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Environmental Regulation and Financial Performance in China: An Integrated View of the Porter Hypothesis and Institutional Theory

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Abstract: The link between environmental regulations and financial performance has long been studied, but whether command and control environmental regulation or voluntary instruments induce better results is an unsettled question. By drawing on the Porter Hypothesis, this paper examines whether both approaches to environmental protection boost forms of environmental protection regulations that have positive impacts on financial performance. By integrating institutional theory, this study also examines whether ownership structures moderate the relationship between environmental regulation and financial performance. The results from data on 183 firms listed on the Shanghai and Shenzhen Stock Exchanges confirmed that both command and control environmental regulation and voluntary instruments positively affect financial performance. This paper also found that ownership structure strengthens the relationship between command and control environmental regulation and financial performance. The findings enrich the Porter Hypothesis and contribute to environmental research by revealing that properly designed environmental regulations have positive impacts on financial performance. By drawing on institutional theory, this study further contributes to business and management studies by confirming that the specific moderator, China's state-owned enterprises, is a crucial contributor in achieving robust financial results.

Keywords: environment management; environmental regulation; porter hypothesis; institutional theory; financial performance

1. Introduction

Since China opened its economy in 1978, rapid economic growth has led to the significant deterioration and sacrifice of the environment. During China's decades of rapid industrialization, environmental protection was not a policy priority. The nation's economic model was "growth first, clean up later", and, consequently, the severe degradation of the natural environment ensued. To that end, aware of the long-term repercussions of environmental damage, China pivoted, enacting its most stringent and highest degree of environmental protection law called the "New Environment Protection Law" in 2015 [1]. Whether environmental regulations are efficient mechanisms to achieve economic sustainability and improve firm financial performance is still being debated [2,3]. Extant studies generally confirm a link between environmental regulations and firms' performance. The underpinning mechanism of the Porter Hypothesis is that well-designed environmental regulations stimulate innovation that offsets the costs of complying with regulations and ultimately increases a firm's financial performance [4]. By drawing on economic rationale, scholars have long suggested that environmental regulations and financial performance are closely connected [5]. That is, the regulations directly drive innovation or mediate the assimilation of technology advancement and the adoption of green innovation, enabling firms to gain competitive advantages that affect their financial performance [6–8].

Although relevant studies delve into the relationship between environmental regulation and a firm's financial performance, they are impaired by two major research gaps. First, most studies on the Porter Hypothesis are primarily based on survey data. This type of data could contain serious biases, and also a paucity of research design leads to inconsistent results [9–11]. Although some studies examine the relationship between environmental regulation and financial performance with empirical data, they investigate at a national or industry level [12]. Furthermore, studies based on secondary data focus only on specific industries, such as heavily polluted industries, and a number of traditional manufacturers have not been examined [8,13]. Even though there are empirical results that prove the Porter Hypothesis, the current papers only cover short periods, such as two-year periods of data [14]. Studied together, the extant papers only provide limited results. The second research gap arises from the notion that, although the environmental regulation/financial performance linkage has been identified, the effect of the different types of environmental regulations on financial performance remains undefined [9,13,15]. Based on the Porter Hypothesis, environmental regulation spurs green innovation and ultimately results in a competitive advantage and better financial performance. Existing studies have scrutinized two types of regulation approaches: command and control environmental regulation (hereinafter called "CACER") and voluntary instruments [3]. CACER is imperative, while voluntary instruments allow flexibility in adopting or augmenting environment-friendly abilities [2]. Current studies on the potential impact of environmental regulation on financial performance have considered only a single type of regulation as a possible determinant [3]. Furthermore, to date, the research conclusions on the relationship between environmental regulation and financial performance have been mixed and inconsistent [3,16]. Some conclude that CACER has a higher positive effect on a firm's financial performance, while others argue that voluntary instruments are better [2,3,17]. On the other hand, unlike revisionists such as Porter and van der Linde (1995), who believe that environmental regulations incite continual improvement and innovation, traditional neoclassic economists highlight the negative impact of government interventions. The latter view has long argued that the uncertainty of regulatory intervention hinders investments in new products and processes, which results in reduced productivity and inhibited innovation and competitiveness [10].

