one another in the late 1990s, as explained by [Ruggerio \(2021\)](#). As such, the World Commission on Environment and Development in 1987 defined the phrase 'sustainable development' in their report as the development process that meets current needs without compromising future generations' needs ([Butlin, 1989](#)). Recently, sustainable development has evolved into a more refined concept called ESG (environment, social, and governance). ESG concept can be seen as the business case for sustainability, which argues that if an entity effectively identifies and manages its ESG risks, it will be able to create value in the long term ([Signori et al., 2021](#)). However, the current literature does not show a unified and consistent definition of this construct ([Li et al., 2021](#)). Furthermore, as highlighted by ([Khan & Finance, 2022](#)), numerous theoretical frameworks have been used in the literature as a basis for this concept. However, the most prominent and popular theory associated with this concept remains the Stakeholder theory (usually accredited to [Freeman et al. \(2010\)](#)). This theory argues that firms need to be held accountable to a wider stakeholder group (not just the shareholders or investors), and as such, firms must consider environmental and social factors as well ([Bissoondoyal-Bheenick, Brooks, & Do, 2023](#); [Huang & finance, 2021](#); [Khan & Finance, 2022](#); [Li et al., 2021](#); [Peng, Isa, & Finance, 2020](#)). Based on this notion, ESG considerations should be associated with relevant firm-specific factors like firm value, risk, and performance.

However, as true with other complex constructs, literature does not have a consensus on the impact of ESG on factors like firm performance. For example, ([Huang & finance, 2021](#)) performed a thorough review and consolidation of the work done in the literature on the impact of ESG on firm performance and highlighted that although the impact is positive, it is modest. On the other hand, the work of [Handayani \(2019\)](#) depicts much more complexity. Their work demonstrates that the impact of ESG depends not only on which dimension is being used for analysis (that is, environmental, social, or governance) but also on whether accounting-based or market-based measures are being used to demonstrate firm-specific aspects like performance or size.

Additionally, the ambiguity is further amplified when we consider the results of developed versus developing markets. Two key aspects that need to be considered here are: (1) regulatory reforms regarding sustainability and social responsibility; and (2) reporting standards followed by entities in these nations. Unfortunately, there are no global standards that are agreed upon unanimously by the different nations ([Guariso, Castañeda, & Guerrero, 2023](#); [Sisto et al., 2020](#)). This divergence of reporting preferences and norms increases the confusion over the impact of ESG factors over firm-specific factors in developing and developing markets ([Cristóbal García et al., 2021](#)). For example, a study by [Pu \(2023\)](#) shows that the developing market of China demonstrates a positive association between ESG and firm performance; however, the relationship is non-linear. On the other hand, the study by [Cho \(2022\)](#) focuses on the South Korean market and assumes a linear relationship between ESG and firm performance. However, this study also shows a positive correlation. Another study, focusing on the developing market of India by [Beloskar and Rao \(2023\)](#), shows that ESG reduces stock volatility (improving it from the perspective of investment) but only in a crisis period (more specifically, the COVID-19 pandemic), not during 'nominal' periods. However, the work of [Hira et al. \(2023\)](#),

focusing on the developing market of Pakistan, demonstrates a positive impact of ESG on firm performance. These are just a few examples of inconsistent or contradictory findings of studies in developing markets (other examples include: ([Behl et al., 2022](#); [Handayani, 2019](#); [Maji, Lohia, & Review, 2023](#); [Meng-tao et al., 2023](#); [Rahman, Zahid, & Al-Faryan, 2023](#); [Saygili, Arslan, & Birkan, 2022](#)).

Shifting the focus on the developed markets, the overall availability of literature is more diverse for these markets. For example, the work of [Alareeni and Hamdan \(2020\)](#) focuses on the US market, and demonstrates that environmental disclosures are negatively correlated with measures like return on assets (ROA.) and return on equity (ROE) but are positively correlated with market-based measures of performance like Tobin's Q. Similarly, these findings are corroborated for the European market by [Sassen, Hinze and Hardeck \(2016\)](#), where it is demonstrated that ESG can improve firm value. Other studies focusing on developed markets include [Ahmad et al. \(2021\)](#); [Aydoğmuş, Gülay and Ergun \(2022\)](#); [Fatemi, Glaum and Kaiser \(2018\)](#); and [Nguyen et al. \(2022\)](#).

However, taking a broader view when examining the impact of ESG on firm-specific factors, [Diaye, Ho and Oueghliissi \(2022\)](#) take a global sample (mostly comprising developed markets¹) and conclude that ESG does not demonstrate a short-term relationship with firm performance (however, it does show evidence of a long-term relationship). Analogously, the work of [Shaikh and Management \(2022\)](#) also demonstrates differences in the performance and value of firms based on their ESG performance in European and Asian markets. Other studies focusing on international samples, confirming these results, include [Aydoğmuş et al. \(2022\)](#); and [Wu et al. \(2022\)](#). Nonetheless, the meta-analysis performed by [Khan and Finance \(2022\)](#) and the review by [Huang and finance \(2021\)](#) shows that ESG generally demonstrates a positive relationship with firm-specific factors like value and performance.

On a slightly different note, one matter that is up for debate in modern literature is the nature of the relationship between ESG and firm-specific factors. As such, scholars have started to examine the non-linearity of ESG with firm-specific factors. For example, the work of [Bruna et al. \(2022\)](#); [Margot et al. \(2021\)](#); [Pu \(2023\)](#) and [Ren et al. \(2022\)](#) shows evidence of a non-linear relationship of ESG with firm performance. However, based on the findings of these studies, it remains to be tested whether such a relationship is demonstrated on other factors (like firm value and risk) as well. Therefore, there appears to be a need to assess the non-linearity between ESG and firm-specific factors (including value, risk, and performance) to improve the overall comprehension and understanding of this construct in the literature.

