

The Impact of Environmental Performance on Firm Value: Evidence from Listed Companies in China

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Abstract

Environmental performance has become increasingly significant in the context of global sustainability and corporate governance. Considering the increasing severity of global environmental issues, the impact of environmental performance on firm value has attracted widespread attention. This study aims to explore the impact of environmental performance on firm value, using a sample of Chinese listed companies from 2013 to 2022. The study employs various empirical analysis methods, including ordinary least squares and fixed effects models, to rigorously examine this relationship. The findings reveal that environmental performance has a significant negative impact on firm value. The results provide valuable references for companies in formulating balanced environmental management strategies that address both economic and environmental objectives. Furthermore, the study proposes that future research should delve into industry-specific impacts and the long-term effects of environmental performance on firm value and conduct comparative analyses with data from other countries to enhance the generalizability and applicability of the findings.

Keywords: Firm Value, Environmental Performance, Principal-Agent Theory, Sustainability, Chinese Listed Companies

Introduction

In the context of globalization and sustainable development, the evaluation of firms is no longer limited to financial indicators but also includes non-financial factors such as environmental, social, and governance aspects (Suresha et al., 2022). With the increasing severity of environmental issues, both the government and the public are paying more attention to corporate environmental responsibility. Companies must consider their environmental performance while pursuing economic benefits, especially under increasingly stringent environmental regulations. Therefore, studying firm value from the perspective of environmental performance can not only reveal the impact of environmental responsibility on long-term corporate development but also provide valuable references for corporate

managers and policymakers to achieve a win-win situation between economic benefits and environmental protection. China has accelerated the process of effectively managing environmental pollution, making environmental protection a current development priority. As microeconomic entities within the broader macroeconomic landscape, companies should assume responsibility for environmental governance (Ji & Bo, 2022). Additionally, there is still limited research on how environmental performance affects firm value, warranting further in-depth investigation.

Theoretically, good environmental performance is considered to positively influence firm value by enhancing its public image and brand value, reducing legal risks and compliance costs, and improving operational efficiency (Wu & Zhang, 2018). Principal-agent theory is concerned with the relationship between an agent-principal, particularly the agency problems that can occur when goals are not aligned. Environmental performance may affect agency costs because good environmental policies require initial investment and long-term commitment, which may not be entirely consistent with the objectives of managers seeking short-term financial performance (Singh et al., 2023). Thus, although environmental performance theoretically contributes to the growth of firm value, in practice it may have a negative impact due to increased agency costs. Stakeholder theory extends the scope of corporate responsibility by emphasizing that firms should focus on other stakeholders besides shareholders, such as employees, customers, suppliers, communities, and governments. Good environmental performance can be seen as an expression of a firm's responsibility to a wide range of stakeholders, helping to build the firm's social capital and credibility, thereby reducing conflicts with stakeholders and enhancing the firm's social legitimacy and market competitiveness (Jia & Wang, 2018). However, if the market and other stakeholders fail to recognize the value of a firm's environmental efforts in a timely manner or perceive that these efforts do not translate into economic benefits, these environmental investments may become a burden to the firm, thereby affecting firm value in the short term. The above theoretical analysis suggests the need for further research into the actual relationship between environmental performance and firm value.

The aim of this study is to investigate the impact of environmental performance on firm value using a sample of Chinese listed companies from 2013 to 2022, thereby filling the existing research gap from both theoretical and practical perspectives. Through empirical analysis of the relationship between environmental performance and firm value, this paper aims to reveal how a company's efforts in environmental management influence its market performance and value. The contributions of this research are twofold: firstly, it provides a scientific basis for corporate managers, aiding them in better balancing economic benefits and environmental responsibilities when formulating environmental strategies. Secondly, it offers valuable insights for policymakers, promoting compliance with environmental regulations while achieving sustainable development goals, thus enhancing the overall competitiveness and market position of firms.

Following is the remainder of this paper. The literature review and hypothesis formulation are discussed in Section 2. The section 3 describes the methodology, which includes sample selection and data sources, definitions of variables, and models. Section 4 provides descriptive statistics samples and empirical findings. Section 5 provides concluding remarks and implications.