To fill the void, this research poses research questions in two parts: (1) Do both the environmental regulations of CACER and voluntary instruments affect financial performance? (2) Is the relationship affected by specific moderators? China constitutes an ideal setting to find the answers. It has transitioned to a market economy from a planned economy and employs both CACER and voluntary instruments. Chinese firms tend to prioritize profit maximization and economic outcomes in a market economy and are mindful of government monitoring, complying with laws and regulations. [1,18]. Regarding environmental policy and its results as products of institutional governance, this paper focuses on the uniqueness of a firm's ownership in China [19]. The fundamentally different profiles of private firms and state-owned enterprises (hereinafter called "SOEs") give the latter certain advantages and additional roles in the economy. From 1953 to 1978, the central and local governments in China took ownership of most enterprises in order to execute development plans. Thus, active government involvement and regulated behavior characterized business operations [20]. Although many private enterprises have emerged since 1978 in China, SOEs can be seen as the main engine for economic growth and ambitions for sustainable expansion [21]. To support the SOEs' role, government intervention has ensured the allocation of resources to them and positioned SOEs at the higher tiers of the value chain. Consequently, China's SOEs have generated relatively higher profits than many private firms and spearheaded China's economic output for decades [22]. Moreover, these accomplishments have contributed to social stability through secure employment and output as they advanced the government's interests [23]. In fulfilling its assignment in long-range economic plans, China's SOEs support and implement state directives [24]. For example, SOEs not only implement government environmental responsibility (GER) for sustainable growth, but also align their strategy with the government objectives of environmental protection projects [1]. Therefore, relevant studies argue that the ownership structure in China affects competitive advantage and financial performance [19].

Taking into account the CACER, voluntary instruments, and unique business ownership structure in China's transition economy, this paper attempts to determine whether environmental regulations affect financial performance, and, if so, the circumstances in which it materializes. In particular, voluntary instruments are one of the representations of society's goals, and also can also be enforced by both state and non-state actors, which include private firms, non-governmental organizations, and government and international bodies. Unlike compulsory environmental regulations, voluntary instruments can act as incentives to firms as well as flexible tools to augment their abilities [25]. Voluntary instruments encourage firms to improve their management of solid waste and air pollution, renew production technology, and process and manufacture environmentally friendly products with the use of subsidies, environmental taxes, green practices, and several incentives [2,5]. Additionally, voluntary instruments encourage proactive investment and motivate green activities through market incentive mechanisms, which help reduce depreciation costs. Through the process, actors may gain competitive advantages and realize benefits in the long term [23,25].

The theoretical contribution of this paper is twofold. First, the results of this paper confirm that the Porter Hypothesis is applicable to China, where environmental regulations and voluntary norms are positively associated with the overall financial performance of Chinese firms. By drawing on the Porter Hypothesis, this study aims to explore the research question of whether environmental regulations affect financial performance. Unlike current studies, I gauged distinct forms of environmental protection regulations, CACER, and voluntary instruments, and investigated whether either benefit financial performance. I investigate the impact of both environmental regulations on financial performance with the archival the data of A-shares listed in the Shanghai and Shenzhen Stock Exchanges. As such, this study expands the theoretical framework of the traditional Porter Hypothesis, and the finding answers repeated calls to identify "well-designed" environmental regulations that bolster financial performance. Second, from a management research perspective, this study integrates institutional theory with the Porter Hypothesis, and a specific moderator of ownership structure is proposed to confirm the sustainable positive effects on financial performance. By drawing on institutional theory, this study addresses the moderating effects the ownership structure of Chinese firms may have on the environmental protection regulations and financial performance relationship. This is an association that very few studies have explored. Based on institutional theory, I concentrate on the unique backdrop (transition economy) and the role of SOEs in China. This paper examines whether ownership structure moderates the relationship between environmental regulations and financial performance. The findings not only identify the specific mechanism in which environmental regulation affects financial performance, but also provide a novel perspective for environmental research. When aggregated, the findings respond to the call for more environmental research and management studies on how and under what circumstances environmental regulation may promote financial performance.

In the following section, I discuss the relationship between environmental regulations and financial performance and develop hypotheses regarding, first, the effect of environmental regulations on financial performance, and, secondly, the moderating effect of the ownership structure on this relationship. I then present the data collection and study methodology, followed by the results. I conclude with the findings and implications for practice and theory. Lastly, this paper presents the limitations and future research directions.

2. Theoretical Background and Hypothesis Development

2.1. Porter Hypothesis

Environmental protection measures in economic theories can be divided into two categories in extant papers: direct measures, such as command-and-control environmental regulation (CACER), and voluntary instruments, such as economic and soft instruments [2,3]. The underlying difference between direct regulation and voluntary instruments derives from the stringency of regulations [26].

Direct regulations such as CACER have compulsory standards and requirements enacted by the government and penalties for non-compliance [5]. On the other hand, voluntary instruments such as economic motivation encourage rather than pressure firms to improve green management and eco-innovation with the use of licensing and subsidies [2]. Voluntary instruments and soft instruments include unforced communication, agreements, and investment for green procurement and efforts to reduce deterioration costs and realize benefits from this process [27].

