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RESEARCH ARTICLE

Unlocking the effect of corporate environmental practices in driving firms' financial performance

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Abstract

This study examines the relationship between corporate environmental performance (ENP) and financial performance, focusing on US firms from 2001 to 2021. Environmental sustainability has become a pivotal issue facing businesses. However, empirical findings on the ENP–financial performance linkage remain mixed. The sample comprises 2,711 US firms analyzed using ordinary least squares, fixed effects, feasible generalized least squares, generalized method of moments, and quantile regression. Results reveal a significant positive relationship between ENP and firms' financial performance. These findings are consistent across models, underscoring their robustness. This suggests investments in environmental performance can enhance profitability, valuation, and earnings. This paper contributes the empirical evidence to the academic literature on the corporate sustainability-financial performance nexus. It also offers business and policy insights into the financial merits of corporate environmental responsibility, highlighting ENP's role in delivering sustainable growth.

Keywords Environmental performance · Return on assets · Financial performance · Tobin's Q · Earnings per share

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1 Introduction

In recent decades, corporate environmental sustainability has been one of the biggest risks faced by everyone, from individuals to businesses across the globe. The interplay between a firm's environmental practices and its financial outcomes has emerged as a topic of active interest among academia, financial researchers', and management. The growing recognition of the profound impact that businesses have on the environment, coupled with the escalating concerns surrounding climate change risk, resource depletion, and sustainability, has placed firms' environmental performance at the forefront of corporate agendas worldwide. Parallels, investors, shareholders, and stakeholders have become more attentive to the financial repercussions of a firm's environmental practices, leading to a rapidly increasing body of research exploring the complex association between firm environmental and financial performance.

The concept of firm's environmental practices performance refers to the degree to which an organization manages its environmental impacts, implements sustainable practices, and addresses ecological challenges. It encompasses a wide range of activities, including reducing greenhouse gas emissions, minimizing waste generation, adopting renewable energy sources, and embracing environmentally friendly technologies and processes. Achieving high environmental performance not only contributes to mitigating the adverse effects of business operations on the natural environment but also enhances a firm's reputation, regulatory compliance, and stakeholder relationships. Simultaneously, financial performance remains a fundamental objective for firms, reflecting their ability to generate profits, deliver shareholder value, and sustain long-term growth. Traditional financial metrics, such as returns on investment, revenue growth, and market share, have long been used to evaluate a firm's financial performance. However, an evolving perspective now recognizes that financial success cannot be considered in isolation from environmental responsibility. This perspective acknowledges the potential interdependencies and synergies between environmental and financial performance and seeks to understand how they interact and influence each other.

The literature examining the relationship between firm environmental and firms' financial performance at the micro and macro levels has offered inconclusive empirical findings, providing diverse insights into this complex phenomenon. Ozkan et al. (2022) documented a mixed association between environmental performance scores and the firm's accounting-based and market-based measures in the context of United States listed firms. Fuente et al. (2022) find a U-shaped relationship between a firm's environmental performance and firm value in the context of United States listed firms. Teng et al. (2021) demonstrate a negative linkage between firms' environmental practices and sustainable growth in the case of Taiwan-listed firms. Traditional views suggest that environmental laws, including taxes and pollution abatement expenses, negatively impact business performance (Gray 1987; Kalt 1985). However, researchers such as this perspective with the Porter Hypothesis, which argues that well-designed environmental regulations can stimulate innovation and improve performance. Case studies support the notion that addressing environmental contamination can enhance resource efficiency, productivity, and the development of popular green products (Ambec et al. 2013; Hu et al. 2017; Porter 1996; Porter and

van der Linde 1995). The Porter Hypothesis suggests a natural progression from environmental regulation to innovation and performance. In today's global economy, businesses recognize the growing importance of environmental management and are willing to invest in green solutions, bridging the gap between economic development and environmental preservation (Chang 2011).

There are several factors those derive from this investigation. First, global environmental sustainability risk is having a significant impact on the US economy and is also a major threat to United States (US) residents and businesses (Roston 2019). A 10% drop in US GDP by 2100 is possible if serious measures are not taken to combat global warming (Aggarwal and Dow 2012; Huang and Lin 2022). According to new data issued by the World Economic Forum, severe environmental disasters are among the top worldwide risks facing businesses today (Bruno 2020). Approximately $500 billion of the $1 trillion that businesses will spend to mitigate climate risk will be needed during the next five years (Young 2022). Second, manufacturing businesses contribute positively to economic expansion, notably in terms of the number of jobs created and the amount of economic output they generate (Khan et al. 2021).

Given the critical importance of understanding the nexus between firm environmental and financial performance, based on a resource-based view (Barney 1991), the first aim of this paper is to unlock the effect of corporate environmental practices in driving firms' financial performance. Past studies have used traditional accounting-based measures, such as returns on assets and net-profit ratios, which are subject to accounting limitations. So, the second aim of this study is to use both accounting-based as well as market-based measures of firms' performance, as investors' decisions are largely based on market-based measures (Habib and Mourad 2023). Third, the aim of this study is to provide updated evidence on the environmental performance of US firms whether they are contributing to firms' sustainable performance, which will eventually contribute to the global SGDs agenda.

Advancing toward objectives, we analyze a sample of 2711 United States publicly listed firms over the period of 2001–2021. Environmental practices are measured by Refinitiv, formerly Thomson Reuters Asset4 ESG database environmental dimension score. It considers three dimensions, which are product innovation, resource, and emission reduction, while firms' performance is measured by market and accounting-based measures. Advancing toward study objectives, we employ static and dynamic models. Dynamic panel generalized method of moment findings reveals a positive and statistically significant relationship between environmental practices and financial performance, indicating that better environmental performance is linked to higher returns and market value. Besides, we confirm our study results are robust under contemporaneous quantile regression. Finally, this study offers useful policy enlightenment and opens new avenues for future research.

This study contributes to the existing literature by utilizing advanced econometric techniques to examine the relationship between environmental performance and financial outcomes in a rigorous and comprehensive manner. As sustainability concerns continue to gain momentum and financial performance remains a core objective for firms, understanding the intricate dynamics between firm environmental and financial performance becomes increasingly crucial. By unraveling the complexities

of this relationship, researchers, practitioners, policymakers, and stakeholders can develop evidence-based strategies and interventions that simultaneously foster environmental sustainability and enhance economic value creation. Our research sets out to contribute to this endeavor by integrating existing knowledge and setting the stage for future inquiry into the fascinating domain of the firm's environmental and financial performance.