Literature Review and Hypothesis Development

Environmental performance is the efforts made by companies in terms of greenhouse gas emissions, resource consumption, pollution emission policies, environmental risk management policies, and environmental information disclosure policies, and for highly polluting industries, environmental performance is the focus of attention (Song et al., 2017). From a sustainable development perspective, achieving environmental sustainability reduces dependence on natural resources, reduces environmental risks, and improves a company's resilience and ability to withstand market changes, thereby maintaining and increasing firm value over the long term (Ziegler et al., 2008). And according to stakeholder theory, environmental protection measures can lead to more sustainable operations, a better brand image and stronger customer relationships, all of which may translate into long-term financial success (Jia & Wang, 2018).

For decades, the literature has increased with the environmental problems brought about by economic development, but there is no unified conclusion yet (Li & Xiao, 2020). The findings are positive, negative, no correlation, U-shaped correlation, inverted U-shaped correlation, etc., which basically cover all possibilities in a statistical sense. What exactly is the relationship between the two is extremely important to the attitude of companies in implementing environmental measures (Chouaibi et al., 2022). If the relationship between the two is positive, then companies will take the initiative to take on environmental responsibility to improve their environmental performance and, thus, firm value. If the relationship is negative, companies will avoid environmental responsibility, and in this case, the only way to rely on strict government regulation.

Walley and Whitehead (1994) argue that the use of rational design for industrial products from an environmentally conscious point of view will save direct production costs and attract growing consumer demand for environmentally friendly products. Ziegler et al (2008) found a significantly positive relationship between environmental performance and stock performance in an examination of European companies. And from the perspective of Chinese domestic studies, in recent years a growing literature has concluded that there is a positive relationship between the environmental performance on firm value. Song et al. (2017) found that environmental management was not significantly related to improved firm value in the current year, while it was significantly and positively related to firm value in the following year. Wu and Zhang (2018) revealed that the fulfilment of corporate environmental responsibility sends signals to society about well-performing and committed companies, thus positively influencing firm value. Qiu and Yin (2019) concluded that Chinese firms with good ESG performance can reduce their financing costs, but social responsibility environmental, social and governance each have a differentiated impact on firms' financing costs and only the environmental and governance dimensions can reduce firms' financing costs.

However, in Filbeck and Gorman (2004)'s study of the relationship between utilities and firm value, found that utilities, as producers and distributors of energy, generate a significant amount of pollution, and therefore utilities are regulated, and there is a negative relationship between environmental performance and firm value in the presence of the moderating effect of regulation. Jia and Wang (2018) conducted a regression analysis using data from manufacturing and mining industries from 2014-2016 and found that: there is a non-linear relationship between environmental performance and firm value; long-term firm value is U-shaped correlated with environmental performance, but the short-term firm value is inverted U-shaped correlated. Ji and Bo (2022) based their study on the social responsibility reports of Shanghai and Shenzhen A-share listed companies from 2010 to 2016, selecting heavily polluting enterprises with typical investments in environmental protection and pollution

expenses as research samples. They found that environmental performance has a negative impact on firm value. They argued that the funds invested in environmental projects by enterprises did not directly yield economic benefits, resulting in marginal costs exceeding marginal benefits. This study also suggests that investments in environmental management increase production costs, which may reduce the company's profits and market value in the short term. In conjunction with the above discussion, the hypothesis of this study is built as follows:

H1: Environmental performance has a negative effect on firm value across listed companies in China.

Research Methodology

Sample and Data Collection

This study investigates the relationship between environmental performance and firm value by analyzing companies listed on the China A-share Stock Exchanges over a ten-year period from 2013 to 2022. The research utilized secondary data sources to gather the necessary information. Specifically, data on firm value and control variables were obtained from the Chinese Stock Market Accounting Research (CSMAR) database. Environmental performance metrics were sourced from the Sino-Securities environmental rating index. The following steps were undertaken during data analysis: (1) Companies designated as Special Treatment (ST) or *ST were excluded from the sample due to their financial instability. (2) Data from companies in the financial and insurance sectors were also excluded because their accounting practices are distinct from those of other industries. (3) Any instances with incomplete data were removed to ensure the integrity of the analysis. After these exclusions, the final dataset comprised 1681 companies, yielding a total of 16,810 observations over the ten-year period.

This comprehensive dataset enabled a robust analysis of the impact of environmental performance on firm value, controlling for various internal and external factors. By eliminating financially unstable companies and those from sectors with unique accounting standards, the study aimed to provide a clearer understanding of the general relationship between environmental performance and firm value across a wide range of industries. The use of reliable secondary data sources further ensured the accuracy and relevance of the findings, contributing to a more nuanced understanding of how environmental factors influence corporate performance in the context of the Chinese stock market.