The impact of environmental regulations on a firm's financial performance has long been studied. Economic rationale links environmental regulations and financial performance [2,3,10]. The Porter Hypothesis argues that well-designed environmental regulations can spur innovations that can lower the cost of complying with environmental regulations [4]. Since innovation decreases the cost of fulfilling environmental regulations and consequently enhances a firm's competitive advantages, firms have motivations to innovate both their products and processes [4]. Innovations to meet environmental regulations may not only reduce pollution, but may also enhance product features, including performance, safety, production cost, and resale and scrap value. Similarly, compliance with environmental protection rules can lead to more than reduced pollution. Adherence may lead to improvements in several phases, including output; downtime, due to more careful monitoring and maintenance; material savings; the utilization of by-products; recycling waste into valuable forms; and workplace conditions, as well as help to drive down handling and waste disposal costs [4].

Porter and van der Linde (1995) explain the link between environmental regulation and a firm's financial performance. Environmental regulations give firms incentives to innovate, and this leads to compliance and reduced costs. This suggests that the potential source of competitive advantage of firms is the regulations, as they can lead to better operating efficiency and productivity [2]. By stimulating green innovation, regulation ultimately benefits firms' financial performance [4,5]. Taking these outcomes into account, some studies have disaggregated the Porter Hypothesis into three versions; "weak", "strong", and "narrow" [5,9,28]. The "weak" version of the Porter Hypothesis suggests that certain kinds of environmental regulation may spur innovation [28]. The second part of the Porter Hypothesis posits that properly designed environmental regulations may stimulate innovation. The innovation can compensate for the cost of regulatory compliance, which results in productivity gains [5,28]. This "innovation offsets" effect has often been called the "strong" version of the Porter Hypothesis. The current literature verifies the underlying mechanism between environmental regulations, innovation, and business performance. Jaffe and Palmer (1997) and Lanoie et al. (2011) examined U.S. and OECD (Organization for Economic Co-operation and Development) manufacturing facilities, and the results confirm that stringent environmental regulations induce environmental R&D expenditures for developing new technologies, which in turn leads to improving the firm's productivity and performance [17,28]. The "narrow" version of the Porter Hypothesis argues that flexible and market-based incentive environmental regulations enable firms to innovate, and therefore they are better than prescriptive forms of regulations [9,28].

Ecological economics studies and environmental research, drawing on the Porter Hypothesis, confirm the link between environmental regulation, green innovation, and financial performance. Xing et al. (2020) surveyed Chinese manufacturers and discovered a relationship between environmental regulation and financial performance. The results show that the relationship is mediated by environmental commitment and the innovation of firms and confirmed the Porter Hypothesis [29]. Liu and Gu (2020) investigate how stringent environmental regulation, such as CACER, impacts financial performance by examining the green technical levels of Chinese listed firms. This paper found that environmental protection measures have a threshold effect on technical levels and argues that financial performance increases if the technical levels are high, indicating that innovation promotes financial performance [8]. Zhou et al. (2019) used 2016–18 data to test the Porter Hypothesis on whether environmental regulation impacts financial performance [7]. The results show that green innovation has a mediating effect between environmental regulation and financial performance demands, but stiffer regulation appears to have a negative impact on financial performance.

2.2. Institutional Theory

Institutional theory, defined as “the rules of the game,” states that the beliefs, goals, and actions of individuals and groups are strongly influenced by various environmental institutions [30]. Scott (1995) defines institutions as regulatory (laws and rules), cognitive (social knowledge and perception), and normative (social instruments and culture) [31]. In a similar vein, institutions are more broadly defined as formal and informal institutions [32]. Formal institutions include laws and regulatory regimes, while informal institutions include behavior and politics such as corruption, social instruments, and networks [33]. The overall condition of formal and informal institutions influences market demand and the changes that firms confront. Therefore, institutional theory has been applied to explain that firms are shaped by the home and host countries’ institutional environment [32].

In business and management studies, the institutional-based theory perspective focuses on the dynamic interaction between institutions and organizations and considers strategic choices as the outcome [33,34]. The institutional-based perspective suggests that formal institutions such as laws and regulations reduce heterogeneous behavior by firms and shape corporate social behavior as firms are put under pressure to meet social expectations [35]. From the perspective of the institutional theory, corporate behavior and responsibility also differ among countries, since it has been contextualized by the varying institutional framework [36]. In particular, how firms co-evolve with the environment of firms is the question that organizations have long been seeking; therefore, the question of how institutions affect a firm’s performance and strategic choices has long been studied along with institutional-based views [33,37]. Peng et al. (2008) argue that institutions directly determine firm’s competitive advantage, which influences the firm’s performance level. This is because the three pillars of factors—industry competition, firm-specific resources and capabilities, and the condition of institutions—enable firms to formulate and implement a strategy to create competitive advantages that ultimately affect a firm’s financial performance. In this vein, institutions are much more than the background condition of firms [34].