Besides, this study draws upon institutional theory, resource-based view (RBV), stakeholder theory, and corporate social responsibility to investigate the relationship between environmental performance (ENP) and financial outcomes, focusing on return on assets (ROA), Tobin's Q, and earnings per share (EPS). By integrating these theoretical perspectives, we aim to provide a comprehensive understanding of how ENP influences the firm's financial performance. Institutional theory allows us to explore how societal norms, regulations, and pressures shape a firm's environmental practices, while stakeholder theory helps us identify the diverse stakeholders that can be affected by a firm's environmental performance and their corresponding interests. The resource-based view (RBV) provides insights into how a firm's unique resources and capabilities related to environmental performance can contribute to competitive advantage and superior financial performance. Furthermore, the lens of corporate social responsibility sheds light on the ethical and social dimensions of a firm's environmental practices and their potential impact on financial outcomes. To analyze this relationship, we employ various econometric techniques to address potential issues arising from the panel nature of the dataset, including heteroscedasticity, panel-specific autocorrelation, and endogeneity. Initially, we utilize ordinary least squares (OLS) regression with robust and cluster standard errors to estimate the association between environmental performance and financial outcomes. Subsequently, to account for time-invariant and time-varying unobserved heterogeneity, we employ fixed effects (FE) with Driscoll–Kraay standard errors. Given the panel data characteristics, which include heteroscedasticity and panel-specific autocorrelation, we employ feasible generalized least squares (FGLS) to address these issues. Furthermore, we implement the two-step generalized method of moment (GMM) approach, known for its effectiveness in handling endogeneity in econometric estimation, thereby enhancing reliability and accuracy. To confirm the robustness of our results, we conduct simultaneous quantile regression (SQR) analysis at different quantiles (50th, 75th, and 90th). SQR provides a comprehensive understanding of how environmental performance affects financial outcomes across different quantiles, thus strengthening the validity of the relationship.

The study offers significant implications for businesses, investors, public policymakers, and society. Since corporate environmental performance improves financial performance, US businesses should prioritize and invest in sustainable and environmentally responsible operations. Environmental performance boosts market value, earnings per share, and financial performance. Companies could include environmental considerations in strategic decisions to gain a competitive edge and increase long-term profitability. Companies, investors, and governments all benefit from recognizing the beneficial relationship between environmental performance and economic performance.

The study's structure consists of a second section, a literature review, third methodology, and a fourth section presents descriptive statistics, correlation, and the main results of the model. The fifth section concludes the research.

2 Theoretical framework and hypotheses formulation

2.1 Literature review

Relationships between firm environmental and financial performance have been widely explored in the literature, drawing on various theoretical perspectives, empirical studies, and arguments. This section reviews the existing body of knowledge, highlighting key theories and findings that contribute to our understanding of this complex relationship.

In the realm of business and environmental sustainability, the phenomena of the deep and nuanced connection that exists between the environmental performance of a firm and its financial performance have been the subject of a significant amount of research over the course of recent years. Previous research has presented a range of theoretical perspectives and empirical findings, yielding diverse insights into the nature and determinants of this relationship. According to the traditional view, business performance is seen to suffer as a result of environmental laws, including taxes on environmental output and spending on pollution abatement (Gollop and Roberts 1983; Gray 1987; Kalt 1985).

A number of researchers have opposed this view (Hu et al. 2017), the researcher Porter and van der Linde (1995) being the most notable to have done so. The Porter Hypothesis is not the first theory to challenge accepted knowledge on innovation (Hicks 1963), although its methodical justification of the causal link between environmental regulation, innovation, efficiency and reignited the discussion on environmental regulations. Porter and van der Linde (1995) employ case studies to demonstrate how environmental contamination wastes resources and lowers business productivity, so if restrictions are well-designed, they may spur innovation. Utilizing resources more effectively and creating well-liked green goods, businesses may improve performance and reduce the cost of regulatory compliance (Ambec et al. 2013; Broberg et al. 2013; Hu et al. 2017; Porter 1996; Porter and van der Linde 1995; Ramanathan et al. 2017, 2018). Porter's Hypothesis certainly suggests a natural progression from environmental regulation through innovation to performance.

In response to external environmental pressures, companies may choose to embrace environmental management practices. While neoclassical economists traditionally argue that the main goal of companies is to maximize shareholders' wealth (Friedman 1970), institutional theory highlights the impact of external agencies on firms' strategic choices (Hoffman 2001). This perspective suggests that companies are not solely driven by profit maximization and often line up their activities with the external pressures to gain legitimacy. Consequently, companies have a compelling motive to incorporate environmental considerations into their products and engage in green innovations in order to earn the trust of these external institutions (Chang 2011).

According to the RBV (resource-based view), companies are able to achieve a competitive advantage by leveraging their essential resources and key capabilities (Barney 1991; Orsato 2006). Within this framework, RBV highlights that environmental social responsibility can serve as a critical capability, leading to long-term competitive advantage (Hart 1995). Given the influence of various environmental forces, such as environmentalism, stakeholder activism, national environmental policies, competitive pressures, and international regulations on firms' operations (Rugman and Verbeke 1998), companies are increasingly compelled to adopt environmental management practices. These practices are necessary to fulfill with international environmental rules and respond to consumer demands for environmental responsibility (Berry and Rondinelli 1998). Consequently, recognizing environmental management as an essential component of a firm's strategy and acknowledging it as a unique capability within the RBV framework is crucial (Hart 1995). By doing so, companies can leverage their environmental management practices to gain a competitive advantage in the market.

Companies engage in environmental management practices driven by their desire to demonstrate social responsibility. While immediate profitability gains may not be evident, such practices can yield long-term economic benefits (Hart and Ahuja 1996). Moreover, according to stakeholder theory, firms should take into consideration the interests of their various stakeholders when formulating strategies in order to garner the confidence and support of key stakeholders (Freeman 1984; Mitchell et al. 1997). In case the companies solely prioritize economic objectives, the integration of environmental stewardship in their strategies may become unattainable (Drumwright 1994). Therefore, firms need to adopt a long-term sustainable mindset that embraces non-economic goals and responds to corporate and stakeholder demands (Prakash 2002). Moreover, a robust environmental performance (ENP) enables businesses to establish a positive reputation and garner the support of their stakeholders. In fact, instrumental stakeholder theory demonstrates that fostering positive stakeholder relationships can provide firms with a competitive advantage by enhancing their reputation and legitimacy (Baughn et al. 2007; Li et al. 2017; Wu et al. 2020; Zahller et al. 2015).

Consequently, the literature on stakeholder theory, institutional theory, resource-based view (RBV), and corporate social responsibility provides substantial support for the existence of a positive relationship between competitive advantage and corporate environmental activities and offer valuable insights into the potential pathways and mechanisms through which environmental and financial performance influence each other. However, the literature also underscores the need for additional research to address methodological limitations, explore diverse contexts, and to provide a more subtle insight of this intricate association.

