



The Impact of Confucian Culture on Corporate Environmental Governance

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ABSTRACT

Using A-share listed companies in Shanghai and Shenzhen from 2010 to 2019 and the density of Confucian temples and schools near sample company headquarters, this paper uses regression analysis to estimate the impact of Confucian culture on corporate environmental governance. Enterprise environmental capital investment as a percent of total assets is the dependent variable used as a proxy for environmental governance. The log of the number of the number of Confucian temples and Confucian academies within a 200-kilometer radius of the company's registered location plus one is the independent variable. This study finds that the environmental capital expenditures increase by 0.007% for every unit increase in the independent variable. Similar results are found when the radius is expanded to 300 kilometers. The greater the influence of Confucian culture is, the more inclined enterprises are to participate in corporate environmental governance. Additionally, environmental governance information disclosure can be a key influence path for this correlation. Further analysis finds that the relationship between Confucian culture and environmental governance is stronger with more experienced managers, a more developed institutional environment, and after 2015 following the People's Republic of China's enactment of the Environmental Protection Law. This study expands the literature on the factors that influence Confucian culture on corporate environmental governance, enriches the empirical evidence of the influence of the informal system of corporate environmental governance on enterprise decision-making, and confirms the modern commercial value of Confucian culture.

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Introduction

Numerous studies attribute global warming to carbon emissions (Udara et al. et al., 2019; Beydeera et al., 2019). The adverse effects of climate change on both the environment and humanity have raised widespread concern and calls for action to reduce carbon emissions. As the main source of pollution, firms have the primary responsibility of reducing emissions.

There are two types of corporate environmental governance systems: informal and formal. Formal systems include public sector laws and regulations and private sector standards, while informal systems guide behavior and include social norms, religious beliefs, ideology, and culture. Formal systems compel firms to reduce pollution but have limitations since they usually only set minimum requirements for pollution mitigation. The informal system can enhance the formal system by having firms go beyond minimum environmental standards to achieve greater pollution mitigation. The informal system refers to the code of conduct that societies have gradually developed, including values, beliefs, customs, culture, traditions, ethics, and ideology.

Confucian culture, with its principles of "being people-oriented," "being benevolent to all creatures on earth," and "harmony between heaven and human," is ancient China's leading philosophy of governance and ideology. Confucian culture exerts a subtle influence on the thoughts and behaviors of Chinese people (Jin et al., 2017). The values, mindsets of thinking, and behavior patterns of Chinese entrepreneurs are generally permeated with Confucianism and reflected in the business decision-making of enterprises (Hofstede, 2001).

China increasingly recognizes the importance of environmental quality, and ecological civilization construction is becoming a national strategy. So, it is worth exploring whether Confucian culture, as an informal institution, impacts enterprises' environmental actions. Previous studies have shown that Confucian culture can promote enterprises to undertake social responsibility (Low & Ang, 2013) and private firms' investment in R&D (Yan et al., 2021), alleviate agency conflicts (Du, 2015), suppress management self-interest behavior (Chen et al., 2020) and earnings management (Yang et al., 2022), and improve green innovation efficiency (Dong & Li, 2023). In fact, the values advocated by Confucian culture, such as "benevolence," "integrity," and "harmony," are highly compatible with the concepts of environmental governance. However, current research on the mechanism and path of the impact of Confucian culture on environmental investment is still insufficient, which provides an opportunity for this paper.

Based on the discussion above, this paper examines the influence of Confucian culture on corporate environmental actions. This study finds that as the level of Confucianism deepens, corporate investment in environmental mitigation increases significantly, and the disclosure of environmental responsibility information creates a bridge between Confucian culture and environmental governance. Further analysis finds that the relationship between Confucian culture and environmental governance is stronger with more experienced managers and a more developed institutional environment. In addition, by analyzing the sample before and after the enactment of the Environmental Protection Law of the People's Republic of China, we find that environmental regulations magnified the impact of Confucian culture in promoting corporate environmental governance.

The contributions of this study are as follows: (1) Most previous studies explored the key factors affecting corporate environmental governance from the perspective of formal institutions. In contrast, this paper measures the impact of Confucian culture on corporate environmental investment, which expands the literature on corporate environmental governance. (2) This study also adds to the literature by examining the moderating effect of management experience and institutional environment on Confucian culture's impact on corporate environmental governance. We find a greater impact with more experienced managers and a more developed institutional environment. (3) This study also analyses the interaction effect between formal and informal environmental governance systems. We find the enactment of China's Environmental Protection Law magnified the impact of Confucian culture on promoting corporate environmental governance. (4) In analyzing Confucian culture data, we use Python programming to obtain the number of Confucian temples and Confucian academies within a 200 km and 300 km radius of the listed company's registered office, which improves the accuracy and reliability of the research results.

Literature Review

Social responsibility theory holds that it is reasonable for enterprises to earn profits legally, but they should not pursue money as their sole purpose (Zou, 2020). The triple bottom line theory proposed by British scholar John Elkington (1994) suggests that corporate behavior should meet economic, social, and environmental bottom lines. Specifically, corporations should be accountable to shareholders by pursuing profit goals and socially responsible by respecting the integrated value of the economy, society, and the environment. Firms, such as manufacturers, are the principal source of pollution and should be responsible for reducing carbon emissions caused by their production and operation (Kim et al., 2019; Pedersen et al., 2021).

Existing literature indicates two categories of factors influencing corporate environmental governance: internal and external motivations. Internal factors mainly include executive characteristics (Wu & Huang, 2013), corporate governance (Barko et al., 2021), and the nature of property rights (Ren et al., 2021).

External factors can be divided into two categories: formal systems and informal systems. Formal systems impacting corporate environmental governance consist of environmental protection systems and laws and regulations, regulatory efforts, policy instruments for environmental regulation, and government environmental audits. Table 1 lists related research.

Table 1: Research on formal institutions and corporate environmental governance

Symbols	Variable Definition
Environmental protection systems and laws and regulations	Worthington & Patton, 2005
Regulatory efforts	Shen & Feng, 2012; He et al., 2020
Policy instruments for environmental regulation	Acemoglu et al., 2012; Li & Xiao, 2020
Government environmental audits	Liu et al., 2020; Cai et al., 2021

Under a clear and specific formal regulatory system, firms will actively strengthen their environmental governance, increase investments in clean environmental technologies (Klassen & Whybark, 1999), transform and upgrade their technological innovation (Lyu & Huang, 2021), and proactively fulfill their corporate environmental responsibilities (Yu et al., 2020). However, the influence of informal institutions on corporate environmental governance should not be underestimated. Table 2 lists some research demonstrating this impact.