Although scarce, in environmental research, interdisciplinary research encompassing economics, management, and political science has attempted to apply institutional theory to environmental regulations. Environmental research also sheds light on the prominent role of institutions, since institutions coexist with and influence the outcomes of environmental issues [36,37]. From an ecological economics perspective, the condition of institutions determines the collective action and environmental resource allocation that can attain sustainable growth; therefore, institutions still matter to design principles for environmental resources [38,39]. Paavola and Adger (2005) argue that interdependence can resolve environmental issues and conflict by establishing, modifying, and redefining institutions, and ultimately balance environmental resources allocation within society and different interest parties [40]. That is, recognizing, allocating, and participating in environmental issues lead to effective resolutions; therefore, the institutions and environmental regulation cannot be treated as separate matters [38].

2.3. Hypothesis Development

2.3.1. CACER, Voluntary Instruments, and Financial Performance

The debate on the relationship between environmental regulations and competitive performance has long been argued over in the last few decades, and ecological economics suggests different perspectives [2,10]. As opposed to revisionists such as Porter and van der Linde (1995) advocating for adherence to environmental regulations, there exists the opposite view of supporting the adverse impact of environmental regulations on financial performance. The opposite perspective stems primarily from the nature of the relationship between regulation and innovation. Scholars argue that regulations and innovation appear as a “trade-off” relationship. The tighter environmental regulations lower desire for technology innovation, and vice versa, innovation is stimulated when the stringency of regulation is relaxed [2]. In the same vein, traditional neoclassical environmental economics addresses

the negative aspect of environmental regulations. The neoclassical perspectives insist that firms have to confront higher production costs and replace systems and resources while adhering to coercive environmental regulations [10]. They pinpoint that such punitive pressure and the uncertainty of regulatory intervention consequently hinder investments in new products and processes, resulting in inhibiting the innovation of firms and reducing the benefits.

Nevertheless, based on the Porter Theory, the literature highlights how environmental regulation promotes green innovation, which subsequently enhances financial performance because regulations force firms to reduce emissions and comply with society's goals [4,18,29]. In pursuit of the theoretical underpinning, several studies present empirical results about the relationship between environmental regulations and financial performance [2,3,7]. When CACER is issued, firms that fail to meet government standards and requirements may incur financial penalties such as fines and clean-up costs. Therefore, the punitive pressure behind environmental regulations can lead to compliance, spur green innovation, and increase financial performance [5,41]. Obeying CACER is imperative, with the government demanding compliance to conserve more energy and slash emissions. Thus, firms are forced into green practices to adhere to environmental regulations and avoid punitive government action [25]. Albertini (2013) conducted a meta-analysis of 52 studies over a 35-year period and found that stringent environmental regulations have positive impacts on financial performance. This is because firms better understand the concept of environmental management when they are under pressure to comply with regulations. The heightened awareness transformed into a competitive advantage, such as energy-saving cost reduction or developing less-polluting processes [42]. Liu and Gu (2020) also argue that strong environmental regulation positively influences financial performance. By drawing on the Porter Hypothesis, this paper argues that more stringent environmental regulations have a stronger effect on improving the technical level, so the benefit arising from the technological progress can offset the environmental burden, leading to higher profits [8]. Similarly, Testa et al. (2011) surveyed the European construction sector and found that stringent and direct regulation, which is measured by inspection frequency, better impacts financial performance than voluntary instruments [2].

On the other hand, several studies claim that voluntary instruments are also effective instruments for measuring financial performance. Voluntary instruments can act as incentives to firms and also offer flexibility in choosing how to enhance their abilities [25]. Voluntary instruments encourage firms to improve the management of solid waste and air pollution; renew production technology; and process and manufacture environmentally friendly products with the use of emission-quota trades, licensing, tax breaks, and subsidies [5]. Additionally, voluntary instruments encourage proactive investment and motivate green activities through market incentive mechanisms, which helps to reduce depreciation costs. Through the process, firms can gain competitive advantages and realize benefits in the long-term [27,43].