Rising global environmental awareness has spurred increased research on the relationship between corporate environmental and financial performance (Brouwers et al. 2018; Chang 2015; Narula et al. 2024; Robaina and Madaleno 2020; Wedari et al. 2023). These studies have yielded mixed results. Some find a positive direct relationship between environmental and financial performance (Brouwers et al. 2018; Chang 2015; Narula et al. 2024; Robaina and Madaleno 2020; Wedari et al. 2023). Others reveal a U-shaped relationship (Barnett and Salomon 2012; Trumpp

and Guenther 2017) or a negative relationship (Chang 2015; Narula et al. 2024; Robaina and Madaleno 2020). Additional studies report an insignificant association (Elsayed and Paton 2005). The inconclusive nature of existing research underscores the need for continued investigation. This study aims to provide updated evidence on the corporate environmental and financial performance nexus using a sample of 2711 US firms from 2001 to 2021.

2.2 Hypotheses development

Based on the theoretical perspectives outlined in the literature review and supported empirical studies in this section, we formulate hypothesis for our study. The resource-based view suggests ENP represents a unique capability that can drive competitive advantage through efficiency gains, innovation, and reputation. Stakeholder theory highlights how ENP can enhance stakeholder relationships and legitimacy. Institutional theory points to societal and regulatory pressures that compel firms to adopt ENP. The corporate social responsibility lens emphasizes ENP's role in balancing economic and social objectives. Based on prior empirical evidence (Brouwers et al. 2018; Chang 2015; Narula et al. 2024; Robaina and Madaleno 2020; Wedari et al. 2023) and resource-based theory, stakeholder theory, institutional theory, and corporate social responsibility, we formulate the below hypothesis.

H1: There is a positive relationship between environmental performance (ENP) and returns on assets (ROA)

H1 relates to ROA, an accounting-based metric of firm profitability. Stronger ENP may improve efficiency, lower costs, and enhance resource utilization, thereby increasing profitability and ROA.

H2: There is a positive relationship between environmental performance (ENP) and Tobin's Q

H2 associates ENP with the market-based metric Tobin's Q. Superior ENP may signal positive intangibles like reputation, innovation, and strong stakeholder relations, increasing investor confidence and market valuation.

H3: There is a positive relationship between environmental performance (ENP) and earnings per share (EPS).

H3 links ENP to EPS, a bottom-line earnings metric. Improved brand image and stakeholder relations from ENP can increase sales and revenue, boosting EPS. Cost savings from ENP can also directly increase net income and EPS. Figure 1 graphically represents the study theoretical framework.

The relationship between ENP and financial outcomes has gained significant attention in both academic and business circles. However, there remains a need for a comprehensive analysis that examines this relationship using advanced econometric techniques while addressing potential issues, such as heteroscedasticity, panel-specific autocorrelation, and endogeneity. While some studies have explored the impact of ENP on financial metrics, there is still a lack of consensus regarding the magnitude and significance of this relationship. Furthermore, the existing literature often overlooks the potential heterogeneity within the data and fails to adequately account for unobserved factors that may affect the relationship. Therefore, this paper aims

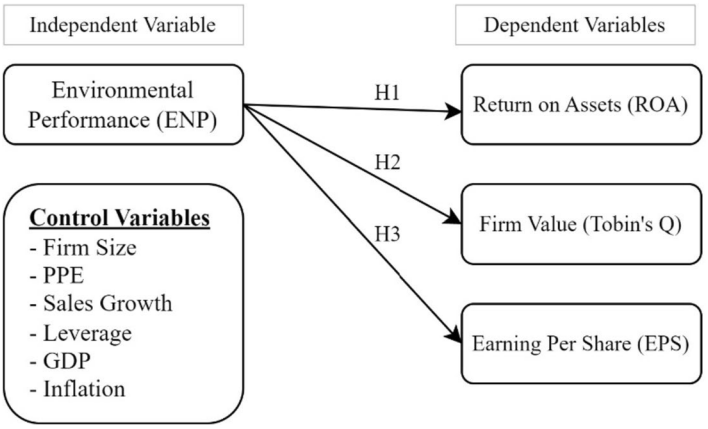

Fig. 1 Theoretical framework of the study. The figure represents the conceptual framework of this study. Environmental performance (ENP) serves as the main independent variable. The three dependent variables reflecting financial performance are return on assets (ROA), Tobin's Q, and earnings per share (EPS). Several control variables are included to account for other factors that can influence the financial performance metrics

to address these gaps by conducting a rigorous econometric analysis to assess the impact of ENP on financial outcomes, including ROA (return on assets), Tobin's Q, and EPS (earnings per share). By utilizing a panel dataset spanning over two decades and employing advanced econometric techniques such as OLS (ordinary least squares) regression, FE (fixed effects), FGLS (feasible generalized least squares), and the GMM (generalized method of moments) approach, we aim to provide a comprehensive insight of ENP relationship with financial performance.

By examining this relationship using robust econometric methods, this research will contribute to the existing literature by providing more reliable and accurate insights into the impact of ENP on financial outcomes. The study's findings will have implications for businesses, policymakers, and investors seeking to understand the potential financial benefits associated with improved environmental performance. In the next section, we will outline the empirical strategy to test hypothesis while accounting for endogeneity, heterogeneity, and other issues inherent in panel data.

3 Methodology

3.1 Data

We investigate the relationship between environmental performance (ENP) and financial outcomes (ROA, Tobin's Q and EPS). We collected data for the period from 2001 to 2021. Financial fundamental data collected from Compustat, and environmental performance data collected from Refinitiv. The sample for primary analysis is made up of 44,306 observations from 2,711 companies in the context of US.

3.2 Variables construction

Our dependent variable is firms' financial performance. We employed three proxies (ROA, Tobin's Q and EPS) to measure financial performance in previous literature studies e.g., Narula et al. (2024); Wamba (2021); Wedari et al. (2023) utilized similar approach to measure the financial performance of firms. The firm's environmental performance (ENP) is our independent variable. The environmental dimension/pillar score from the Refinitiv, formerly Thomson Reuters Asset4 ESG database is used to calculate a company's environmental performance. ESG ratings compiled by Refinitiv provide a transparent and neutral evaluation of the company's ESG performance based on publicly disclosed and independently collected information (Guérin and Suntheim 2021; Marsat et al. 2022). Product innovation, resource, and emission reduction are the three areas into which Refinitiv divides environmental data. In order to assess business environmental performance, Refinitiv data have been extensively utilized in academic publications (Cheng et al. 2014; Guérin and Suntheim 2021; Gupta 2018; Lys et al. 2015; Marsat et al. 2022; Wamba 2021).