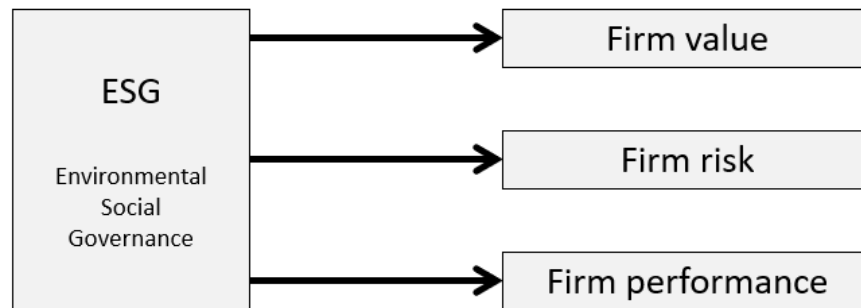
To summarize, overall, the literature confirms the complexity of the ESG construct. Where studies not only show varying results for different markets but also show varying relationships (linear versus non-linear). As such, it is important to consider ESG from a rather broader aspect. Additionally, the importance of institutional and market forces must be considered to ensure proper inference of examination results. Therefore, this study aims to address these gaps by taking a holistic approach when examining the non-linearity of ESG with firm factors, and by considering firm value, risk, and performance simultaneously. The study also aims to ascertain if institutional and market factors need to be considered when inferring the results by considering the developed and developing markets separately.

¹ The study focused on OECD countries.

For this purpose, we devise hypotheses for three areas (firm value, risk, and performance), following the conceptual framework of Stakeholder theory ([Freeman et al., 2010](#)) and Institutional theory ([Meyer and Rowan \(1977\)](#)), as shown below:

Figure 1

Theoretical Model



Source: Author

2.1 | Firm Value

Literature usually measures firm value through market-based factors like market capitalization and Tobin's Q. However, rarely is it measured using book-based factors like a firm's size (total assets, total net assets, or total employees). Stakeholder theory prefers to use market-based factors to measure firm value, as it provides a better insight into how investors and the market perceive the firm's total worth. Based on the notions of Stakeholder theory (a firm engaged with ESG practices would improve the firm reputation, and thus its value) and Institutional theory (institutional and market settings should impact the relationship of ESG with firm value), the study develops the following two hypotheses for firm value:

H1a: ESG shows a non-linear and positive relationship with firm value in developed markets.

H1b: ESG shows a non-linear and positive relationship with firm value in developing markets.

2.2 | Firm Risk

Similar to firm value, firm risk has been represented using different proxies in the literature. Scholars have mostly identified firm risk as 'beta' or the firm's systematic risk (following Sharpe's capital asset pricing model ([1964](#))). Other proxies used in the literature include total risk (or standard deviation of the returns), idiosyncratic risk, and downside risk. [Farah et al. \(2021\)](#) have tested the relationship between CSR and firm risk for non-linearity, however, no study has directly tested this for ESG factors. Based on the notions of Stakeholder theory (a firm considering its ESG-related risks would be in a better position to manage and control its risks) and Institutional theory (institutional and market settings should impact the association of ESG factors with firm risk), we develop two hypotheses for firm risk as follows.

H2a: ESG shows a non-linear and negative relationship with firm risk in developed markets.

H2b: ESG shows a non-linear and negative relationship with firm risk in developing markets.

2.3 | Firm Performance

Finally, for firm performance, the literature again uses numerous proxies, either market-based (like Tobin's Q and earnings per share or EPS) or accounting-based (like return on assets or ROA and return on equity or ROE). However, accounting-based measures like ROA and ROA remain the most used measures. Based on the notions of Stakeholder theory (firms considering their ESG risks should be able to better control their risks and improve their performance) and Institutional theory (market and institutional settings should impact the relationship between ESG factors and firm performance), we further develop following two hypotheses, this time for firm performance.

H3a: *ESG shows a non-linear and positive relationship with firm performance in developed markets.*

H3b: *ESG shows a non-linear and positive relationship with firm performance in developing markets.*

3 | METHODOLOGY & DESIGN

3.1 | Overall Approach and Sampling

The study uses a quantitative research design to answer the research questions, that performs a causal study by estimating the dependent variables in equations 1 to 6 (expressed in the later subsection) in their first lag. The study tests the hypotheses by empirically testing the data from an international sample divided into developed and developing markets. A total of six countries represents developed markets, and a total of five countries represent developing markets. The sample construction is presented in Table 1. The sample comprises 614 non-financial from 11 countries, the firms, and their representing countries, are selected based on market capitalization. Data is collected from 2008 to 2021, totaling 8,052 unbalanced observations.

Table 1

Sample Construction

	Developed	Developing	Total
Countries	6	5	11
Total firms	1,500	1,362	2,862
Less: financial firms	(86)	(42)	(128)
Less: firms with missing data	(976)	(1,151)	(2,127)
Net firms included in the sample	416	169	585
Total unbalanced observations	5,755	2,297	8,052
Country-wise breakup			
Country	Market	Observations	%
USA	Developed	2,466	31%
UK	Developed	1,005	12%
Germany	Developed	541	7%
France	Developed	658	8%
Netherlands	Developed	481	6%
Switzerland	Developed	604	8%
Brazil	Developing	392	5%

China	Developing	361	4%
India	Developing	486	6%
South Africa	Developing	907	11%
Turkey	Developing	151	2%
Total		8,052	100%

Source: Author

Note: Countries appearing as 'high-income economies' in the World Bank's classification for the fiscal year 2024 are treated as developed economies (2024), however, countries not listed in this group are treated as developing economies.