López-Gamero et al. (2010) surveyed in Spain and investigated whether CACER or voluntary instruments influence financial performance [3]. The findings showed the latter helped raise cost efficiency and differentiation, creating a competitive advantage that positively impacted financial performance. Cai and Li (2018) confirmed voluntary instruments positively influence a firm's performance with data from surveys in China [44]. They also found that eco-innovation behavior through market pressure, customer demand, and incentives from green innovation significantly enhances firm performance. Taken together, the environmental regulations applied either by CACER or voluntary instruments may lead to positive outcomes for financial performance. Thus, I arrive at the following hypotheses, and Figure 1 shows the research model of this study.

H1a. *Command and control environmental regulation (CACER) is positively associated with a firm's financial performance.*

H1b. *Voluntary instruments are positively associated with a firm's financial performance.*

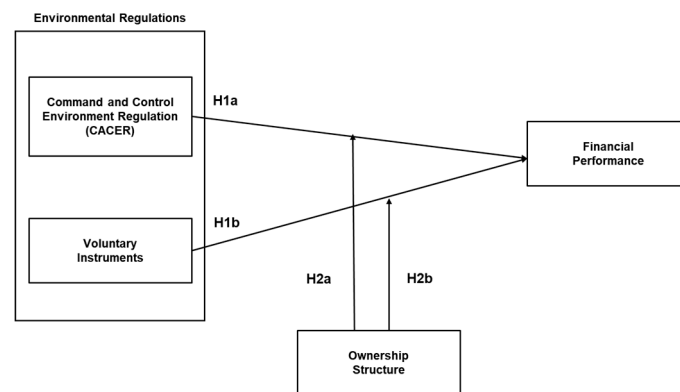


Figure 1. Research model.

2.3.2. The Moderating Effect of Ownership Structure

Based on the institutional-based perspective, ownership is one of the most salient determinants in a firm's strategic planning and financial performance [37,38]. In particular, state ownership is pivotal, since SOEs are considered standard bearers of government policy and regulations [45]. In particular, in emerging markets government agencies are the most salient institutions because they can enforce regulatory policies and control resources [45]. Governments are deemed to be actors that can dictate a firm's competitiveness and performance and, thus, their ability to survive and succeed [32,46]. Emerging markets are poorly regulated and lack formal and informal institutions such as capital markets, skills, knowledge, and resources. Therefore, the government becomes an intermediate and often intervenes in a firm's activities through economic regulations, strategic plans, policies, and financing for allocating resources [34,45].

Recent environmental papers highlight the importance of governance in the relationship between environmental regulation and institutions [12]. In environmental research, the institutional theory-based perspective broadly defines governance as forms of ownership and what the government does [38]. In particular, the state ownership of firms has significant implications for the relationship between environmental regulations and institutions, since the government body enacts, monitors, and enforces rules and regulations and may provide incentives [38,39]. Environmental governance can steer environmental outcomes and distribute the beneficial inputs derived from resources [12]. Furthermore, environmental governance determines what is being monitored and by whom. Legislation, compliance, and inspection can be endowments from the government to implement environmental laws and regulations [38]. From this perspective, governance can mold the framework for institutions' regulations by creating a system of checks, balances, and transparency.

Based on the institutional-based perspective, since governments and SOEs align, support, and implement environmental regulations, normative institutions can be pivotal factors that can be used by the government in addition to regulatory forces in motivating firms to implement environmental regulations [1]. Accordingly, it is noteworthy that the majority of the listed firms are owned and controlled by the local and central governments. Although the governments privatized SOEs through economic reform, they still support SOEs with substantial means endowments [44]. For the last few decades, China's SOEs have become the center of attention in government economic activities and become its spearhead in implementing key strategies for economic development [47]. SOEs align their operations to government goals and also pressure firms on behalf of the government. The Party's SOEs policy mandated government support of strategic industries and infrastructure creation [48].

In particular, China's "New Environment Protection Law" in 2015 aimed at curbing air pollution and monitoring firms for pollution. Implementing green practices and environmental regulations is being accepted as one of the obligations to sustain businesses for the local and central government in China [1]. Under China's New Environment Protection Law, central and local governments implement green environmental practices and government environmental responsibility (GER) measures for

sustainable growth. [1]. The Chinese government is also seeking to boost scientific innovation in new technology, green technology, energy saving, and the environmental protection industry, which have been highly encouraged since 2010 [49].