Table 2: Research on informal institutions and corporate environmental governance

Informal vector	Research reference
Social Norms	Li & Shen, 2011
Craftsman's Spirit	Tang & Wan, 2019
Traditional Culture	Bi et al., 2015
Religious Social Norms	Terzani & Turzo, 2021
Hometown Identity	(Hu et al., 2017)
Political Association	Chen & Chen, 2018
Public Pressure	Cheng et al., 2018

Although scholars have discussed the main motivations of corporate environmental governance from various perspectives, few have focused on Confucian culture, which has deep roots in Chinese society. Some studies have found that Confucian culture promotes corporate innovation (Zhang & Shu, 2022), effectively mitigates agency conflicts (Gu, 2015), improves corporate governance (Cheng et al., 2020), enhances social responsibility (Chen et al., 2020), improves risk management (Xu et al., 2020), and enhances corporate social responsibility (Pan et al., 2021). However, there is little discussion on how Confucian culture influences corporate environmental governance. Using data from the Chinese Private Enterprise Survey (CPES) conducted in 2010, 2012, and 2014, Xu et al. 2019 found a positive relationship between Confucian culture and environmental investment. They also found the relationship stronger in areas with less stringent environmental standards. The impact of the informal system of Confucian culture acted as a substitute for the formal system of environmental regulation. Their results were based on survey data, and they measured the strength of Confucian culture at the provincial level.

We contribute to the literature by using data from A-share companies listed on the Shanghai and Shenzhen Stock Exchanges in China from 2010 to 2019 and measure the strength of Confucian culture based on the number of remaining Confucian temples and schools within 200 and 300 kilometers of each listed company's place of incorporation.

Theoretical and Conceptual Background

Confucianism emphasizes friendship and cooperation between people, which has virtue at its core. The essence of Confucianism is "virtue," "righteousness," "manners," "wisdom," and "credit," and it is against "excess" and "deficiency," advocates "moderation" and "harmony" (Li & Nie, 2011). Thus, it can be seen that there are many similar tenets between corporate environmental governance and Confucian culture. For enterprises, environmental pollution has strong negative externalities with high mitigation costs. Under the assumption of a "rational person," managers will aim to maximize profits. However, behavioral economics research suggests that human decision-making is not entirely rational but influenced by many psychological factors. Environmental psychology indicates that the environment influences human behavior and becomes an element of human behavior and its direction. Social psychology holds that psychology and social culture are interdependent and mutually reinforcing (Markus & Kitayama, 2010). Therefore, long-term exposure to Confucian culture shapes the cognitive imprint of entrepreneurs and executives, forming special ethical value preferences and subtly influencing environmental investment decisions (Xu et al., 2020). Specifically, this paper argues that Confucian culture may drive corporate environmental investment in the following ways.

Firstly, the core of Confucian culture is "virtue," which refers to implementing benevolent governance with the heart of "loving people" so that people from all social strata can enjoy the right to live and be happy. Enterprises' environmental pollution has strong adverse external effects, which harm the public interest, reduce the quality of life, and conflict with the idea of "virtue" in Confucianism. The concern of enterprises for environmental governance manifests the virtue and people-oriented ideas in Confucianism. Under the influence of Confucianism, business managers have more empathy for the damage pollution does to people's interests. According to Batson's Empathy Altruism Hypothesis (Batson et al., 1991), empathy, concern, and compassion are automatically generated when bystanders perceive that others are in distress. Managers following Confucian culture may be more empathetic to the problems caused by environmental pollution, thus strengthening their concern for environmental governance issues.

Secondly, righteousness is the core content of Confucian ethics, which means that human behaviors should be in accordance with *the Rite of Zhou* and morality and that benefits should be obtained through proper means and channels. Confucian tenets hold that righteousness is more important than profit. Gaining profit by harming the environment conflicts with the Confucian culture of "righteousness," and environmental governance expresses "righteousness" for society and the environment. Confucianism's idea of righteousness over profit can guide entrepreneurs and managers to pay more attention to righteousness rather than profit, to bear moral responsibility for the environment and nature, and to consider environmental issues when developing corporate strategy. While enterprises are concerned about profit, they will also try to shoulder their duty to society as much as possible and give back to society.

Furthermore, "harmony" is the ultimate goal pursued by Confucianism in dealing with various relationships. Confucian culture advocates the "doctrine of the mean" and "harmony." The principle of coexistence, whether between people and nature, people and society, between individuals or between countries, can be summarized as "harmony is precious," which is consistent with corporate environmental governance in many aspects. Confucianism advocates that people should respect nature, use it appropriately, maintain ecological balance, make rational use of natural resources, and realize the harmonious development between man and nature. Only by conforming to the cosmic order and the law of development characterized by harmony and protecting nature and the environment can we reduce or avoid natural disasters and ultimately benefit human beings. Following these concepts, entrepreneurs and managers will pay more attention to the environment and ecology, thus strengthening corporate environmental governance. Confucian quotes linked to virtue, righteousness, and harmony are shown in Table 3.

Table 3: Text references to Confucian Cultural Traits

Trait	Text Reference
Virtue	To employ the people as if you were assisting at a great sacrifice, not to do to others as you would not wish done to yourself (Analects of Confucius - Yan Yuan Chapter). The man of perfect virtue, wishing to be established himself, seeks also to establish others; wishing to be enlarged himself, he seeks also to enlarge others (Analects of Confucius - Yong Ye Chapter 28).
Righteousness	He angled, but did not use a net; He shot, but not at birds perching (Analects of Confucius - Shu-er chapter 26). The mind of the superior man is conversant with righteousness; the mind of the mean man is conversant with gain. (Analects of Confucius – Liren chapter 16) Riches and honors acquired by unrighteousness, are to me as a floating cloud (Analects of Confucius _Shu-er chapter 1).
Harmony	Righteousness brings profit and one should never abandon righteousness for profit. (Zuo Zhuan) A master would follow nature so that his actions do not violate the function of heaven and earth to nurture all things; follow the sun and moon so as not to act against the light; follow the four seasons so as not to act out of their order; follow the ancestor's statecraft so as not to violate its discourse on good and bad; pay attention to natural phenomena, so he does not violate natural phenomena, inherits natural phenomena so as to follow natural climate conditions. (The Book of Changes, Western Zhou Dynasty). It is not right to cut wood or kill a beast in inappropriate time (Rites of Passage - Rituals, the Spring and Autumn Period). Dense hole nets do not enter the pond, the fish and aquatic turtle products will not eat up; cut down the forest only at proper times, the wood will not run out. (Mencius - King Hui of Liang).