We would also control for other variables that could impact financial performance. Thus, we incorporate in our models, firm size (Size) measured with the natural log of a firm's gross assets, fixed asset property plant and equipment (PPE), leverage (Fin. Leverage) divided by the firms' total debt to its total assets, sales growth measured by the sales revenue divided by the past year's sales revenue, gross domestic product (GDP) growth at country level and inflation at country level.

3.3 Empirical strategy and model setting

In the first step, basic estimation techniques were used, such as ordinary least squares (OLS), with robust and cluster standard errors, to establish the relationship between environmental performance and financial outcomes. In the next step, to account for time-invariant and time-varying unobserved heterogeneity, we employed fixed effects (FE) with Driscoll–Kraay standard error. The nature of our dataset is panel which is subject to heteroscedasticity and panel-specific autocorrelation issues. Feasible generalized least squares (FGLS) employed to address heteroscedasticity and panel-specific autocorrelation in the data. In the final step, the two-step generalized method of moment (GMM) approach was implemented due to its enhanced reliability and accuracy in producing outcomes. The GMM is widely recognized as a highly effective econometric approach for addressing the issue of endogeneity frequently observed in econometric estimation and possesses the ability to automatically generate instrumental variables and thereby eliminate endogeneity, making it a preferred method in econometrics (Arellano and Bond 1991; Arellano and Bover 1995; Blundell and Bond 1998; Windmeijer 2005). Our GMM models are represented as follows:

$$\begin{aligned} \mathrm{ROA}_{i,t} = {} & \alpha_0 + \beta_1 \mathrm{ROA}_{i,(t-1)} + \beta_2 \mathrm{ENP}_{i,t} + \delta_1 \mathrm{SIZE}_{i,t} + \delta_2 \mathrm{PPE}_{i,t} + \delta_3 \mathrm{SalesGrowth}_{i,t} \\ & + \delta_4 \mathrm{Fin.Leverage}_{i,t} + \delta_5 \mathrm{GDP}_t + \delta_6 \mathrm{Inflation}_t + \varepsilon_{i,t} \end{aligned} \tag{1}$$

$$\mathrm{TQR}_{i,t} = \alpha_0 + \beta_1 \mathrm{TQR}_{i,(t-1)} + \beta_2 \mathrm{ENP}_{i,t} + \delta_1 \mathrm{SIZE}_{i,t} + \delta_2 \mathrm{PPE}_{i,t} + \delta_3 \mathrm{SalesGrowth}_{i,t} + \delta_4 \mathrm{Fin.Leverage}_{i,t} + \delta_5 \mathrm{GDP}_t + \delta_6 \mathrm{Inflation}_t + \varepsilon_{i,t} \quad (2)$$

$$\mathrm{EPS}_{i,t} = \alpha_0 + \beta_1 \mathrm{EPS}_{i,(t-1)} + \beta_2 \mathrm{ENP}_{i,t} + \delta_1 \mathrm{SIZE}_{i,t} + \delta_2 \mathrm{PPE}_{i,t} + \delta_3 \mathrm{SalesGrowth}_{i,t} + \delta_4 \mathrm{Fin.Leverage}_{i,t} + \delta_5 \mathrm{GDP}_t + \delta_6 \mathrm{Inflation}_t + \varepsilon_{i,t} \quad (3)$$

where ROA is returns on equity, TQR is Tobin's Q and EPS is earnings per share are dependent variables in all three models respectively. The independent variable is the environmental performance indicated with ENP. The control variables include, Size indicates firm size, PPE indicates property plant and equipment, sales growth, fin. Leverage indicates financial leverage, GDP is a gross domestic product, and inflation.

For robustness analysis, simultaneous quantile regression (SQR) is, at different quantiles (50th, 75th, and 90th), employed. SQR provides a comprehensive understanding of how the independent variables affect the dependent variables at different quantiles. It strengthens the validity of the association between environmental performance and the dependent variables by showing that the findings are not driven by specific segments of the data or extreme observations. Figure 2 shows the flow of methods of the analysis.

4 Results and discussion

4.1 Summary statistics

In this part, we report variables summary statistics. Table 1 presents the brief descriptive statistics, correlations, and variance inflation factors (VIF) for variables with 44,306 yearly observations. ENP is environmental performance. ROA, Tobin's Q and EPS used to measure the firm's financial performance. In addition to

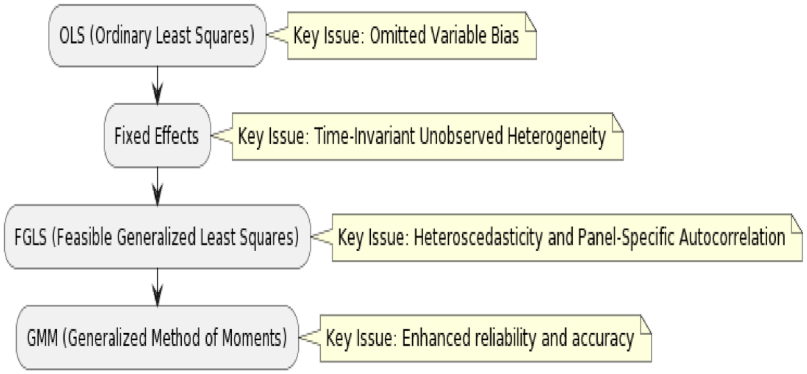

Fig. 2 Flow of analysis techniques. Figure represents the flow of methods of the analysis to analyze the relationship among study variables

Table 1 Descriptive statistics and correlations matrix

Variables	Mean	Std. D	VIF	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) ENP	0.232	0.325	1.030	1.000						
(2) Size	0.022	2.304	1.019	0.004	1.000					
(3) PPE	0.014	0.225	1.021	0.004	0.130	1.000				
(4) Sales growth	− 1.403	1.471	1.034	− 0.142	0.006	− 0.032	1.000			
(5) Fin. leverage	0.019	0.685	1.003	0.019	0.006	0.047	− 0.006	1.000		
(6) GDP	− 0.043	0.422	1.024	0.035	− 0.029	− 0.015	− 0.082	0.001	1.000	
(7) Inflation	0.644	0.769	1.022	− 0.087	0.006	0.002	0.024	− 0.025	− 0.099	1.000
Mean VIF			1.022							
ROA	− 2.17	1.713								
Tobin's *Q*	6.569	2.728								
EPS	1.1	6.621								

The table provides descriptive stats, variance inflation factor (VIF) and pairwise correlation and. The number of observations is 44,306. ENP (environmental performance) is our independent variable. The control variables include Size, PPE (property plant and equipment), sales growth, financial leverage, GDP (gross domestic product) and inflation. Dependent variables are ROA (return on assets), Tobin's *Q* and EPS (earning per share)

the correlation between each variable under study, the columns individually provide each variable's mean and standard deviation. Overall, it can be shown that no variable-to-variable correlation was sufficiently dominant to constitute a serious multicollinearity problem.