SOEs tend to respond to government calls to implement green practices and take more green measures because the government directly supervises and regulates SOEs [50]. The behavior of SOEs results in higher competitiveness and financial performance, and empirical results have also confirmed that SOEs' green practice implementation affects financial performance [7,50]. Zhang et al. (2017) investigated the relationship between green innovation and a firm's financial performance. The results show that green innovation boosts financial performance, especially among SOEs, as they have more green patent applications than non-SOEs. Zhang et al. (2017) explain that this may be due to the fact that the Chinese government provides incentives to SOEs under the environmental regulations, and this encourages green innovation and enhances financial performance [50]. Hence, I hypothesize that:

H2a. *The ownership structure of firms strengthens the relationship between command and control environmental regulation and the firm's financial performance.*

On the contrary, although scarce, some papers maintain the skeptical view of a positive link between government intervention and competitiveness. As noted, the nature of regulation stringency may stifle innovation. Existing studies argue that bureaucracy with control and regulation lowers the creativity of environmentally friendly technology innovation, which leads to a higher chance of non-compliance with environmental regulations and suppresses financial performance [51]. Furthermore, the interconnectedness between voluntary instruments and government may not function properly for innovation and competitiveness. Yi et al. (2020) verified that the government environmental regulations of voluntary instruments are not conducive to improving green innovation in China. Voluntary instruments such as government subsidies tend to go to low-end industries that are relatively small, and those firms focus more on profits than innovation. Thus, they tend to have less impetus to carry out green innovation. Government subsidies tend to use these for improving productivity rather than creating green innovation technology such as energy saving and emission reduction [52]. Additionally, the reliance on voluntary instruments such as subsidies and economic incentives provided by the state not only causes rent-seeking but also leads to inefficient administrative measurement. The idiosyncratic cycle in the long run virtually hinders green innovation [52]. Thus, this paper posits the following hypothesis:

H2b. *The ownership structure of firms weakens the relationship between voluntary instruments and the firm's financial performance.*

3. Data and Methods

3.1. Research Setting

China's legislation introduced the first amendments to its environmental protection law in 1989. Twenty-five years after the law was first enforced, the Chinese government inaugurated the "New Environmental Protection Law" in 2015 and employs stricter penalty requirements and monitoring systems to promote sustainable development [1]. This action includes both CACER and voluntary means, such as environmental inspection, regulation supervision, infrastructure investment, providing economic incentives, and subsidies. To be specific, according to clauses 24 to 26 and clauses 42 to 49, the state shall not only supervise construction projects but also prohibit the implementation of projects after the scrutinization of the degree of ecological hazard. The state may impose penalties and fines on illegal discharge or the waste discharge of pollutants. The assessment is implemented on a daily basis, and Chinese firms must pay any fines for waste discharge within 15 days of assessment by environmental protection authorities. The state shall provide extensive economic incentives to Chinese firms that engage in corporate environmental responsibility (CER) and green activities such as contaminated facility replacement, the recycling of resources, and ecological preservation projects.

The regional disparities and the role of local governments are salient factors influencing environmental regulation implementation in China. When central and local governments enforce actions, the varying degree of economic development in China influences the behavior of local governments and SOEs toward environmental responsibility and green activities. For example, some especially polluted areas in China are subject to strict government monitors and are affected by environmental regulations [1]. The east is the most developed but is highly polluted, therefore it is more motivated to enforce stricter environmental regulations [1,53,54]. This not only affects regional economic development but also affects the company's green consciousness, as well as the environmental awareness of the government [42].

3.2. Sample and Data Collection

To collect the sample, referring to the research methodology of Jiang et al. (2019), I applied mixed methods combining qualitative and quantitative research. The firm's financial data were collected from each firm's annual report, as well as the China Statistical Yearbook (<http://www.stats.gov.cn/english/Statisticaldata/AnnualData/>) and the Thomson Reuter database.

The panel data were collected using the following procedures. First, I obtained corporate financial indicators (e.g., total assets, debt ratio, annual fees for waste discharge, EBITDA) from each firm's annual report, and the Thomson Reuter database. To collect the macro-level variables for each city's GDP and population, I collected this data from the China Statistical Yearbook. Additionally, I obtained the information regarding each firm's ownership status, firm size, and firm age from the Thomson Reuter database. Secondly, I obtained the voluntary instrument figures by examining descriptive research in examining the literature and corporate social responsibility report. I identified the firm's green activities and green investments they had during the years from 2013 to 2017. Finally, through this process, comprehensive voluntary instrument data, including subsidies and green investments, were collected from each firm's annual report. Referring to the research of Zhou et al. (2019) and Jiang et al. (2019), I selected samples after excluding the sample enterprises with abnormal financial conditions (Special Treatment, ST) for more than two years and eliminating the financial industry sample enterprises [13,45]. I further excluded samples that had neither CACER nor voluntary instruments between 2013 and 2017. In total, the dataset consists of a panel data of 915 from 183 firms.