Empirical Review and Hypothesis Development

In summary, Confucianism will increase public morality and create effective external constraints. Meanwhile, higher public morality may also positively impact the formal system's regulation level, leading to a synergy between the formal and informal systems to positively impact environmental governance. Therefore, we believe managers influenced by Confucian culture are more likely to pay close attention to environmental governance. Accordingly, this paper proposes hypothesis 1.

Hypothesis 1: Confucian culture will promote corporate environmental governance. The greater the influence of Confucianism is, the more inclined companies are to participate in environmental governance.

Research and Methodology

This paper selects A-share companies listed in the Shanghai and Shenzhen Stock Exchanges from 2010 to 2019 as the research samples. The data on enterprise environmental protection expenditure, Confucian temples, and Confucian schools are from the CNRDS (Chinese Research Data Services Platform) database. We use Python software to calculate the number of Confucian temples and Confucian schools within a radius of 200 km and 300 km, where the company is registered, to form the data on Confucian culture in this paper. The paper processes the initial data as follows: (1) Exclude ST and delisted companies, as these two types of companies are subject to stricter regulatory scrutiny and have experienced significant fluctuations in their performance; (2) Exclude financial industry companies, as there are significant differences in operational and financial characteristics between financial and non-financial companies (Tang et al., 2022); (3) Exclude undisclosed environmental capital expenditures and samples with missing values to ensure data integrity (Yang et al., 2022).

The final sample contains 3058 annual observations, and the upper and lower 1% quantiles are winsorized for continuous variables. Referring to the research of Hu, Song, and Wang (2017) and Xu, Li, and Chen (2020), the model of this paper is :

$$Env_{i,t} = \beta_0 + \beta_1 Confu200 / Confu300_{i,t} + \beta_j Control_{i,t} + \sum Year + \sum Industry + \varepsilon_{i,t} \quad (1)$$

Variable definition

(1) Dependent Variable: Enterprise Environmental Performance (Env):

Environmental capital expenditures of enterprises are a relatively accurate objective environmental performance indicator (Gillan et al., 2021), and they measure enterprises' environmental performance (Hu et al., 2017). To control for enterprise size, we standardize environmental capital expenditure by dividing it by the total end-of-year assets of the enterprise.

(2) Independent variable: Confucian culture (Confu200 and Confu300)

Following the research of Gu (2015) and Du (2013), A-share companies listed in the Shanghai and Shenzhen Stock Exchanges in China from 2010 to 2019 are used as indicators of the strength of Confucian culture. Based on the dimension of the regression coefficient, we normalize each by dividing by 100. Specific measurement methods are as follows:

Step 1: The CNRDS and CSMAR databases are used to obtain the latitude and longitude of each listed company's registered location, the longitude and latitude of the remaining Confucian temple, and the longitude and latitude of the Confucian schools' locations.

Step 2: We calculate the distance of Confucian temples and schools using latitude and longitude in Python software with the following steps:

a. Using formula 2, the central Angle (θ) is calculated using the longitude λ_F and latitude ϕ_F of the registered place of the listed company and the longitude λ_C and latitude ϕ_C of the district and county where the remaining Confucian temple or school is located:

$$\cos\theta = \sin\phi_C \times \sin\phi_F + \cos\phi_C \times \cos\phi_F \times \cos(\lambda_C - \lambda_F) \quad (2)$$

b. We calculate the arc length (rad) using the following formula:

$$rad = \frac{40075.04}{360} \times \frac{180}{\pi} \quad (3)$$

c. We calculate the distance between each listed enterprise's registration place and each remaining Confucian temple or school according to the following formula:

$$Distance = rad \times \left(\frac{\pi}{2} - \arctan\left(\frac{\cos\theta}{\sqrt{1 - \cos^2\theta}}\right) \right) \quad (4)$$

d. Define two datasets, Group1 and Group2. Group1 represents a list of the longitude and latitude of the registered locations of all listed companies; Group2 represents the latitude and longitude list of Confucian temples or schools. Afterward, traverse these two sets of locations through a two-layer loop and call the distance calculation formula to calculate the distance between them.

Step 3: We count the remaining Confucian temples and schools within 200 and 300 kilometers of each listed company's place of incorporation.

Step 4: We standardize the number of remaining Confucian temples and schools by dividing by 100.

(3) Control variables

With reference to research on Confucian culture and corporate environmental governance (Acemoglu et al., 2012; Hu et al., 2017; Xu et al., 2020), the control variables selected in this paper include enterprise size (Size), financial leverage (LEV), return on equity (ROE), growth (Growth), nature of equity (State), equity concentration (First), dual roles of chairperson and CEO (Duality), board size (Board), proportion of independent directors (Indirector), remuneration of directors and supervisors (ExeCom), industry competition in the enterprise's industry (HHI), and corporate social responsibility score (Score). Considering the potential impact of industry competition (HHI) and high executive compensation (ExeCom) on corporate environmental governance investment decisions (Moskovics, 2024), choose the remuneration of directors and supervisors (ExeCom) and industry competition (HHI). ExeCom refers to the salary of directors, supervisors, and senior management personnel, usually consisting of a fixed salary, performance-based salary, and long-term incentives. HHI (The Herfindahl Hirschman Index) refers to the sum of squares of the percentage of total industry revenue or total assets held by various market competitors in an industry, used to measure changes in market share. Its value is between 0 and 1. The specific calculation formula is as follows:

$$HHI = \sum_{i=1}^n \left(X_i / X \right)^2, X = \sum_{i=1}^n X_i.$$

Among them, Xi represents the annual operating revenue of enterprise i in the industry, and n represents the number of enterprises in the industry. The larger the HHI index, the less competitive the industry is.