3.2 | Data Collection, Variables, and their Measurement

The main independent variable of the study is the ESG index score. The three dependent variables of the study include (1) Tobin's Q (representing firm value); (2) historical beat (representing firm risk); and (3) ROA (representing firm performance). Further, the study uses firm-specific control variables derived from the literature. Finally, to control country effects, the study uses two macroeconomic variables, annual inflation rate and gross domestic product (GDP) for firm value and performance and annual inflation rate for firm risk.

The study uses secondary data collected from the Thomson Reuters DataStream for all the variables except for the macroeconomic variables. The data for macroeconomic variables is gathered from the World Bank's DataBank (2023).

The definitions of the variables and their measurement are available in Table 2 (where details of the ESG index are available in Appendix I).

Table 2

Definition and measurement of the variables

Variable	Definition and measurement	Symbol	Classification	Reference
Historical beta	Covariance between the excess return of the stock and the excess return of the market	BETA	Dependent	Khan (2022); and Valls Martínez et al. (2022)
Return on asset	Net income divided by total assets	ROA	Dependent and Control	Khan (2022); and Nguyen et al. (2022)
Tobin's Q	Market capitalization divided by the total assets of the company	TOBINQ	Dependent	Khan (2022); and Nguyen et al. (2022)
ESG Index	Environmental, social, and governance (index) of the firm (for its measurement, refer to Appendix I).	ESG	Independent	Fatemi et al. (2018); and Wu et al. (2022)
Total assets	Total assets of the firm (expressed in natural log form)	LNASST	Control	Khan (2022); and Wu et al. (2022)
Debt to equity ratio	Total (non-current plus current) debt divided by the total capital	LEV	Control	Khan (2022); Verga Matos et al. (2020); and Wu et al. (2022)
Earnings per share	Earnings available for ordinary shareholders divided by the weighted average number of ordinary shares	EPS	Control	Ahmad et al. (2021)
Dividend per share	Total cash dividend divided by number of ordinary shares	DPS	Control	Verga Matos et al. (2020)
Inflation	Rise in the annual consumer prices	INF	Control	Basnicki & Pickering (2021)
Gross domestic product	The total gross value added by all resident producers in the economy plus any product taxes less any subsidies not included in the value of the products	GDP	Control	Diaye et al. (2022)

Source: Author

NOTE: Variables have been expressed in their natural log forms where relevant to improve normality.

3.2 | Empirical Model and Testing Approach

The three equations to test the hypotheses of the study are stated below.

Equation 1

$$TOBINQ_{i,t} = \alpha_0 + \alpha_1 ESG_{i,t-1} + \alpha_2 LNASST_{i,t-1} + \alpha_3 LEV_{i,t-1} + \alpha_4 EPS_{i,t-1} + \alpha_5 INF_{j,t-1} + \alpha_6 GDP_{j,t-1} + \delta_{i,t}$$

Equation 2

$$BETA_{i,t} = \beta_0 + \beta_1 ESG_{i,t-1} + \beta_2 ROA_{i,t-1} + \beta_3 DPS_{i,t-1} + \beta_4 LNASST_{i,t-1} + \beta_5 LEV_{i,t-1} + \beta_6 INF_{j,t-1} + \varepsilon_{i,t}$$

Equation 3

$$ROA_{i,t} = \gamma_0 + \gamma_1 ESG_{i,t-1} + \gamma_2 LNASST_{i,t-1} + \gamma_3 LEV_{i,t-1} + \gamma_4 EPS_{i,t-1} + \gamma_5 INF_{j,t-1} + \gamma_6 GDP_{j,t-1} + \mu_{i,t}$$

Where 'i' represents the firm, 't' represents time, 'j' represents country, and δ , ε , and μ represent relevant error terms in respective equations.

Before testing for non-linearity, we test for stationarity of the variables. For this, the study performs a unit root test. Further, the study tests non-linearity by performing a Quantile regression, as this technique is considered robust when testing for empirical evidence for non-linearity (see for example [Cheng et al. \(2022\)](#); [Law et al. \(2021\)](#); [Nguyen et al. \(2022\)](#)). [Koenker \(2017\)](#) explains that Quantile regression techniques can be used to empirically demonstrate data features, among which the author includes non-linearity, that might not be revealed by conditional mean least square estimation approaches (for example, generalized least square, or GLS, estimations). More specifically, we perform two tests to examine linearity. These tests include (1) testing process coefficients and (2) slope equality tests.

We also perform a robustness check to test non-linearity over time (that is, stability of the coefficient of ESG over time) by pooling the observations of developing and developed markets into an international sample and dividing the total international sample into two parts (from 2008-2014 and then from 2015-2021). We use a dummy variable to differentiate the sample between these two groups. Observations appearing in 2008-2014 are given nil value, whereas observations for 2015-2021 are given a value of unity. This is done under the notion that if coefficients of ESG are stable over time (that is, the interactive dummy term or slope dummy is statistically insignificant), this would provide evidence of structural stability (advocating linearity). The fixed effects approach is used to estimate Equations 4, 5, and 6 (stated below), after applying the Hausman test and checking for preference between Random Effects and Fixed Effects models.