3.3. Measures

3.3.1. Dependent Variable

As a common measure of financial performance, ROA (return on asset) is used for the dependent variable. ROA is the ratio of net income to the total asset ($ROA = \text{net income} / \text{total asset}$). Many studies use ROA, ROE (Return on Equity), or Tobin's q to measure financial performance [15,42]. However, Albertini (2013) and Zhou et al. (2018) argue that ROA is an appropriate indicator for green studies to measure business performance. This is due to the ROA reflecting the firm's intrinsic values showing the impact of a firm's resource utilization on expected returns rather than reflecting the organizations actions from external impacts [7,15]. Therefore, this paper employs ROA in a given year of a firm and logarithmically processed [7,8,12].

3.3.2. Independent Variable

CACER includes compulsory standards and prohibitions such as the penalty or fines on waste discharges imposed by environmental protection authorities [2]. Following the conventional approach, I measured CACER as an annual fee on waste discharge and collected the data through the annual reports of environmental protection enforcement that results from inspections [55,56].

Voluntary instruments indicate environmental duties as well as market-based means, such as economic incentives, subsidies, and green facility investments and replacement [2]. To collect data on voluntary instruments, I gauged variable funding, green investment, and incentives from the local

governments [2,12]. The indicators for voluntary instruments are the contributions from the public sector and the funding for environmental sustainability projects [12]. Green facility investments and replacements are largely aimed at improving energy efficiency, air pollution abatement, and water treatment [5]. Green subsidies and incentives are economic incentives from local governments that participate in environmental sustainability projects, such as green-sky projects. To determine environment-related government subsidies given to firms, this paper relied on the firm's annual reports and social responsibility report [12,13]. When neither government subsidies nor green investments exist, "0" is computed [13]. Both independent variables were logarithmically processed [12,13].

3.3.3. Moderating Variable

The moderating variable is the ownership structure of firms in China. As noted, China's firms can be divided into SOEs that are controlled by central and local governments, and private enterprises. This paper posits that the ownership structure may influence the relationship between environmental regulations and financial performance. To explore the moderating effect of the ownership structure on this relationship, this paper sets a dummy variable. The computed ownership has dummy variables—"1" for state-owned enterprises and "0" for private enterprises, and the interaction terms of CACER*Ownership and VI (voluntary instruments)*Ownership were computed before the hypotheses were tested [45].

3.3.4. Control Variables

I controlled several factors that could affect the dependent variable. At the firm level, I controlled the firm size, firm age, and debt ratio, since the firm's financial status and age would affect the dependent variable [13]. Firm size and firm age are measured by the number of employees of the local firms in a given year and the firm's operating age, respectively [25]. The debt ratio is measured with the ratio of total debts to total assets for the firm in a given year [57].

At the macro level, I controlled each city's GDP (Gross Domestic Product) and population to show the degree of economic development. Samples were collected from the China Statistical Yearbook [58]. Considering the large difference of variables among firms, the variables were logarithmically processed to reduce the discreteness and heteroscedasticity [13].

4. Results

4.1. Descriptive Statistics

The descriptive statistics and correlations between variables are reported in Tables 1 and 2. The variables include ROA, the amount of CACER, the number of voluntary instruments (VI), ownership, debt ratio, firm size, firm age, city GDP, and city population. As noted earlier, the sample consists of 915 observations from 2013 to 2017. The mean (median) of CACER and VI is 15.0960 and 16.5044, respectively, indicating that the paying amount of both environmental regulations in China firms are similar. Interestingly, however, the maximum amount of CACER and VI varies by Chinese firms. The maximum of VI is higher than CACER, while the minimum of CACER is higher than VI. The results indicate that the degree of VI is polarized among Chinese firms.

Table 1. The descriptive statistics of variables.

Variables	Observation	Mean	SD	Min	Max
ROA	915	22.6493	1.26953	19.58	27.08
CACER	915	15.0960	1.73668	8.55	19.98
VI	915	16.5044	2.51329	2.77	22.71
Ownership	915	0.42	0.526	0	3
Debt ratio	915	−0.8057	0.58372	−4.16	−0.22
Firm size	915	8.2503	1.18076	4.06	11.81
Firm age	915	2.8058	0.31368	1.39	3.43
City GDP	915	17.1791	1.12262	14.06	19.46
City population	915	6.0592	0.87142	2.77	8.13

Note: N = 915; whole sample from 2013 to 2017; CACER, Voluntary Instruments, ROA, and debt ratio, Yuan RMB; city GDP and population; billions of RMB and people; firm size, no. of employees. Abbreviation: ROA, return on assets; CACER, command and control environmental regulation; VI, voluntary instruments.