Additionally, we include the annual dummy variable (Year) and the industry dummy variable (Industry). Table 4 details the specific variable definitions.

Table 4: Definition and description of variables

Variable Type	Variable Name	Symbols	Variable Definition
Dependent variable	Corporate environmental governance	Env	Enterprise environmental protection investment / total assets × 100%
		Confu200	The number of Confucian temples and Confucian academies within a 200-kilometer radius of the company's registered location plus one and taken as a logarithm
Independent variable	Confucianism	Confu300	The number of Confucian temples and Confucian academies within a 300-kilometer radius of the company's registered location plus one and taken as a logarithm

Control variables	Enterprise size	Size	Total assets at the end of the year plus one and taken as a logarithm
	Financial leverage	LEV	Asset liability ratio at the end of the year
	Return on equity	ROE	Net income/average balance of shareholders' equity
	Growth	Growth	Operating income growth rate
	Nature of equity	State	Indicator variable that equals 1 if the enterprise is state-owned and 0 otherwise
	Shareholding Concentration	First	Percentage of shareholding of the largest shareholder
	Double Duty	Duality	Indicator variable equals 1 if the chairperson and CEO are the same person and 0 otherwise.
	Board Size	Board	Number of Board of Directors
	Percentage of independent directors	Indirector	Number of independent directors/number of directors
	Remuneration of Directors and Supervisors	ExeCom	Ln (Total remuneration of directors, supervisors and executives + 1)
	Industry Competition	HHI	Herfindahl-Hirschmann Index
	Corporate Social Responsibility Score	Score	Hexun CSR Rating Score/100
	Annual dummy variables	Year	Annual dummy variables
	Industry dummy variables	Industry	Industry dummy variables

Findings

Descriptive statistical analysis

Table 5 provides the descriptive statistical results of the variables. The minimum and maximum values of Env are 0.000 and 1.079, respectively, and the mean value is 0.104. The mean values of the variables Confu200 and Confu300 of Confucian culture are 5.240 and 5.934, and the standard deviations are 1.343 and 1.329, respectively, indicating significant differences in the intensity of Confucian culture. The mean values of LEV and ROE are 0.473 and 0.048, respectively. The mean value of State is 0.539, indicating that 53.9% of the enterprises in the sample are state-owned enterprises. The mean value of First is 36.09%, and the maximum value is 75.72%, indicating that the ownership is relatively concentrated and the largest shareholders of most companies have the dominant voting rights. The mean values of Duality and Indirector are 0.187 and 0.372, respectively, indicating that 18.7% of the companies have concurrent roles of chairperson and CEO, and the proportion of independent directors is slightly higher than the minimum legal requirements. The mean value and standard deviation of ExeCom are 15.13 and 0.751, respectively, indicating little variation in the ExeCom salary levels of listed companies. The mean and median of HHI are 0.186 and 0.145, respectively, indicating a low intensity of competition in most industries of the sample companies. The minimum value of Score is -0.031, and the average value is 0.239. The sample companies' corporate social responsibility score is relatively low, indicating that the social responsibility of the sample companies needs strengthening.

Table 5: Descriptive statistics

Variables	Number of samples	Average value	Standard deviation	Minimum value	Median	Maximum value
Env	3,058	0.104	0.167	0.000	0.049	1.079
Confu200	3,058	5.240	1.343	0.000	5.715	6.683
Confu300	3,058	5.924	1.329	1.099	6.361	7.280
Size	3,058	22.403	1.244	19.982	22.270	25.912
LEV	3,058	0.473	0.209	0.057	0.478	0.993
ROE	3,058	0.048	0.163	-0.872	0.058	0.460
Growth	3,058	0.171	0.421	-0.481	0.097	2.856
State	3,058	0.539	0.499	0	1	1
First	3,058	36.09	14.340	9.56	35.22	75.72
Duality	3,058	0.187	0.390	0	0	1
Board	3,058	2.415	0.226	1.792	2.398	2.996
Indirector	3,058	0.372	0.069	0.231	0.364	0.600
ExeCom	3,058	15.13	0.751	13.24	15.139	17.15
HHI	3,058	0.186	0.162	0.023	0.145	0.927
Score	3,058	0.239	0.174	-0.031	0.201	0.734

Correlation Analysis

We use a correlation analysis to check for multicollinearity between the main variables, with the results displayed in Table 6. The correlation coefficients between Confucian culture (Confu200 and Con300) and environmental governance investment (Env) were 0.104 and 0.112, respectively, and both were significantly positively correlated at the 1% level. This indicates that, overall, Confucian

culture can, to some extent, increase corporate environmental governance investment, preliminarily supporting hypothesis 1. At the same time, the correlation coefficients between environmental governance investment (Env) and financial leverage (LEV), dual employment (Duality), and industry competition (HHI) are -0.101, 0.100, and -0.127, respectively, which are significant at the 1% level, and all conform to the logical relationship between variables. In addition, except for the correlation between enterprise size and financial leverage (LEV) and the correlation between enterprise size and executive compensation (ExeCom), which are 0.448 and 0.427, respectively, the correlation coefficients between other variables are all below 0.4, indicating that there is no serious multicollinearity problem between the variables, providing accuracy and reliability for the later empirical results to a certain extent.

Table 6: Correlation analysis of main variables

	ENV	Confu200	Confu300	AMA	FePro	Institution	State	First	Duality	Board	Indirector	ExeCom	HHI
ENV	1												
Confu200	0.104***	1											
Confu300	0.112***	0.986***	1										
AMA	-0.037**	-	-	1									
FePro	0.064***	0.054***	0.052***	-	1								
Institution	0.135***	0.543***	0.527***	0.256***	0.204***	1							
State	-	-	-	0.323***	-	-0.289***	1						
First	0.134***	0.132***	0.117***	0.152***	0.290***	-0.100***	0.228***	1					
Duality	-0.043**	-0.043**	-	-	0.102***	-	-	-	1				
Board	0.100***	0.093***	0.083***	0.130***	0.151***	0.153***	-	-	-	1			
Indirector	-	-	-	0.160***	-	-0.137***	0.294***	0.072***	-	-	1		
ExeCom	0.063***	0.079***	0.071***	0.125***	0.125***	0.242***	0.006	0.156***	0.114***	-	-	1	
HHI	-0.006	0.042**	0.034*	0.030	0.092***	0.077***	-	0.027	0.114***	0.155***	-	0.132***	0.027
Score	0.027	0.087***	0.078***	0.223***	-	0.213***	-	-0.037**	-0.018	0.132***	0.027	-	1
	0.127***	0.118***	0.111***	0.010	0.047***	0.050***	0.016	0.049***	-0.042**	-0.021	-0.020	-0.011	-
	-0.002	0.032*	0.033*	0.062***	-	-0.052***	0.083***	0.170***	-0.025	0.003	0.024	0.210***	0.008
					0.095***	-0.030							