Equation 4

$$TOBINQ_{i,t} = \rho_0 + \rho_1 ESG_{i,t-1} + \rho_2 (ESG * TIME)_{i,t-1} + \rho_3 LNASST_{i,t-1} + \rho_4 LEV_{i,t-1} + \rho_5 EPS_{i,t-1} + \rho_6 INF_{j,t-1} + \rho_7 GDP_{j,t-1} + v_{i,t}$$

Equation 5

$$BETA_{i,t} = \eta_0 + \eta_1 ESG_{i,t-1} + \eta_2 (ESG * TIME)_{i,t-1} + \eta_3 ROA_{i,t-1} + \eta_4 DPS_{i,t-1} + \eta_5 LNASST_{i,t-1} + \eta_6 LEV_{i,t-1} + \eta_7 INF_{j,t-1} + \xi_{i,t}$$

Equation 6

$$ROA_{i,t} = \lambda_0 + \lambda_1 ESG_{i,t-1} + \lambda_2 (ESG * TIME)_{i,t-1} + \lambda_3 LNASST_{i,t-1} + \lambda_4 LEV_{i,t-1} + \lambda_5 EPS_{i,t-1} + \lambda_6 INF_{j,t-1} + \lambda_7 GDP_{j,t-1} + \varpi_{i,t}$$

The cross-section weights (PCSE²) method is used for robust coefficient covariances. If the interactive term of the dummy variable representing time with ESG is significantly different from zero, it would provide evidence of the non-linearity of ESG over time (as the coefficient of ESG would demonstrate that it is not stable over time).

4 | RESULTS and ANALYSIS

4.1 | Descriptive statistics, correlation matrix, and ESG Ranking

Table 3 shows the summary of the descriptive statistics. The highest dispersion (represented by the range and standard deviation) is shown by leverage for developed markets and EPS for developing markets. Referring to the mean, developed markets show a higher mean for Tobin's Q than developing markets. However, developing markets show lower beta and higher ROA than developed markets. When comparing the ESG, developed markets show a higher mean than the developing markets. However, they demonstrate a lower level of dispersion for the ESG index, when considering standard deviation.

Table 3

Summary of the Descriptive Statistics

	Observations	Mean	Median	Standard deviation	Maximum	Minimum	Range
Developed							
TOBINQ	5755	1.41	0.99	1.40	23.58	0.00	23.58
BETA	5755	0.96	0.92	0.46	5.10	-0.50	5.60
ROA (%)	5755	7.33	6.69	7.56	69.32	-57.03	126.35
ESG	5755	61.78	65.29	18.91	95.16	1.90	93.26
LNASST	5755	16.59	16.59	1.41	20.50	12.33	8.16
DPS	5755	5.11	1.29	12.04	105.80	0.00	105.80
LEV (%)	5755	40.27	39.04	23.66	167.50	0.00	167.50
EPS	5755	11.60	3.10	25.07	228.80	0.00	228.80
LNCAPEX	5755	13.01	13.14	2.19	17.93	-11.51	29.44
INF	84	1.41	1.45	1.14	4.70	-1.14	5.84
GDP	84	4.81 T	2.72 T	6.13 T	23.32 T	0.55 T	22.76 T
Developing							
TOBINQ	2297	1.35	0.73	1.85	26.30	0.01	26.29
BETA	2297	0.87	0.82	0.47	4.06	-0.58	4.64
ROA (%)	2297	8.20	7.18	8.49	63.98	-43.06	107.04
ESG	2297	51.87	53.64	19.37	94.21	1.36	92.85
LNASST	2297	15.38	15.39	1.76	19.79	9.75	10.04
DPS	2297	2.61	0.75	5.31	60.90	0.00	60.90
LEV (%)	2297	34.23	33.90	22.43	103.60	0.00	103.60
EPS	2297	7.47	1.76	15.02	156.20	0.00	156.20
LNCAPEX	2297	11.99	12.11	2.58	17.72	-11.51	29.24
INF	70	6.25	5.70	3.61	19.60	-0.73	20.32
GDP	70	3.18 T	1.75 T	4.10 T	17.82 T	0.32 T	17.50 T

Source: Author

NOTE: (\$T) represents figures in USD trillions.

² Panel-corrected standard errors

Table 4 shows the correlation matrix for the selected variables of the study. The highest positive correlation is demonstrated between ESP and DPS. However, these variables are not used together as explanatory variables in any equations. The strongest negative correlation is demonstrated by GDP with inflation and leverage with Tobin's Q. Furthermore, none of the explanatory variables (appearing in the same equation) show a positive correlation of more than 70% or a negative correlation of less than -70%, which reduces the possibility of the problem of multicollinearity among the variables of the study.

Table 4

Correlation matrix

	TOBINQ	BETA	ROA	ESG	LNASS T	DPS	LEV	EPS	INF	GD P
TOBINQ	1									
BETA	-0.063** *	1								
ROA	0.685** *	-0.083***	1							
ESG	-0.031***			1						
LNASST	0.239** *	0.118***	0.117***	0.463***	1					
DPS		0.035***	0.035***	0.062***		1				
LEV	-0.043** *	-0.044***	0.044***	0.037***	0.069** *		1			
EPS		0.040***	0.040***	0.042***	-0.022**	0.867***		1		
INF	0.034** *	0.097***	0.097***	-0.103***	-0.260** *	-0.054***	-0.037***	-0.045***	1	
GDP	0.095** *	0.184***	0.048***	0.086***	0.413** *	-0.109***	0.038***	-0.118***	-0.231***	1

Source: Author

Note: (***) depicts significant at 1%, (**) depicts significant at 5%, and (*) depicts significant at 10%.