4.2 Baseline regression results

Table 2 provides the baseline regression results of firms' environmental performance with financial performance (ROA, Tobin's *Q*, and EPS) using OLS, OLS Robust, and OLS Cluster by ID across all models' firms' environmental performance maintain positive relationship with financial performance (ROA, Tobin's *Q* and EPS). The positive and statistically significant coefficient for environmental performance suggests that the better environmental performance is linked to the higher financial performance (ROA), market valuation (Tobin's *Q*), and earnings per share (EPS). This finding aligns with the resource-based view theory, which suggests that firms with superior environmental performance can gain a competitive advantage, leading to better financial outcomes. Additionally, empirical studies Baughn et al. (2007); Li et al. (2017); Wu et al. (2020) have shown a positive relationship between environmental performance and financial performance, supporting the results of this study.

The control variable size has positive and statistically significant, coefficient indicating that larger companies tend to have higher financial performance, market valuation, and earnings per share. This aligns with economies of scale and suggests that larger firms have their own advantages in terms of capital, market power, and diversification. PPE has positive and statistically significant coefficient suggests that higher levels of physical and production assets are associated with better financial performance, market valuation, and earnings per share. These findings align with the theory of productive capacity and efficiency, which posits that firms with greater asset intensity can generate higher returns. Sales growth has negative and statistically significant coefficients suggesting that higher sales growth is associated with lower financial performance, market valuation, and earnings per share. This finding may be explained by the growth-profitability trade-off theory, which suggests that firms may prioritize growth over profitability, leading to lower financial performance. Empirical studies have shown mixed results regarding the relationship between sales growth and financial performance. The financial leverage has negative and statistically significant coefficients indicating that higher levels of debt or leverage are associated with lower financial performance and earnings per share. This finding aligns with the pecking order theory, which suggests that higher levels of debt can increase financial risk and constrain a firm's performance. GDP suggests a mixed relationship with financial performance, market valuation, and earnings per share. Inflation has positive and statistically significant coefficient suggests a positive relationship with financial performance and earnings per share, while the negative coefficient for Tobin's *Q* indicates a negative relationship with market valuation.

Table 2 Baseline regression results

Methods	OLS	OLS Robust	OLS Cluster	OLS	OLS Robust	OLS Cluster	OLS	OLS Robust	OLS Cluster
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Variables	ROA	ROA	ROA	TQR	TQR	TQR	EPS	EPS	EPS
ENP	0.103***	0.103***	0.103***	3.483***	3.483***	3.483***	3.213***	3.213***	3.213***
	(0.0045)	(0.0056)	(0.0068)	(0.0231)	(0.0226)	(0.0595)	(0.112)	(0.0882)	(0.135)
Size	0.0031***	0.0031	0.0031	0.0173***	0.0173***	0.0173***	0.0266	0.0266**	0.0266**
	(0.0005)	(0.0018)	(0.0018)	(0.0030)	(0.0036)	(0.0036)	(0.0146)	(0.0096)	(0.0097)
PPE	0.0444***	0.0444**	0.0444**	0.137***	0.137**	0.137***	0.414**	0.414***	0.414***
	(0.0062)	(0.0155)	(0.0150)	(0.0322)	(0.0463)	(0.0387)	(0.155)	(0.0836)	(0.0864)
Sales growth	−0.0249***	−0.0249***	−0.0249***	−0.137***	−0.137***	−0.137***	−0.394***	−0.394***	−0.394***
	(0.0009)	(0.0009)	(0.0015)	(0.0052)	(0.0055)	(0.0072)	(0.0250)	(0.0242)	(0.0266)
Fin. leverage	−0.0113***	−0.0113***	−0.0113***	−0.0127	−0.0127	−0.0127	−0.294***	−0.294***	−0.294***
	(0.0020)	(0.0029)	(0.0029)	(0.0106)	(0.0119)	(0.0106)	(0.0511)	(0.0415)	(0.0425)
GDP	−0.0082*	−0.0082**	−0.0082***	0.0765***	0.0765***	0.0765***	0.0285	0.0285	0.0285 (0.0474)
	(0.0033)	(0.0028)	(0.0023)	(0.0170)	(0.0157)	(0.0085)	(0.0819)	(0.0507)	
Inflation	0.0082***	0.0082***	0.0082***	−0.0241*	−0.0241*	−0.0241**	0.142**	0.142***	0.142**
	(0.0019)	(0.0017)	(0.0017)	(0.0099)	(0.0094)	(0.0081)	(0.0477)	(0.0419)	(0.0436)
Constant	−0.066***	−0.0661***	−0.0661***	6.226***	6.226***	6.226***	−0.208**	−0.208*	−0.208*
	(0.0026)	(0.0029)	(0.0055)	(0.0133)	(0.0140)	(0.0311)	(0.0642)	(0.0974)	(0.104)
N	37,957	37,957	37,957	37,957	37,957	37,957	37,957	37,957	37,957
R^2/adj. R^2	0.037	0.037	0.037	0.403	0.403	0.403	0.033	0.033	0.033
Cluster by ids	No	No	Yes	No	No	Yes	No	Yes	No

This table contains estimates of the influence firm's environmental performance (ENP) on financial performance. Dependent variables are return on assets (ROA), Tobin's *Q* and earnings per share (EPS). ENP (environmental performance) is our independent variable. The control variables include Size, PPE (property plant and equipment), sales growth, financial leverage, GDP (gross domestic product) and inflation. All estimates include OLS, OLS robust and OLS cluster. Under the coefficients in the parentheses (), standard errors are shown. Statistical significance indicated by asterisks at the * (10%), ** (5%) and ***(1%)

4.3 Static panel analysis

We employed fixed effects estimation to account for time-invariant unobserved factors that might be influencing our dependent variables. The use of fixed effects (FE) estimation is an appropriate technique when working with panel data, as it can control for time-invariant unobserved heterogeneity. By including firm fixed effects, the model accounts for any time-constant factors unique to each firm that may affect the outcome variables. The additional step of using Driscoll–Kraay standard errors further strengthens the analysis, as this method produces heteroscedasticity and autocorrelation consistent (HAC) standard errors that are robust to general forms of cross-sectional and temporal dependence. Employing this technique helps address potential issues like autocorrelation and heteroscedasticity that often arise in panel data. The finding that the relationship between environmental performance and the financial performance metrics (ROA, Tobin's *Q*, EPS) remains consistent and significant across the different estimation approaches (fixed effects, fixed effects with Driscoll–Kraay standard errors) provides strong evidence supporting the hypothesized positive association.