The Influence of Confucian Culture on Corporate Environmental Governance

We begin by discussing whether Confucian culture will affect corporate environmental governance and use model (1) for multiple regression, with the results shown in Table 7. After controlling other factors, the regression coefficients of Confucian culture (Confu200 and Confu300) are 0.007 and 0.008 (t = 2.84 and 3.44), significantly related to Env at the 1% level. The results show that the greater the extent of Confucian culture, the more inclined an enterprise is to increase investment in environmental governance, verifying hypothesis 1. Among the control variables, the coefficients of Size and Env are negative and significant at the level of 1%, which indicates that as the size of enterprises increases, the proportion of environmental investment decreases, perhaps implying an economy of scale. Duality and Env are significantly and positively correlated at the 1% level, which means that listed companies with the integration of chairperson and CEO are more inclined to choose environmental governance projects for investment. ExeCom is significantly and positively correlated with Env at the level of 1%, indicating that taking appropriate incentive measures for directors, supervisors, and senior executives is conducive to promoting corporate environmental governance. HHI and Env are significantly negatively correlated at 1%, which shows that companies in less competitive industries invest less in environmental governance. As expected, Score and Env are significantly positively correlated at 1% since companies with a higher CSR score invest more in pollution mitigation. There is a significant negative correlation between State and Env at the level of 5%, indicating that non-state-owned enterprises have higher environmental governance investment as they have a different regulatory environment than state-owned enterprises. The *Indirector* variable is not significant, indicating that the independent director system does not impact corporate environmental governance.

Table 7: The impact of Confucian culture on corporate environmental governance

Variable	Model (1)	
	Env	Env
Confu200	0.007***(2.84)	
Confu300		0.008***(3.44)
Size	-0.027***(-7.83)	-0.027***(-7.80)
LEV	0.030(1.62)	0.030(1.62)
ROE	-0.030(-1.41)	-0.031(-1.42)
Growth	-0.008(-1.11)	-0.008(-1.11)
First	0.001**(2.25)	0.001**(2.28)
State	-0.018**(-2.57)	-0.018**(-2.59)
Duality	0.021***(2.70)	0.021***(2.69)
Board	-0.003(-0.22)	-0.003(-0.22)
Indirector	-0.050(-1.14)	-0.050(-1.15)
ExeCom	0.017***(3.42)	0.017***(3.40)
HHI	-0.103***(-5.32)	-0.102***(-5.29)
Score	0.073***(3.54)	0.072***(3.51)
Constant	0.392***(4.70)	0.377***(4.51)
Year	control	control
Industry	control	control
Observations	3,058	3,058
R-squared	0.078	0.079
F	7.292	7.409

Note: ***, ** and * indicate significance at 1%, 5% and 10% confidence levels, respectively, with T-statistics in parentheses.

Mechanism Research

Intermediary Effect of Environmental Responsibility Information Disclosure (ERID)

Drawing on the research of Cai, Zheng, and Wang (2021), this paper uses the "content analysis method" to construct the environmental responsibility information disclosure (ERID) index system of listed companies through 30 specific indicators, as shown in Table 8. Among them, the value of "environmental management, government supervision, and agency certification" is 1 if there is disclosure; otherwise, the value is 0; for "governance" and "environmental liabilities," the value of "no description" is 0, the value of "qualitative description" is 1, and the value of "quantitative description" is 2; for the "disclosure carrier" part, the disclosure value in the carrier is 1; otherwise it is 0; for "environmental pollution," the value is -1 if relevant events are disclosed; otherwise, the value is 0. Finally, the total ERID index score is obtained by summing up the scores of each index to measure the level of environmental responsibility information disclosure.

Model (1) regression analysis confirms a significant positive correlation between Confucian culture and corporate environmental governance. We then use model (2) to verify the correlation between Confucian culture (Confu200 and Confu300) and the ERID index. Finally, we use model (3) to test the impact of ERID as an intermediary variable on the relationship between Confucian culture (Confu200 and Confu300) and Env. As the regression results in columns (2) and (4) of Table 5 indicate, Confucian culture (Confu200 and Confu300) and ERID are significantly positively correlated at the 5% confidence level. The positive coefficients imply that companies based in areas with a stronger Confucian cultural environment have greater environmental responsibility information disclosure. The regression results in columns (3) and (5) show that the regression coefficients of Confucian culture (Confu200 and Confu300) and environmental responsibility information disclosure (ERID) are significant, indicating that there is a partial intermediary effect. Confucian culture will directly affect corporate environmental governance (coefficients are 0.006 and 0.007, respectively, and t values are 2.48 and 3.03, respectively), which can also indirectly affect corporate environmental governance through the intermediary effect of environmental responsibility information disclosure. These results show that the listed companies influenced by Confucian culture will be more inclined to reduce environmental pollution emissions, strengthen internal environmental management and environmental governance performance, and further strengthen the decision-making tendency of corporate environmental governance through enhanced environmental responsibility information disclosure. Environmental responsibility information plays an intermediary role in the influence mechanism of Confucian culture on corporate environmental governance.