Table 5 ranks the countries selected in the sample based on the average ESG score of the firms representing those countries. Per the expectations developed based on the study of [Fan et al. \(2011\)](#), developed markets appear in the top five positions. Among them, Germany is appearing at the top, demonstrating that firms operating in Germany show, on average, the highest ESG commitment. Shifting the focus to developing markets, India is ranked at number 6 (the highest rank for a developing market), having a higher ESG ranking than Switzerland (a developed market). Switzerland, at number 9, shows the lowest average ESG scores for the developed markets. Additionally, China appears at number 11, showing the lowest average ESG score for the countries in the total sample selected. Appendix III shows further insights into the year-wise trend of the average ESG scores of these countries.

Table 5*Country-wise Ranking of Countries based on ESG Score*

Market	Country	Rank	Average of ESG
Developed	Germany	1	71.9694
Developed	France	2	67.1653
Developed	Netherlands	3	61.0747
Developed	USA	4	60.7927
Developed	UK	5	60.1172
Developing	India	6	59.6345
Developing	Brazil	7	55.3609
Developing	Turkey	8	55.2966
Developed	Switzerland	9	54.1219
Developing	South Africa	10	50.7661
Developing	China	11	38.9764

*Source: Author**Note: This table shows the ranking of the countries selected in the sample based on the average ESG score of the firms representing these countries.*

4.2 | Stationarity Test and Estimation Outputs

Before estimating the equations expressed previously, we first perform a stationarity test for all the variables of the study. The stationarity test is important when estimating models using panel data because if this assumption is violated then there are chances that the relationship between the variables demonstrated from the estimations is spurious ([Siddiqui, Sohail, & Niazi, 2023](#)). The results of the unit root tests performed to check for stationarity of the variables of the study are available in Appendix II. The results show that all the variables are stationary at level, therefore we estimate equations 1, 2, and 3 using Quantile regression.

The estimation outputs for equations 1, 2, and 3 are presented in Table 6. Further, Table 7 shows process coefficients and slope equality test for ESG for the three equations. Additionally, Figures 2, 3, and 4 graphically show the linearity / non-linearity of the coefficient of ESG in developing and developed markets for the three equations.

Table 6*Estimation outputs*

	Equation											
	(1)				(2)				(3)			
	TOBINQ				BETA				ROA			
	Developed		Developing		Developed		Developing		Developed		Developing	
C	4.7157	***	3.5367	***	0.8140	***	-0.1874	*	25.0964	***	23.3676	***
ESG (-1)	0.0104	***	0.0017	**	-0.0010	**	-0.0016	**	0.0411	***	0.0066	
ROA (-1)					-0.0114	***	-0.0079	***				
DPS (-1)					-0.0033	***	0.0063	**				
LNASTT (-1)	-0.2632	***	-0.1804	***	0.0112	*	0.6540	***	-1.2607	***	-1.1091	***
LEV (-1)	-0.0070	***	-0.0087	***	-0.0004		0.0026	***	-0.0337	***	-0.0521	***
EPS (-1)	0.0035	***	0.0164	***					0.0142	***	0.0727	***
INF (-1)	-0.0905	***	0.0254	***	0.0616	***	0.0098	***	-0.3376	***	0.3031	***
GPD (-1)	-6.01E-14	***	2.45E-14	***					2.41E-13	***	1.36E-13	***

Source: Author

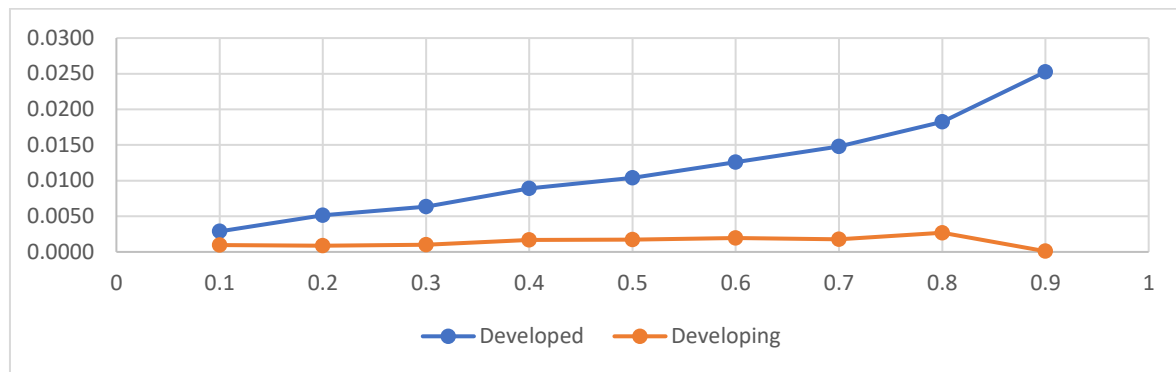
Notes: (***) depicts significant at 1%, (**) deposits significant at 5%, and (*) deposits significant at 10%. The table demonstrates the estimation results for the 0.5 quantiles (median).

Moving further to testing the non-linearity of the relationship of ESG with firm value, risk, and performance, Table 7 demonstrates non-linearity for all the estimation results except for equations 1 and 2 for developed markets.