Overall, the use of fixed effects estimation and Driscoll–Kraay standard errors to corroborate the findings represents a rigorous and careful analysis. Leveraging these techniques to validate the consistency of the results substantially strengthens confidence in hypothesized relationships and in the study's overall conclusions. Demonstrating robustness checks using alternative econometric specifications reinforces the reliability and validity of the results. The fact that the relationship holds under different modeling approaches indicates that the positive linkage between environmental performance and financial performance is real and not simply an artifact of the methodology. In the following sections, the additional econometric analyses using feasible generalized least squares (FGLS) and generalized method of moments (GMM) further validate the study's findings on the relationship between environmental performance and financial performance (Table 3).

4.4 FGLS regression results

The research variables were analyzed using OLS and fixed effects. These approaches assume homoscedasticity, no cross-sectional correlation, and no panel autocorrelation for the stochastic disturbance factor. While the aforementioned assumptions are violated, the feasible generalized least square (FGLS) approach is better for parameter estimation (Greene 2018). FGLS allows for heteroscedasticity in error terms by estimating weights that minimize the heteroscedasticity-related biases. By incorporating these weights, FGLS produces more efficient estimates and addresses potential problems arising from heteroscedasticity. The FGLS Panel-Specific AR (1) extends FGLS approach by additionally accounting for panel-specific autocorrelation, which is the correlation of errors within individual panel units over time. By including an autoregressive term AR (1) that captures this autocorrelation, this method provides more reliable and accurate estimates in the presence of serial

Table 3 Fixed effect robust and Driscoll–Kraay standard errors regression results

Methods	Fixed effect Robust			Driscoll–Kraay with standard error (FE)		
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	ROA	TQR	EPS	ROA	TQR	EPS
ENP	0.0324*** (0.00673)	0.0595*** (0.0104)	1.044*** (0.112)	1.190*** (0.141)	1.954*** (0.300)	2.517*** (0.261)
Size	0.00248 (0.00169)	0.00266 (0.00194)	0.00609** (0.00166)	0.00665*** (0.00154)	0.0230 (0.0153)	0.0243 (0.0164)
PPE	0.0417*** (0.00866)	0.0415*** (0.00908)	0.176*** (0.0268)	0.174*** (0.0301)	0.434** (0.132)	0.423** (0.131)
Sales growth	−0.0110*** (0.00110)	−0.0147*** (0.000926)	−0.0770*** (0.0117)	−0.0800*** (0.00957)	−0.270** (0.0708)	−0.311** (0.0848)
Fin. leverage	−0.0125*** (0.00236)	−0.0122*** (0.00242)	−0.0262* (0.0114)	−0.0258* (0.0118)	−0.303** (0.0849)	−0.300** (0.0819)
GDP	−0.00317 (0.00643)	−0.00447 (0.00636)	0.0617 (0.0566)	0.0622 (0.0581)	0.0746 (0.0866)	0.0629 (0.0833)
Inflation	0.00725 (0.00353)	0.00771 (0.00400)	−0.104 (0.0638)	−0.0995 (0.0592)	0.115 (0.0844)	0.130 (0.0953)
Constant	−0.0267*** (0.00487)	−0.0446*** (0.0108)	6.942*** (0.0748)	6.758*** (0.293)	0.302 (0.190)	0.0262 (0.341)
N	37,957	37,957	37,957	37,957	37,957	37,957
R^2	0.0090	0.0365	0.1545	0.3857	0.0096	0.0327
No. of Ids	2711	2711	2711	2711	2711	2711
Year fixed	Yes	No	Yes	No	Yes	No
Firm fixed	Yes	No	Yes	No	Yes	No
Wald Chi^2/F	52.50	1048.66	119.80	781.78	24.50	255.75
Prob > Chi^2/F	0.000	0.000	0.000	0.000	0.000	0.000

This table contains estimates of the influence firm's environmental performance (ENP) on financial performance. Dependent variables are return on assets (ROA), Tobin's *Q* and earnings per share (EPS). ENP (environmental performance) is our independent variable. The control variables include Size, PPE (property plant and equipment), sales growth, financial leverage, GDP (gross domestic product) and inflation. All estimations include fixed effect (FE) and fixed effect (FE) with Driscoll–Kraay standard error. Under the coefficients in the parentheses (), standard errors are shown. Statistical significance indicated by asterisks at the * (10%), ** (5%) and ***(1%)

Table 4 Feasible generalized least squares (FGLS) regression results

Methods	FGLS			FGLS panel-specific AR (1)		
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	ROA	TQR	EPS	ROA	TQR	EPS
ENP	0.103*** (0.00446)	1.533*** (0.0176)	3.213*** (0.112)	0.105*** (0.00491)	3.483*** (0.0231)	2.645*** (0.134)
Size	0.00313*** (0.000584)	0.00705*** (0.00119)	0.0266 (0.0146)	0.00223*** (0.000461)	0.0173*** (0.00302)	0.00706 (0.0124)
PPE	0.0444*** (0.00622)	0.0694*** (0.0111)	0.414** (0.155)	0.0140** (0.00474)	0.137*** (0.0322)	0.274* (0.125)
Sales growth	−0.0249*** (0.000999)	−0.0433*** (0.00203)	−0.394*** (0.0250)	−0.0147*** (0.000784)	−0.137*** (0.00517)	−0.237*** (0.0190)
Fin. leverage	−0.0113*** (0.00204)	−0.0276*** (0.00366)	−0.294*** (0.0511)	−0.0100*** (0.00155)	−0.0127 (0.0106)	−0.164*** (0.0400)
GDP	−0.00822* (0.00328)	0.0267*** (0.00529)	0.0285 (0.0819)	−0.00115 (0.00228)	0.0765*** (0.0170)	−0.00594 (0.0561)
Inflation	0.00815*** (0.00191)	−0.0216*** (0.00396)	0.142** (0.0477)	0.00418** (0.00160)	−0.0241* (0.00987)	0.162*** (0.0370)
Constant	−0.0661*** (0.00257)	7.013*** (0.0105)	−0.208** (0.0641)	−0.0576*** (0.00160)	6.226*** (0.0133)	−0.201*** (0.0303)
N	37,957	37,949	37,957	37,949	37,957	37,949
Wald Chi^2	1483.63	8522.0	1285.45	188.10	25,583.5	792.16
Prob > Chi^2	0.000	0.000	0.000	0.000	0.000	0.000

The table contains estimates of the influence firm's environmental performance (ENP) on financial performance. Dependent variables are return on assets (ROA), Tobin's *Q* and earnings per share (EPS). ENP (environmental performance) is our independent variable. The control variables include Size, PPE (property plant and equipment), sales growth, financial leverage, GDP (gross domestic product) and inflation. All estimates include FGLS. Under the coefficients in the parentheses (), standard errors are shown. Statistical significance indicated by asterisks at the * (10%), ** (5%) and ***(1%)

correlation within panel units. Table 4 provides the FGLS results for the study variables. The FGLS and FGLS Panel-Specific AR (1) also found similar results in OLS and FE. Obtaining similar results across these techniques further supports the robustness and reliability of our findings. It indicates that the relationship between environmental performance and the dependent variables (ROA, Tobin's *Q*, EPS) remains consistent and holds even after addressing potential issues related to heteroscedasticity and autocorrelation.