Table 8: Disclosure of environmental responsibility information of listed companies

Disclosure items	Serial No	Disclosure content	Disclosure items	Serial No	Disclosure content
Environmental management	1	Environmental protection concept	Environmental liabilities	16	Wastewater discharge
	2	Environmental protection objectives		17	COD emissions
	3	Environmental protection management system		18	SO2 emissions
	4	Environmental protection education and training		19	CO2 emissions
	5	Special actions for environmental protection		20	Smoke and dust emissions
	6	Emergency response mechanism for environmental events		21	Industrial solid waste production
Government regulation	7	Environmental protection honor or award	Disclosure Media	22	Annual report of listed companies
	8	Implementation of "Three Simultaneous" System		23	Social Responsibility Report
	9	Waste gas emission reduction and treatment		24	Environmental report
Governance	10	Wastewater emission reduction and treatment	Agency certification	25	Passed ISO14001 certification
	11	Dust and smoke control		26	Passed ISO9001 certification
	12	Utilization and disposal of solid wastes		27	Key pollution monitoring units
	13	The treatment of noise pollution, light pollution and radiation pollution	environmental pollution	28	Sudden environmental accident
	14	Implementation of cleaner production		29	Environmental violations
	15	Whether the pollutant discharge meets the standard		30	Environmental petition cases

Table 9: The intermediary effect of environmental responsibility information disclosure on the relationship between Confucian culture and corporate environmental governance

Variable	Model (2) ERID	Model (3) Env	Model (2) ERID	Model (3) Env
Confu200	0.159*(1.80)	0.006**(2.48)		
Confu300			0.174*(1.96)	0.007***(3.03)
ERID		0.004***(7.54)		0.004***(7.51)
Size	1.320***(9.84)	-0.032***(-8.88)	1.322***(9.86)	-0.032***(-8.85)
LEV	2.214***(3.08)	0.019(0.96)	2.212***(3.08)	0.019(0.97)
ROE	-4.342***(-5.17)	-0.011(-0.50)	-4.342***(-5.17)	-0.011(-0.51)
Growth	-1.085***(-3.73)	-0.005(-0.65)	-1.086***(-3.74)	-0.005(-0.65)
First	0.024***(2.81)	0.000(1.61)	0.025***(2.83)	0.000(1.64)
State	0.591**(2.17)	-0.019***(-2.59)	0.585**(2.15)	-0.019***(-2.61)
Duality	0.630**(2.05)	0.016*(1.92)	0.630**(2.06)	0.016*(1.91)
Board	1.893***(3.44)	-0.012(-0.81)	1.890***(3.44)	-0.012(-0.80)
Indirector	-0.517(-0.31)	-0.038(-0.84)	-0.515(-0.30)	-0.038(-0.84)
ExeCom	-0.188(-0.98)	0.020***(3.85)	-0.187(-0.98)	0.020***(3.84)
HHI	-2.763***(-3.63)	-0.096***(-4.70)	-2.756***(-3.62)	-0.096***(-4.67)
Score	14.440***(17.63)	0.012(0.51)	14.423***(17.61)	0.011(0.48)
Constant	-31.690***(-9.70)	0.495***(5.55)	-31.985***(-9.75)	0.481***(5.38)
Year	control	control	control	control
Industry	control	control	control	control
Observations	2,849	2,849	2,849	2,849
R-squared	0.313	0.096	0.313	0.097
F	36.55	8.285	36.58	8.378

Note: ***, ** and * indicate significance at 1%, 5% and 10% confidence levels, respectively, with T-statistics in parentheses.

Adjustment Effect of Management Experience

Age gives managers more experience and maturity, which results in different values, risk preferences, work attitudes, and behavioral tendencies. Furthermore, age and experience gradually strengthen managers' moral and civic responsibility and increases risk aversion leading to more mature and rational decisions (Wang & Cheng 2014). According to Forte (2004), experienced managers take a longer-term perspective of the enterprise, no longer limiting their focus on merely financial performance but willing to assume more social responsibilities. In addition, Wu and Huang (2013) argue that more experienced managers generally have achieved economic status and social recognition in their industry due to their career development. Maintaining a good reputation is more important for them than a raise or promotion. Therefore, firms with more experienced managers will follow codes of conduct such as "virtue," "righteousness," "courtesy," "wisdom," and "trust" to maintain and enhance the reputation and market influence of the enterprise. They will consider other stakeholders and pay more attention to corporate social responsibility and environmental governance, significantly mitigating environmental pollution.

Based on the above, this study assumes that management experience positively affects the relationship between Confucian culture and corporate environmental governance. That is, the greater the management experience, the stronger the impact of Confucian culture on corporate environmental governance. To test the moderating effect of management experience on the relationship between Confucian culture and corporate environmental governance, we introduce the management experience (AMA) variable and its interaction terms with Confucian culture (Confu200×AMA, Confu300×AMA) in the regression analysis. The management experience (AMA) variable was obtained by dividing the total age of all the management personnel in the listed company by the total number of management personnel.

Table 10: The regulatory effect of management age on the relationship between Confucian culture and corporate environmental governance

Variable	(1) Env	(2) Env
Confu200	0.006***(2.78)	
Confu300		0.008***(3.43)
AMA	0.085(1.42)	0.087(1.45)
Confu200×AMA	0.111**(2.57)	
Confu300×AMA		0.099**(2.22)
Size	-0.028***(-8.02)	-0.028***(-7.97)
LEV	0.031*(1.70)	0.032*(1.72)
ROE	-0.030(-1.38)	-0.030(-1.40)
Growth	-0.007(-0.97)	-0.007(-0.96)
First	0.001**(2.34)	0.001**(2.35)
State	-0.021***(-2.94)	-0.021***(-2.97)
Duality	0.023***(2.91)	0.023***(2.88)
Board	-0.004(-0.27)	-0.004(-0.31)
Indirector	-0.053(-1.22)	-0.054(-1.23)
ExeCom	0.017*** (3.39)	0.016*** (3.33)
HHI	-0.101***(-5.22)	-0.101***(-5.23)
Score	0.072*** (3.46)	0.071*** (3.45)
Constant	0.417*** (4.76)	0.407*** (4.65)
Year	control	control
Industry	control	control
Observations	3,058	3,058
R-squared	0.081	0.081
F	7.167	7.229

Table 10 shows that the regression coefficient of Confu200 × AMA is 0.111, and the regression coefficient of Confu300 × AMA is 0.099. They are both significantly positively correlated at 1% and 5%, respectively, indicating that management experience strengthens the impact of Confucian culture on corporate environmental governance. More experienced management uses a long-term perspective in strategic planning and is more inclined to focus on corporate social responsibility and reputation. Under these conditions, Confucian culture has a more substantial impact on corporate environmental governance.