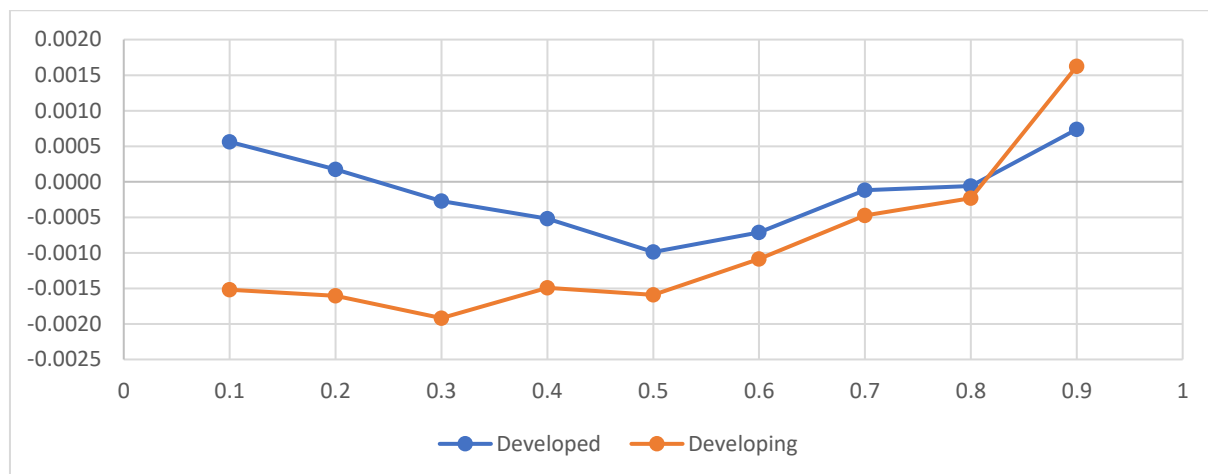
Table 7*Process coefficients and slope equality test for ESG.*

	Equation											
	(1)				(2)				(3)			
	TOBINQ				BETA				ROA			
	Developed		Developing		Developed		Developing		Developed		Developing	
<i>Process coefficients for ESG</i>												
Quantile	Coefficient		Coefficient		Coefficient		Coefficient		Coefficient		Coefficient	
0.1	0.0029	***	0.0010		0.0006		-0.0015	***	0.0216	**	-0.0283	***
0.2	0.0051	***	0.0009		0.0002		-0.0016	**	0.0233	***	-0.0121	
0.3	0.0063	***	0.0010		-0.0003		-0.0019	***	0.0337	***	-0.0066	
0.4	0.0089	***	0.0017	**	-0.0005		-0.0015	**	0.0326	***	-0.0001	
0.5	0.0104	***	0.0017	**	-0.0010	*	-0.0016	**	0.0411	***	0.0066	
0.6	0.0126	***	0.0020	**	-0.0007		-0.0011		0.0471	***	0.0148	**
0.7	0.0148	***	0.0018		-0.0001		-0.0005		0.0545	***	0.0268	***
0.8	0.0182	***	0.0027	*	-0.0001		-0.0002		0.0675	***	0.0350	***
0.9	0.0253	***	0.0001		0.0007		0.0016		0.0682	***	0.0515	***
<i>Slope equality test for ESG</i>												
Chi-sq statistic	203.58	***	5.34		16.21	**	11.21		45.75	***	38.82	***

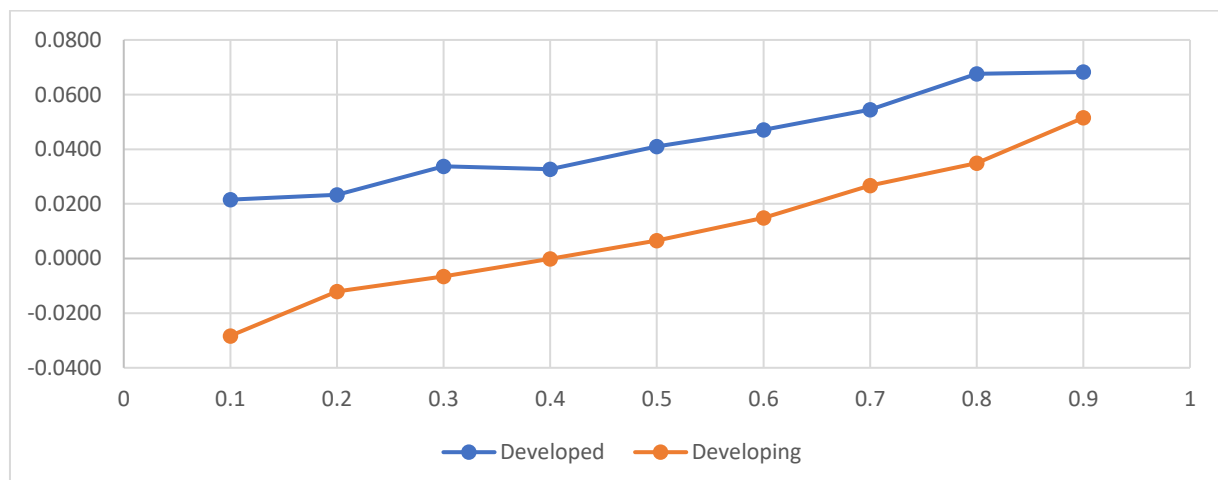
NOTES: Figures in bold are significantly different from zero, where (***) depicts significant at 1%, (**) deposits significant at 5%, and (*) deposits significant at 10%. The number of quantiles tested for the slope equality test for ESG is 10.