4.5 Dynamic panel estimation results

The generalized method of moments (GMM) estimation technique is commonly applied in panel data analysis to address issues related to endogeneity and omitted variable bias. GMM is particularly useful when there is concern about the correlation between the error term and the regressors, which can lead to biased estimates in ordinary least squares regression. GMM further addresses potential endogeneity and improves the reliability of our results. GMM uses the moments of the model's residuals to construct efficient estimates and overcome the limitations of previous estimation methods. The results for the 2-step system GMM are provided in Table 5.

The coefficients for the lagged dependent variables capture the impact of the previous period's values of the dependent variables on the current values. These coefficients measure the persistence and dynamics of the dependent variables over time. Environmental performance (ENP) has positive and statistically significant coefficients indicating that better environmental performance is associated with higher financial performance (ROA). Thus, support our hypothesis **H1**: There is a positive relationship between environmental performance (ENP) and return on assets (ROA). Stronger ENP improves efficiency, lowers costs, and enhances resource utilization, thereby increasing profitability and ROA. Environmental performance (ENP) has positive and statistically significant coefficients indicate that better environmental performance is associated with improved market valuation (Tobin Q). Consistent with our hypothesis **H2**: There is a positive relationship between environmental performance (ENP) and Tobin's *Q*. Greater ENP signals positive intangibles like reputation, innovativeness, and strong stakeholder relations, increasing investor confidence and market valuation. Environmental performance (ENP) has positive and statistically significant coefficients indicate that better environmental performance is associated with higher earnings per share (EPS) validate our hypothesis **H3**: There is a positive relationship between environmental performance (ENP) and earnings per share (EPS). Improved brand image and stakeholder relations from ENP can increase sales and revenue, boosting EPS. Cost savings from ENP can also directly increase net income and EPS.

The findings align with resource-based theory, stakeholder theory, institutional theory, and corporate social responsibility, suggesting that firms with superior environmental performance can gain a competitive advantage, enhance stakeholder trust, balance economic and social objectives, and lead to better financial outcomes. Additionally, empirical studies (Baughn et al. 2007; Brouwers et al. 2018; Chang 2015;

Table 5 Generalized method of moments (GMM) estimation

Methods	GMM	GMM	GMM
	(1)	(2)	(3)
Variables	ROA	TQR	EPS
L. ROA	0.0665 (0.0505)		
L. TR		0.755*** (0.0339)	
L. EPS			0.329*** (0.0678)
ENP	0.0803*** (0.0071)	0.658*** (0.0945)	2.139*** (0.152)
Size	−0.0002 (0.0025)	0.0152*** (0.0058)	0.0192 (0.0215)
PPE	0.0169* (0.0094)	0.0606** (0.0248)	0.204*** (0.0556)
Sales growth	−0.0125*** (0.00092)	−0.0164*** (0.00411)	−0.207*** (0.0137)
Fin. leverage	−0.0105*** (0.0015)	−0.0442*** (0.0074)	−0.237*** (0.0390)
GDP	−0.0033 (0.0029)	0.0137 (0.0087)	−0.0189 (0.0382)
Inflation	0.00504*** (0.0015)	−0.0012 (0.0052)	0.141*** (0.0296)
Constant	−0.0354*** (0.0039)	1.677*** (0.221)	−0.0803 (0.0675)
Observations	35,002	35,002	35,002
Number of ids	2711	2711	2711
AR (1)—*p* value	0.0001	0.0047	0.0031
AR (2)—*p* value	0.293	0.187	0.202
Sargan—*p* value	0.210	0.151	0.358
Hansan—*p* value	0.208	0.119	0.425

The table contains estimates of the influence firm's environmental performance (ENP) on financial performance. Dependent variables are return on assets (ROA), Tobin's *Q* and earnings per share (EPS). ENP (environmental performance) is our independent variable. The control variables include Size, PPE (property plant and equipment), sales growth, financial leverage, GDP (gross domestic product) and inflation. All estimates include GMM. Under the coefficients in the parentheses (), standard errors are shown. Statistical significance indicated by asterisks at the * (10%), ** (5%) and *** (1%)

Li et al. 2017; Narula et al. 2024; Robaina and Madaleno 2020; Wedari et al. 2023; Wu et al. 2020) have shown a positive relationship between environmental performance and financial performance, supporting the results in this study. Control Variables: The coefficients for Size, PPE, Sales Growth, Financial Leverage, GDP, and Inflation capture their respective effects on the dependent variables.

4.6 Robustness analysis

Applying simultaneous quantile regression (SQR) at different quantiles (50th, 75th, and 90th) for robustness analysis is a valuable step in our research. SQR allows to explore the relationship between variables across different points of the conditional distribution, providing a comprehensive understanding of how the independent variables affect the dependent variables at different quantiles. The consistency of the findings from SQR with our previous results reinforces the robustness and reliability of our findings. The relationship between the independent variable (environmental performance) and the dependent variables (ROA, Tobin Q, EPS) holds

across different quantiles, it suggests that the relationship is not driven by outliers or extreme values, but rather is applicable across different segments of the conditional distribution. Finding consistent results across different quantiles reinforces the robustness of the relationship and indicates that it holds across various levels of financial performance and market valuation. SQR is an appropriate method for robustness analysis because it does not assume normality, accounts for heterogeneity across quantiles, and is less influenced by outliers or extreme values. It provides a more comprehensive analysis of the relationship by considering different parts of the conditional distribution, enhancing the validity of the estimated coefficients (Table 6).

5 Conclusion

Drawing on corporate stakeholder theory and based on resource-based, this study empirically unlocked the effect of corporate environmental practices on firms' financial performance. In order to consider the scope of the research, we analyzed a comprehensive set of samples comprised of 2711 United States publicly listed firms over the period of 2001–2021. Environmental practices are measured by Refinitiv, formerly Thomson Reuters Asset4 ESG database environmental dimension score. It considers three dimensions which are product innovation, resource, and emission reduction while firms' performance is measured by market and accounting-based measures. Advancing toward study objectives, we employ static and dynamic models. Dynamic panel Generalized Method of Moments Findings reveal a positive and statistically significant relationship between environmental practices and financial performance, indicating that better environmental performance is linked to higher returns and market value. Besides, we confirm our study results are robust under contemporaneous quantile regression.