Impact of the Institutional Environment

Different regions have different resource endowments, economic policies, and trade environments, leading to variations in the extent of their marketization process, which can impact the business prospects and strategic decisions of listed companies in different regions (Luo & Du, 2014). High economic development, robust market competition, a well-functioning judicial system, public environmental consciousness, and effective media coverage of corporate actions characterize regions with a mature marketization process. Under stakeholder pressure, enterprises tend to be more environmentally responsible, mitigate environmental pollution, and increase their environmental investment (Abdul Rahman & Alsayegh, 2021). In addition, as an informal system mainly restricting enterprise behaviors through the pressure of moral consensus, Confucian culture has some limitations in its influence, strength, and scope. A more advanced formal system often means better relationships among the government, enterprises, and the market, faster development of products and factor markets, better public social services, and well-developed law-regulation systems. To some extent, these can form a complementary relationship with the normative role of Confucian culture, thus strengthening the impact of

Confucian culture on corporate environmental governance and promoting Confucian cultural ideas. Based on the above theoretical analysis, we assume that the institutional environment positively regulates the relationship between Confucian culture and corporate environmental governance. Confucian culture is more effective in promoting corporate environmental governance in regions with a more mature marketization process.

Following the research of Luo and Du (2014), this paper uses the Chinese marketization index to measure the institutional environment of the registered places of the listed companies (Wang et al., 2021). It introduces the cross-term of marketization index and Confucian culture (Confu200 × Institution、 Confu300 × Institution) to test the regulatory effect of the institutional environment on the relationship between Confucian culture (Confu200, Confu300) and Env, with the results displayed in Table 11.

Table 11: The regulatory effect of institutional environment on the relationship between Confucian culture and corporate environmental governance

Variable	(1) Env	(2) Env
Confu200	0.010***(2.94)	
Confu300		0.014***(3.95)
Institution	0.004*(1.88)	0.003(1.52)
Confu200×Institution	0.004***(3.38)	
Confu300×Institution		0.004***(3.92)
Size	-0.025***(-7.34)	-0.025***(-7.27)
LEV	0.032*(1.72)	0.032*(1.73)
ROE	-0.030(-1.37)	-0.031(-1.43)
Growth	-0.008(-1.12)	-0.008(-1.12)
First	0.001***(2.25)	0.001***(2.28)
State	-0.015**(-2.10)	-0.016**(-2.21)
Duality	0.019***(2.36)	0.019***(2.36)
Board	-0.001(-0.06)	-0.001(-0.10)
Indirector	-0.054(-1.23)	-0.053(-1.22)
ExeCom	0.015***(-2.95)	0.014***(-2.92)
HHI	-0.104***(-5.36)	-0.102***(-5.27)
Score	0.068***(-3.28)	0.067***(-3.26)
Constant	0.363***(-4.26)	0.328***(-3.80)
Year	control	control
Industry	control	control
Observations	3,058	3,058
R-squared	0.083	0.085
F	7.365	7.547

Note: ***, ** and * indicate significance at 1%, 5% and 10% confidence levels, respectively, with T-statistics in parentheses.

Table 11 shows that the regression coefficients of Confu200 × Institution and Confu300 × Institution are both 0.004, both significant at the 1% confidence level, indicating that the marketization index will strengthen the impact of Confucian culture on corporate environmental governance. Specifically, Confucian culture has a more significant impact on environmental governance when companies are in areas with a more developed institutional environment.

Robustness test

This study replaces the corporate environmental governance variables and changes the sample range to test the robustness of the conclusions.

Replacement of corporate environmental governance variables

Following the research of Hu et al. (2017), we used the natural logarithm of environmental capital expenditure plus 1 (Lenv) as an alternative indicator of the enterprise's environmental investment governance intensity to conduct a robustness test. Table 12 displays the regression analysis results using model (1). They indicate that the investment in environmental governance after replacement (Lenv) is significantly and positively correlated with Confucian culture (Confu200 and Confu300) at the 1% confidence level. This verifies the robustness of the results that the deeper the influence of Confucian culture is, the more money enterprises spend on environmental governance, which again verifies hypothesis 1, indicating that the previous research results are relatively stable.

Table 12: Robustness Test of Substitute Variables of Environmental Governance Investment

Variable	(1) Lnenv	(2) Lnenv
Confu200	0.098***(4.64)	
Confu300		0.111***(5.23)
Size	0.757***(23.86)	0.759***(23.94)
LEV	0.414***(2.44)	0.413***(2.43)
ROE	0.032(0.16)	0.029(0.14)
Growth	-0.110(-1.61)	-0.110(-1.61)
First	0.008***(3.67)	0.008***(3.73)
State	-0.159**(-2.46)	-0.162**(-2.52)
Duality	0.112(1.54)	0.112(1.54)
Board	-0.225*(-1.73)	-0.227*(-1.74)
Indirector	-0.135(-0.33)	-0.134(-0.33)
ExeCom	0.114***(2.53)	0.114***(2.52)
HHI	-0.780***(-4.38)	-0.775***(-4.35)
Score	0.683***(3.60)	0.674***(3.55)
Constant	-4.700***(-6.13)	-4.889***(-6.36)
Year	control	control
Industry	control	control
Observations	3,058	3,058
R-squared	0.352	0.353
F	46.81	47.07

Note:***, ** and * indicate significance at 1%, 5% and 10% confidence levels, respectively, with T-statistics in parentheses.

Sample Range Modification

According to the Environmental Information Disclosure guidelines for listed companies issued by the Ministry of Environmental Protection, this study divides the research samples into two categories: heavy pollution industries (mainly including 16 heavy pollution industries such as coal, mining, textile, tanning, papermaking, petrochemical industry, pharmaceutical industry, chemical industry, metallurgical industry, thermal power industry, etc.) and non-heavy pollution industries, and takes the listed companies in heavy pollution industries as the research samples to conduct robustness test through model (1). The regression results in Table 13 indicate a significant positive correlation between Env and Confucian culture (Confu200 and Confu300) at the 1% confidence level (regression coefficients are 0.010 and 0.012, respectively, and t values are 2.73 and 3.22, respectively). Consistent with the previous analysis, even limiting the sample to heavily polluting industries, there is still a significant impact relationship between Confucian culture and the environmental governance of listed companies.