Variable Definition

This study follows the methodology employed by Qiu and Yin (2019); Ji and Bo (2022), using Tobin's Q as the dependent variable. Compared to traditional financial metrics, market-based indicators provide a more effective assessment of a firm's valuation. Tobin's Q, which combines theoretical significance with practical utility, is a crucial measure for evaluating a corporation's growth potential and intrinsic value.

The independent variable is environmental performance. Referring to the measurement method used by other scholars in previous studies (Duan et al., 2023; Zheng et al., 2023). This study uses the Sino-Securities environmental rating index as a proxy variable for environmental performance. Sino-Securities environmental ratings system fully draws on the core of international environmental experience and combines China's characteristics to build environmental rating system, including 5 themes and 17 key issues. For example,

indicators such as greenhouse gas emissions, carbon reduction pathways, land use and biodiversity, water resource consumption, industrial emissions, renewable energy, and green buildings are part of the Sino-Securities environmental rating index. Utilizing this index provides a comprehensive overview of China's environmental performance, reflecting its efforts and progress in addressing various environmental challenges.

Lasting, building on the studies by Shahrin et al. (2023), and considering the unique insights from the current research, several control variables have been included. These control variables encompass firm size, debt-to-asset ratio, the concentration of ownership among the top ten shareholders, and board size. Table 1 provides the definitions of the primary variables.

Table 1
Summary of Variables

Type	Variables	Symbol	Formulation
Dependent Variable	Firm Value	TOBINSQ	Tobin's Q Value: Equity Market Value + Liabilities Market Value / Equity Book Value + Liabilities Book Value
Independent Variable	Environmental Performance	EP	EP Rating Score from Sino-Securities Index
	Size of the Firm	SIZE	The Natural Logarithm of the Total Assets
Control Variables	Debt Asset Ratio	LEV	Total Liabilities / Total Assets
	Shareholding Concentration	TOP10	The Sum of The Shareholdings of The Company's Top 10 Shareholders.
	Board Size	BOARD	Natural logarithm of the number of Directors on the Board

Models

To analyze the impact of environmental performance on firm value, we employed the ordinary least squares (OLS) model and the fixed effects model to test the regression results and formulated the following model:

$$\text{Tobin's } Q_{it} = \alpha_0 + \beta_1 (EP_{it}) + \sum \beta_2 (\text{CONTROL}_{it}) + \varepsilon_{it} \quad (1)$$

$$\text{Tobin's } Q_{it} = \alpha_0 + \beta_1 (EP_{it}) + \sum \beta_2 (\text{CONTROL}_{it}) + \mu_i + \varepsilon_{it} \quad (2)$$

where, Tobin's Q is the firm value for firm i in year t , and the environmental performance proxies for firm i in year t are EP score and control variables. The disturbance term is denoted as ε_{it} and is assumed to be serially uncorrelated with mean zero. and the firms-fixed effect μ_i control for cross-sectional differences in the firm characteristics.

Results

Descriptive Statistics

Table 2 Descriptive statistics of the main variables

Variable	N	Mean	Min	Max	p50	SD
TOBINSQ	16810	2.085	0.625	122.190	1.583	2.350
EP	16810	61.156	33.820	93.340	60.920	8.146
SIZE	16810	22.608	17.641	28.637	22.427	1.367
LEV	16810	0.443	0.008	0.994	0.439	0.202
TOP10	16810	0.155	0.000	0.810	0.121	0.116
BOARD	16810	2.137	1.099	2.890	2.197	0.199

Table 2 presents the descriptive statistics of the main variables. TOBINSQ (Tobin's Q) has a mean value of 2.085 and a standard deviation of 2.350, indicating significant fluctuations in the market value of the firms relative to their book value of assets within the sample. The maximum value of 122.190 is far above the mean, showing that some firms are highly valued in the market. EP (environmental performance) has a mean value of 61.156 and a standard deviation of 8.146, suggesting that most firms have concentrated scores in environmental performance with a relatively tight distribution. The highest score is 93.340, and the lowest is 33.820, reflecting substantial variations in environmental performance among different firms. SIZE (firm size) has a mean value of 22.608 and a standard deviation of 1.367, indicating relatively consistent firm sizes within the sample, though with some variability. The minimum and maximum values are 17.641 and 28.637, respectively, showing a modest range in firm sizes. LEV (debt-to-asset ratio) has a mean value of 0.443 and a standard deviation of 0.202, indicating considerable variations in firms' leverage levels. The minimum value is 0.008, and the maximum is 0.994, suggesting that some firms have minimal debt while others have debt levels nearly equivalent to their total assets. TOP10 (top ten shareholders' concentration) has a mean value of 0.155 and a standard deviation of 0.116, showing that the equity concentration among the top ten shareholders is generally low, with most firms having a low concentration. The minimum value is 0.000, and the maximum is 0.810, reflecting that some firms have highly dispersed ownership, while others have relatively concentrated ownership. BOARD (board size) has a mean value of 2.137 and a standard deviation of 0.199, indicating relatively consistent board sizes among the firms, with minimal variation. The minimum and maximum values are 1.099 and 2.890, respectively. The descriptive statistics suggest significant market value volatility, concentrated environmental performance scores, consistent firm and board sizes, and notable variations in leverage and equity concentration. These diversities and variabilities in the variables will facilitate further analysis of the impact of environmental performance on firm value.