Figure 2*Process coefficients for ESG for Equation 1 (firm value)*

Source: Author

Figure 3*Process coefficients for ESG for Equation 2 (firm risk)*

Source: Author

Figure 4*Process coefficients for ESG for Equation 3 (firm performance)*

Source: Author

4.3 | Robustness Check

The results for the estimation for Equations 4, 5, and 6, for the robustness check, are presented in Table 8. The dummy variables representing time show a significant impact when interacting with the ESG coefficients for firm value and firm performance.

Table 8

Robustness check – Stability of Coefficient of ESG over time

	(4)		Equation		(6)	
	TOBINQ		BETA		ROA	
C	3.6658	***	1.0006	***	34.6803	***
ESG	0.0032	***	-0.0011	***	0.0177	***
ESG*TIME	0.0011	***	0.0001	*	-0.0085	***
ROA			-0.0008	**		
DPS			-0.0003			
LNASST	-0.1875	***	-0.0019		-1.7746	***
LEV	-0.0047	***	0.0009	***	-0.0734	***
EPS	0.0071	***			0.0592	***
INF	0.0160	***	0.0008		0.2665	***
GPD	8.43E-14	***			3.36E-13	***

Source: Author

NOTES: Figures in bold are significantly different from zero, where (***) depicts significant at 1%, (**) depicts significant at 5%, and (*) depicts significant at 10%. Model specifications include Random Effects with cross-section weights (PCSR) standard errors and covariances (degree of freedom adjusted).

6 | DISCUSSION

Commenting on the estimation results shown in Table 6, the average impact of ESG on firm value, risk, and performance for median quantile regression between developing and developed markets differ. For firm value, the impact of ESG is lower for developing markets than for developed markets. However, both markets demonstrate a coefficient for ESG significantly different from zero (henceforth, the phrase 'significantly different from zero' is referred to as 'significant' for simplicity). These findings for the developed markets and developing markets are consistent with the work of [Chang et al. \(2022\)](#); [Fatemi et al. \(2018\)](#); [Rastogi, Singh and Kanoujiya \(2024\)](#); [Wong et al. \(2021\)](#); [Wu et al. \(2022\)](#). When considering the impact of ESG on firm beta, the results show that ESG demonstrates a negative relationship with the beta for both developing and developed markets. However, the impact of ESG in developing markets is marginally higher than in developed markets. These results are consistent with the work of [Farah et al. \(2021\)](#); [Giese et al. \(2019\)](#); [Ielasi, Ceccherini and Zito \(2020\)](#); [Jin \(2022\)](#); and [Sassen et al. \(2016\)](#), where ESG also shows a reduction in the firm's risk. Finally, the results for Equation 3 diverge the most when comparing developing and developed markets. Here, ESG demonstrates a positive and significant impact on ROA in developed markets. However, it does not significantly impact ROA in developing markets. For developing markets, these findings are consistent with

the works of [Carnini Pulino et al. \(2022\)](#); [Huang and finance \(2021\)](#); [Khan and Finance \(2022\)](#). These findings contradict the available literature when considering the results for the developing markets. For example, [Saygili et al. \(2022\)](#) show a significant and negative impact of ESG (specifically, environmental aspects) on corporate financial performance in Turkey. On the other hand, [Cho \(2022\)](#) shows a significant positive impact of ESG on firm performance in the South Korean market. One reason for the divergence of the current study's findings from the general literature can be seen as the non-linearity of the relationship between ESG and firm performance.

As such, we shift the focus to non-linearity, as shown by the Process coefficients and slope equality test for ESG, which can be used to help explain the divergence. For developed markets, ESG steadily increases its coefficient's value as Tobin's Q increases. However, for developing markets, the coefficient of ESG does not demonstrate a significant change (Figure 2). The slope equality test for ESG also corroborates these findings for both markets, showing that overall, ESG shows a non-linear relationship in developed markets and a linear relationship in developing markets, with firm value. Although there is a general scarcity of literature testing the non-linear relationship between ESG and firm value in developing markets, the study results for the developed markets corroborate with the findings of [Haiyan \(2021\)](#). Interestingly, considering the results of Equation 2, results for developed markets show that the ESG has a weakly significant relationship with firm risk at the median. However, in quantiles lower or higher than the median, ESG does not show a significant impact on firm risk. For developing markets, ESG again does not demonstrate a non-linear relationship with firm risk. Additionally, as the quantiles increase, the significance of the ESG and firm risk relationship reduces. Figure 3 demonstrates this relationship visually, where developed markets show a non-linear, and developing markets show a linear relationship between ESG and firm risk. These findings partially confirm the conclusions of [Farah et al. \(2021\)](#), where an international sample showed a non-linear relationship between CSR and beta. However, dividing the sample into developing and developed markets provides further insights into how developed markets show evidence of a non-linear relationship. Finally, ESG and firm performance results show non-linearity in both developing and developed markets, consistent with the findings of [Farah et al. \(2021\)](#); and [Pu \(2023\)](#). Additionally, the study's findings also show consistency with literature relating to the non-linear relationship of ESG with firm performance highlighted in the bibliometric review of [Li et al. \(2021\)](#). The results of developing markets are interesting here, as ESG has a negative and insignificant impact on firm performance in lower quantiles but turns this into a positive and significant impact in higher quantiles. Figure 4 demonstrates this visually.

The results of the robustness check are quite consistent with the understanding developed from the baseline estimations (Table 6). The results show evidence of non-linearity of the ESG relationship with firm size, risk, and performance over time, however, output for Equation 5 (firm risk) shows evidence of weak significance.