Table 13: Robustness test based on heavily polluted industries

Variables	(1) Env	(2) Env
Confu200	0.010***(2.73)	
Confu300		0.012***(3.22)
Size	-0.038***(-7.74)	-0.038***(-7.66)
LEV	0.023(0.88)	0.022(0.86)
ROE	-0.061**(-1.97)	-0.061**(-1.98)
Growth	-0.006(-0.55)	-0.006(-0.55)
First	0.001*(1.78)	0.001*(1.82)
State	-0.014(-1.36)	-0.014(-1.38)
Duality	0.031***(2.71)	0.031***(2.74)
Board	-0.018(-0.85)	-0.019(-0.89)
Indirector	-0.059(-0.88)	-0.059(-0.89)
ExeCom	0.025***(3.58)	0.025***(3.54)
HHI	-0.116***(-3.38)	-0.115***(-3.35)
Score	0.090***(3.00)	0.089***(2.97)
Constant	0.493***(2.78)	0.473***(2.66)
Year	control	control
Industry	control	control
Observations	1,922	1,922
R-squared	0.087	0.088
F	7.527	7.661

Note:***, ** and * indicate significance at 1%, 5% and 10% confidence levels, respectively, with T-statistics in parentheses.

Additional Analyses

On April 24, 2014, the Eighth Session of the Standing Committee of the Twelfth National People's Congress of the People's Republic of China revised and adopted the Environmental Protection Law (EPL), which came into force on January 1, 2015. The law aims to protect the environment by limiting pollution to promote ecological civilization construction and sustainable social development. The combination of formal and informal systems may synergistically promote corporate environmental governance. We test this by dividing the sample into pre-enforcement (2010-2014) and post-enforcement (2015-2019) periods.

Table 14 displays the regression results for both periods. Before the implementation of the law (2010-2014), Env is significantly correlated with Confucian culture (Confu200 and Confu300) at 10% and 5% confidence levels ($t = 1.96$ and 2.26 , respectively). After the law's implementation (2015-2019), the correlation and regression coefficients between Env and Confucian culture (Confu200 and Confu300) increased by approximately 30%. The increase indicates that after the EPL enactment, Confucian culture's impact on corporate environmental governance is more pronounced, perhaps due to an enhanced level of civic awareness and the desire of firms to maintain their reputation.

Table 14: Confucian culture and corporate environmental governance (analysis of the difference in impact before and after legislation)

Variables	2010~2014		2015~2019	
	ENV	ENV	ENV	ENV
Confu200	0.006*(1.96)		0.008**(2.23)	
Confu300		0.007**(2.26)		0.009***(2.77)
Size	-0.026***(-5.64)	-0.026***(-5.62)	-0.027***(-5.28)	-0.027***(-5.26)
LEV	0.048**(2.07)	0.048**(2.06)	0.007(0.25)	0.007(0.24)
ROE	-0.030(-1.07)	-0.030(-1.09)	-0.041(-1.21)	-0.041(-1.22)
Growth	-0.004(-0.38)	-0.004(-0.38)	-0.011(-0.99)	-0.011(-0.98)
First	0.001**(2.01)	0.001**(2.04)	0.000(1.32)	0.000(1.35)
State	-0.013(-1.38)	-0.013(-1.40)	-0.022**(-2.07)	-0.022**(-2.08)
Duality	0.025**(2.45)	0.025**(2.46)	0.019(1.63)	0.019(1.61)
Board	-0.004(-0.21)	-0.004(-0.22)	0.002(0.11)	0.002(0.12)
Indirector	-0.031(-0.55)	-0.031(-0.55)	-0.076(-1.15)	-0.076(-1.15)
ExeCom	0.013**(1.98)	0.013**(1.97)	0.019**(2.54)	0.018**(2.53)
HHI	-0.061**(-2.25)	-0.061**(-2.24)	-0.132***(-4.79)	-0.131***(-4.76)
Score	0.053**(2.34)	0.053**(2.33)	0.102**(2.56)	0.101**(2.52)
Constant	0.397***(3.72)	0.386***(3.61)	0.387***(2.99)	0.366***(2.83)
Year	Control	Control	Control	Control
Industry	Control	Control	Control	Control
Observations	1,409	1,409	1,649	1,649
R-squared	0.067	0.067	0.091	0.092
F	3.273	3.318	5.576	5.677

Note: ***, ** and * indicate significance at 1%, 5% and 10% confidence levels, respectively, with T-statistics in parentheses.

Discussion and Conclusions

This study uses data of listed companies in Shanghai and Shenzhen A-shares from 2010 to 2019 and proxies of Confucian cultural strength to estimate the impact of Confucian culture on corporate environmental governance. We find that: (1) Similar to the results of Xu et al. 2019, Confucian culture promotes corporate environmental governance; that is, the more deeply influenced by Confucian culture, the more inclined enterprises are to participate in environmental governance; (2) Enterprises influenced by Confucian culture are more proactive in assuming corporate environmental responsibility through improved disclosure of environmental responsibility information, thereby increasing their investment in environmental management; (3) Management experience has a positive moderating effect on the correlation between Confucian culture and corporate environmental governance. Confucian culture has a greater impact on environmental governance with more experienced management teams. (4) In contrast to the results of Xu et al. 2019, Confucian culture has a more significant impact on environmental governance in areas with a more developed institutional environment. (5) In contrast to the results of Xu et al. 2019, synergies between informal and formal regulation magnify Confucian culture's effect on environmental governance. After the enactment of China's Environmental Protection Law, the effect of Confucian culture on corporate environmental governance is greater.

The conclusions of this paper have meaningful policy implications. First, Confucian culture, as an implicit governance mechanism that restrains and guides enterprise behavior, should be promoted in firms to increase environmental stewardship. Furthermore, its influence and positive effect merit learning by the managers of enterprises. Second, policymakers should strengthen corporate environmental governance information to promote social responsibility. Third, enterprises can adjust their human resources framework by hiring more experienced managers and integrating Confucian culture into their personnel training to improve corporate environmental governance. Fourth, policymakers should consider the role of the institutional environment in promoting corporate environmental governance. A higher degree of marketization strengthens the influence of Confucian culture on corporate environmental governance. Finally, policymakers can nurture the synergies between the formal and informal institutions in the market economy so that they can play a more effective role in environmental governance.

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