Empirical Results

Table 3

Effects of environmental performance on firm value

Variables	TOBINQ (1) OLS	TOBINQ (2) OLS	TOBINQ (3) Fixed Effect	TOBINQ (4) Fixed Effect
EP	-0.035*** (-12.447)	-0.011*** (-7.068)	-0.037*** (-13.454)	-0.013*** (-8.184)
SIZE		-0.544*** (-10.013)		-0.532*** (-9.328)
LEV		-0.077 (-0.268)		0.158 (0.511)
TOP10		0.229** (2.526)		0.553*** (5.822)
BOARD		-0.104 (-1.471)		0.028 (0.400)
Constant	4.203*** (22.887)	15.309*** (13.601)	4.370*** (23.871)	14.680*** (12.644)
Observations	16,810	16,810	16,810	16,810
Year	No	No	Yes	Yes
Industry	No	No	Yes	Yes
R-squared	0.0144	0.1100	0.0898	0.1540
F	154.9	366.2	181.0	176.7

*Notes: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Robust t-statistics in parentheses. Standard errors are robust standard errors.*

Table 3 presents the baseline regression results on the effects of environmental performance on firm value, analyzed across four columns. The first column shows the OLS regression results without control variables, where the coefficient for environmental performance (EP) on Tobin's Q is -0.035, significant at the 1% level ($p < 0.01$), indicating a significant negative impact of environmental performance on firm value. The second column includes control variables in the OLS regression, with the coefficient for environmental performance changing to -0.011, still significant at the 1% level ($p < 0.01$), suggesting that the negative impact of environmental performance on firm value remains significant even after adding control variables. The third column presents the fixed effects regression results without control variables, with the coefficient for environmental performance at -0.037, also significant at the 1% level, further validating the negative impact of environmental performance on firm value. The fourth column shows the fixed effects regression results with control variables, where the coefficient for environmental performance is -0.013, maintaining significance at the 1% level ($p < 0.01$), indicating that the negative impact of environmental performance on firm value remains significant even in the fixed effects model. Overall, the results from all four columns consistently support the hypothesis that environmental

performance has a significant negative impact on firm value. Therefore, it can be concluded that environmental performance negatively affects the firm value of listed companies in China, and this hypothesis cannot be rejected.

Robustness Tests

Robustness tests are conducted to validate the reliability and robustness of the baseline regression results, ensuring that the findings are not significantly affected by changes in model specification, variable selection, or data characteristics, thereby enhancing the credibility of the research conclusions. According to the methods outlined by Li and Xiao (2020); Chouaibi et al (2022), this study employs two approaches for robustness tests. The first approach involves replacing the dependent variable by using market value as the measure of firm value. The second approach utilizes lagged independent variables for the regression, which also helps address the issue of endogeneity. Lagged independent variables are generally considered exogenous, reducing the problem of reverse causality, thus improving the reliability and validity of the regression results.

Table 4
Robustness tests

Variables	Market Value (1)	TOBINQ (2)
EP	-0.003*** (-7.529)	
L.EP		-0.013*** (-7.435)
SIZE	0.839*** (189.475)	-0.552*** (-8.878)
LEV	-0.287*** (-11.734)	0.141 (0.414)
TOP10	0.149*** (5.402)	0.677*** (6.485)
BOARD	-0.015 (-0.923)	0.019 (0.255)
Constant	4.517*** (49.453)	15.211*** (11.947)
Observations	16,810	15,129
R-squared	0.8870	0.1535
F test	0.0000	0.0000
r2_a	0.8868	0.1521
F	15033.62	168.02
Year	Yes	Yes
Industry	Yes	Yes

Notes: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Robust t-statistics in parentheses. Standard errors are robust standard errors.