A robust environmental performance (ENP) enables businesses to establish a positive reputation and garner the support of their stakeholders. In fact, the instrumental stakeholder theory (Donaldson and Preston 1995; Jones 1995) demonstrates that fostering positive stakeholder relationships can provide firms with a competitive advantage by enhancing their reputation and legitimacy (Baughn et al. 2007; Li et al. 2017; Wu et al. 2020; Zahller et al. 2015). Consequently, the literature on institutional theory, resource-based view (RBV), stakeholder theory, and corporate social responsibility provides substantial support for the existence of a positive relationship between competitive advantage and corporate environmental activities and offer valuable insights into the potential pathways and mechanisms through which environmental and financial performances influence each other.

The findings of this study have a number of significant implications for a wide range of different stakeholders, corporate houses, investors, public policy-makers, and society as a whole. We demonstrate that there is a positive association between the environmental performance of corporations and the financial performance of US organizations. According to the findings, businesses should direct their attention and resources toward activities that are both environmentally responsible and environmentally sustainable because environmental performance has a beneficial impact

Table 6 Robustness analysis simultaneous quantile regression (SQR)

Methods	SQR (50th)	SQR (75th)	SQR (90th)	SQR (50th)	SQR (75th)	SQR (90th)	SQR (50th)	SQR (75th)	SQR (90th)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Variables	ROA	ROA	ROA	TQR	TQR	TQR	EPS	EPS	EPS
ENP	0.0345***	0.0350***	0.0375***	3.370***	3.419***	3.668***	2.301***	3.274***	4.965***
	(0.0012)	(0.0014)	(0.0022)	(0.0295)	(0.0287)	(0.0485)	(0.0425)	(0.0649)	(0.122)
Size	0.0028	0.0006	−0.0003	0.0172***	0.0148***	0.0171***	0.0166***	0.0133*	−0.0092
	(0.0018)	(0.0005)	(0.0005)	(0.0041)	(0.0034)	(0.0041)	(0.0048)	(0.0072)	(0.0184)
PPE	0.0145***	0.0125**	0.0085	0.176***	0.267***	0.342***	0.102**	0.0809 (0.113)	0.190 (0.158)
	(0.0041)	(0.0049)	(0.0067)	(0.0548)	(0.0564)	(0.105)	(0.0460)		
Sales growth	−0.0071***	−0.0063***	−0.0044***	−0.133***	−0.0912***	−0.0569***	−0.249***	−0.244***	−0.252***
	(0.0002)	(0.0004)	(0.0007)	(0.0081)	(0.0066)	(0.0126)	(0.0077)	(0.0106)	(0.0230)
Fin. leverage	−0.0084***	−0.0069***	−0.0056***	−0.0117	0.0068	0.0319	−0.133***	−0.134***	−0.212***
	(0.0005)	(0.0008)	(0.0012)	(0.0135)	(0.0122)	(0.0209)	(0.0167)	(0.0230)	(0.0472)
GDP	−0.0014**	−0.0019**	−0.0042***	0.0666***	0.102***	0.155***	−0.0302	−0.0443	0.0518 (0.0610)
	(0.0006)	(0.0008)	(0.0016)	(0.0158)	(0.0155)	(0.0292)	(0.0198)	(0.0319)	
Inflation	0.0042***	0.0053***	0.0072***	−0.0401***	−0.0160*	−0.0173	0.0535***	0.0179	−0.0248
	(0.0004)	(0.0004)	(0.0009)	(0.0120)	(0.0085)	(0.0140)	(0.0079)	(0.0172)	(0.0286)
Constant	0.0094***	0.0486***	0.0958***	6.302***	7.206***	7.989***	0.168***	1.186***	2.359***
	(0.0007)	(0.0009)	(0.0015)	(0.0222)	(0.0148)	(0.0218)	(0.0101)	(0.0237)	(0.0477)
Observations	37,957	37,957	37,957	37,957	37,957	37,957	37,957	37,957	37,957
No. of Ids	2711	2711	2711	2711	2711	2711	2711	2711	2711
Pseudo R2	0.0248	0.0199	0.132	0.2494	0.2669	0.2484	0.0864	0.1019	0.1146

The table contains estimates of the influence firm's environmental performance (ENP) on financial performance. Dependent variables are return on assets (ROA), Tobin's *Q* and earnings per share (EPS). ENP (environmental performance) is our independent variable. The control variables include Size, PPE (property plant and equipment), sales growth, financial leverage, GDP (gross domestic product) and inflation. All estimations include Simultaneous quantile regression (SQR) at 50th, 75th and 90th quantiles. Under the coefficients in the parentheses (), standard errors are shown. Statistical significance indicated by asterisks at the * (10%), ** (5%) and ***(1%)

on financial outcomes. Financial performance, market value, and earnings per share can all be improved by improving environmental performance. The incorporation of environmental considerations into the strategic decision-making process of businesses is recommended in order to achieve a competitive advantage and improve long-term profitability. Investors may align their portfolios with sustainability and ethical considerations by taking environmental performance into account as a key aspect in the decision-making processes they use. The findings of this study indicate, in general, that environmental responsibility and financial success are not necessarily mutually exclusive. When businesses implement environmentally responsible policies, they stand to gain both financially and socially (a win–win situation).

While this study analyzed a large sample of US listed firms, it was constrained to a single country context. Future research could expand the scope through cross-country comparisons across contexts, such as China, Japan, and other pollution-intensive countries. Examining the relationship between environmental and financial performance across different institutional and regulatory regimes could provide valuable insights. The study was also limited by its focus on larger publicly listed firms. Further studies could investigate small and medium enterprises as well as private firms to understand if the linkages differ based on firm size and ownership structure. Additionally, future research could explore mediating mechanisms and moderating factors influencing the environmental-financial performance relationship. Potential mediators, such as green innovation, corporate social responsibility, and diversification strategies, could be analyzed. Moderators like ownership concentration, corporate governance, and legal systems may also affect the strength of the relationship. Longitudinal studies tracking firms over time could provide a dynamic perspective on how improvements in environmental performance influence financial outcomes. Qualitative studies and case analyses may also yield additional contextual insights into this complex relationship. Overall, this study offers a foundation for further scholarly inquiry into the multifaceted linkages between corporate environmental and financial performance across diverse settings. Expanding the contextual boundaries, incorporating moderating and mediating factors, and utilizing varied methodologies could significantly advance understanding of this critical issue at the nexus of business and sustainability.

Data availability Data may be available on request if any.

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