To summarize the study's findings, the study shows evidence that the impact of ESG on firm value, risk, and performance in developing and developed nations is different. As such, following the notions of [Fan et al. \(2011\)](#), it is important to consider the institutional and market settings when developing and testing empirical models relating to ESG. Additionally, regarding the non-linear relationship between ESG and firm value, risk, and performance, Figures 2, 3, and 4 visually summarize these results. We see a non-linear relationship between ESG and firm value in developed markets and a linear relationship in developing markets.

Additionally, the coefficient values for ESG for developed markets are higher than for developing markets for all the quantiles. Similarly, for ESG and firm risk, developed markets again show a non-linear relationship and developing markets demonstrate a linear relationship. Additionally, here, the coefficient for ESG shows a higher impact for developing markets, compared to developed markets. Finally, the impact of ESG on firm performance is non-linear in developing and developed markets both. Here, the value of the ESG coefficient for developed markets is higher than for developing markets.

5 | CONCLUSION AND POLICY IMPLICATIONS

This study conducts two examinations. Firstly, it tests if a broad construct like ESG demonstrates a complex relationship with other variables, for example, non-linear in some markets and linear in others. Next, the study tests if the relationships shown by ESG with firm-specific variables, like firm value, risk, and performance, are different for developing and developed markets, following the notion of ([Fan et al., 2011](#)).

The results partially confirm the hypotheses developed, where ESG shows a non-linear relationship with firm value and risk in developed markets but shows evidence of a linear relationship in developing markets. Finally, for ESG and firm performance, both developing and developed markets demonstrate a non-linear relationship. For firm value and performance, the coefficients of ESG for developed markets are higher in value than for developing markets. Additionally, for firm performance, ESG shows a rather interesting comparison. For higher quantiles, developing markets show a stronger impact of ESG in improving a firm's performance. However, as the quantiles decrease, the sign of the relationship turns negative.

As such, the findings of this study confirm the overall understanding developed in this study that the relationship demonstrated by ESG with firm-specific variables is quite complex, and institutional background and market setting play an integral role in defining how ESG interacts with other variables. Additionally, the nature of relationships is also complex, as the relationship with certain variables is linear, and with others, it is non-linear. This relationship also shows evidence of dependency on the types of market. Finally, the robustness shows evidence of instability of the coefficient of ESG with firm value and performance over time. This is understandable, considering the growing interest of stakeholders and investors in ESG factors over time.

This study provides new evidence regarding relationships between ESG and firm-specific factors, with numerous practical and theoretical implications for investors, firms, and policy-making institutions.

5.1 | Theoretical Contribution

Theoretically, the findings (specifically for ESG and firm risk) show interesting insights. First, developing markets show that the relationship between ESG and beta is positive as the beta value increases. This means that ESG factors increase the overall volatility instead of reducing the risk. This is mainly because of the non-linear relationship between these two variables in developing markets. Secondly, for developed markets, the findings show that ESG remains significant for firm risk around the median. However, the relationship turns insignificant as we move to lower or higher quantiles. Researchers and scholars must consider these findings when preparing empirical models for ESG investing. Secondly, considering the results of the robustness check, it can be argued that the relationship of ESG should be examined for shorter periods due to the amplifying

impact of its recent popularity, due to which the coefficient does not show stability over time. Therefore, scholars need to consider this when deciding the periods of study.

5.2 | Practical Implications

From a practical perspective, the study has two further implications. Firstly, policy-setting institutions must consider institutional settings and market conditions when setting standards or policies regarding ESG. This is because the study's findings show evidence that the impact of ESG on firm-specific factors is not consistent over different markets. Secondly, the non-linearity of ESG and firm risk in developing markets can significantly impact ESG portfolios and investment strategies. There is immense literature on ESG investment for developed markets ([Farah et al., 2021](#); [Giese et al., 2019](#); [Valls Martínez, Soriano Román, & Martín Cervantes, 2022](#)). However, the available literature on this area for developing nations is not as thorough. As such, the findings of this study can be used by investors in developing countries to prepare effective ESG investment spectrums.

5.3 | Limitation and Future Research Directions

On a separate note, the current study's limitations can be used as avenues for future research direction. Firstly, the study shows an interesting relationship between ESG and firm risk. However, the sample used to develop this understanding is pooled. Future research can test this relationship for country-specific studies to provide better insights. Additionally, the complexity of ESG must also be considered from the aspect of co-integration, as the literature review performed in this study demonstrates a lack of thorough examination of the long-term relationship of ESG with firm-specific factors. Furthermore, the sample selected in this study is subject to selection bias, as 6 countries have been selected to represent developed markets and 5 countries have been selected to represent developing markets, based on market capitalization. Finally, although the study examines the role of ESG in improving firm value, an interesting and marginally debated area in literature is justifying the business case of ESG. That is, considering value addition capabilities of ESG and sustainability, bearing in mind the role of audit and assurance of ESG activities and costs incurred by firms to achieve their ESG objectives.

Acknowledgment: The authors would like to express their sincere thanks to the editor and the anonymous reviewers for their helpful comments and suggestions.

Author Contributions: Conceptualization, O.S.; methodology, O.S., and M.K.S; software, O.S. and B.N.; validation, O.S. and M.K.S; investigation, O.S., M.K.S., and B.N.; data curation, B.N. and M.K.S.; writing original draft preparation, O.S.; writing—review and editing, M.K.S. All authors have read and agreed to the published version of the manuscript.

Declaration of Conflicting Interest: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Funding: The author(s) received no financial support for the research, authorship, and/or publication of this article.

Data Availability Statement: Data that supports the findings of this study are available on request from the corresponding author.

Plagiarism Statement: This article was scanned by the plagiarism program. No plagiarism was detected.

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