Table 4 presents the results of two robustness tests. The first column uses market value as the measure of firm value, while the second column employs lagged one-period independent variables for regression analysis. In the first column, the coefficient for environmental performance (EP) is -0.003 and is significant at the 1% level ($p < 0.01$), indicating a significant negative impact of environmental performance on firm market value. Other control variables such as firm size (SIZE), leverage ratio (LEV), and the top ten shareholders' concentration (TOP10) also show significant effects, further validating the robustness of the model. In the second column, the coefficient for lagged environmental performance (L.EP) is -0.013, also significant at the 1% level ($p < 0.01$), demonstrating that the negative impact of environmental performance on Tobin's Q remains significant. This suggests that even when considering endogeneity issues, the negative impact of environmental performance on firm value persists. In summary, the results of the two robustness tests consistently support the original baseline regression conclusion, that environmental performance has a significant negative impact on firm value. Therefore, the hypothesis remains supported.

Conclusions

This study uses data from Chinese listed companies from 2013 to 2022 as the research sample to explain the significant impact of environmental performance on firm value. The results show that environmental performance significantly and negatively affects firm value. The results of the hypothesis are consistent with some past studies (Filbeck & Gorman, 2004; Song et al., 2017; Ionescu et al., 2019; Nekhili et al., 2021; Khan & Liu, 2023). In China, the investment and management of listed companies in environmental performance is affected by both national policies and market effects (Zhang & Ouyang, 2021). As a matter of policy, the Chinese government emphasizes green and sustainable development and promotes firms to strengthen environmental protection and improve environmental performance. However, environmental investments often involve high initial costs that may burden the financial performance of firms in the short term. Second, the implementation of environmental policies and measures may face inefficiencies and implementation difficulties at the outset, especially in areas with stringent regulations and high technological requirements (Zhang & Chen, 2017). Furthermore, there may be a lag in market response to environmental investments, and investors and consumers may not yet fully appreciate the long-term value of such measures. In addition, the direct positive effect of improved environmental performance on firm value may be more difficult to demonstrate in certain industries due to their inherent exposure to environmental risks, such as the chemical and energy industries. Therefore, the combination of these factors may lead to a negative correlation between environmental performance and firm value. In conclusion, due to the agency cost problem in principal-agent theory and the lag in the perception of the economic benefits of environmental activities in stakeholder theory, as well as the real inputs needed to improve environmental performance, it may lead to a negative correlation between environmental performance and firm value. This requires firms to pay more attention to communicating and coordinating with all stakeholders when implementing environmental policies, and to ensure that the long-term sustainability of the environmental strategy is consistent with the overall strategy of the firm.

The contributions of this paper are primarily reflected in the following aspects: Firstly, through empirical analysis of the relationship between environmental performance and firm value, it reveals how a company's efforts in environmental management impact its market performance and value. This provides a new theoretical perspective for further understanding the role of environmental performance in corporate management and strategy. Secondly, the research results offer scientific evidence for corporate managers in formulating environmental strategies, helping them better balance economic benefits and environmental responsibilities. Companies can enhance their market competitiveness and long-term sustainability by improving their environmental performance. Finally, this study provides valuable references for policymakers, promoting companies to achieve sustainable development goals while complying with environmental regulations. By formulating more effective policies, encouraging corporate investment in environmental protection can enhance overall competitiveness and market positioning.

This study has some limitations. Firstly, it only uses data from Chinese listed companies from 2013 to 2022. Future research could consider using data spanning a longer period to verify the generalizability of the conclusions. Secondly, this study does not conduct a detailed analysis of different industries but instead examines the overall impact of environmental performance on firm value. Future research could delve into the specific characteristics of different industries to further reveal the mechanisms through which environmental performance affects firm value. Although this study considers various control variables, there may still be other potential factors not accounted for that influence the relationship between environmental performance and firm value. Future research could include more variables for a more comprehensive analysis. Future research directions could include comparing the findings from China with those of other countries to explore the impact of different environmental policies and market mechanisms on the relationship between environmental performance and firm value across different countries and regions. Additionally, using data with a longer time span to further verify the long-term impact of environmental performance on firm value and conducting in-depth analyses of different industries to uncover industry-specific mechanisms through which environmental performance affects firm value, thereby providing more targeted recommendations for industry management.

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