Table 2 shows the Pearson correlation results of all the variables. Most of the values of correlation are below 0.50, which indicates strong multicollinearity among variables is not a serious concern. However, the correlation between several variables is above 0.50 in Table 2. Therefore, I implemented a multicollinearity test and reported the results in Table 3. The highest variance inflation factor (VIF) of 3.048 in all regression was below the threshold of 10; therefore, there is no serious issue of multicollinearity [59].

Table 2. The correlation results of all variables.

	1	2	3	4	5	6	7	8	9
1 ROA	1								
2 CACER	0.599 **	1							
3 VI	0.457 **	0.317 **	1						
4 Ownership	0.315 **	0.229 **	0.308 **	1					
5 Firm size	0.827 **	0.558 **	0.410 **	0.302 **	1				
6 Firm age	0.051 **	0.033	0.067 *	0.102 **	0.028	1			
7 Debt ratio	0.436 **	0.290 **	0.339 **	0.261 **	0.432 **	0.105 **	1		
8 City GDP	0.153 **	0.023	−0.167 **	−0.170 **	0.074 *	0.019	0.031	1	
9 City population	0.050	−0.049	−0.176 **	−0.132 **	0.004	0.049	0.007	0.804 **	1

Abbreviation: ROA, return on asset; CACER, command and control environmental regulation; VI, voluntary instruments. * $p < 0.05$ ** $p < 0.01$.

4.2. Hypotheses Testing Results

This paper used hierarchical regression for hypotheses tests. Step-by-step I included the variables. Model 1 includes control variables. Model 2 includes the independent variable of CACER and shows the test result of Hypothesis 1a. Model 3 includes the independent variable of voluntary instruments and shows the test results of Hypothesis 1b. Model 4 tests Hypothesis 2a, which shows whether the ownership moderates the relationship between CACER and financial performance. Model 5 tests Hypothesis 2b, which reports whether ownership moderates the relationship between voluntary instruments and financial performance.

Hypothesis 1a states that CACER has a positive impact on financial performance, and Model 2 examined the relationship between CACER and financial performance. The results from Model 2 in Table 3 show that CACER has a positive relationship with financial performance ($\beta = 0.141, p < 0.01$), therefore, Hypothesis 1a is supported.

Hypothesis 1b states that voluntary instruments have a positive impact on financial performance. The results from Model 3 in Table 3 show that VI is positively associated with financial performance ($\beta = 0.079, p < 0.01$); hence, Hypothesis 1b is supported.

Hypothesis 2a states that the ownership structure of firms strengthens the relationship between CACER and the firm's financial performance. In the test results from Model 4 in Table 3, it is shown that the coefficient of the interaction term (CACER * ownership) is significantly positive ($\beta = 0.012, p < 0.01$), which indicates that ownership structure positively moderates the relationship between CACER and financial performance. Accordingly, Hypothesis 2a is supported.

Hypothesis 2b states that the ownership structure of firms weakens the relationship between voluntary instruments and the firm's financial performance. As shown in Model 5 in Table 3, the coefficient of the interaction term (VI * ownership) is significantly positive ($\beta = 0.011, p < 0.01$), which indicates that ownership structure positively moderates the relationship between VI and financial performance. The result is at odds with the hypothesis; therefore, Hypothesis 2b is not supported.

Table 3. Hypotheses testing results.

Dependent Variable	ROA									
	(1)		(2)		(3)		(4)		(5)	
	Beta (t-Value)	VIF	Beta (t-Value)	VIF	Beta (t-Value)	VIF	Beta (t-Value)	VIF	Beta (t-Value)	VIF
Control variable										
Firm size	0.832 ** (38.354)	1.245	0.723 ** (30.192)	1.655	0.771 ** (34.455)	1.382	0.704 ** (29.263)	1.712	0.755 ** (33.444)	1.429
Firm age	0.084 (1.145)	1.015	0.072 (1.021)	1.016	0.023 (0.318)	1.013	0.048 (0.684)	1.023	−0.001 (−0.010)	1.020
Debt ratio	0.207 ** (4.724)	1.243	0.182 ** (4.338)	1.248	0.134 * (3.053)	1.276	0.160 ** (3.802)	1.269	0.116 * (2.662)	1.289
City GDP	0.181 ** (5.227)	2.872	0.167 ** (5.024)	2.878	0.220 ** (6.364)	2.999	0.187 ** (5.617)	2.940	0.237 ** (6.875)	3.048
City population	−0.122 ** (−2.729)	2.862	−0.092 * (−2.157)	2.878	−0.118 * (−2.668)	2.960	−0.098 * (−2.302)	2.881	−0.125 * (−2.836)	2.964
Main Effect										
CACER			0.141 ** (9.181)	1.469			0.131 ** (8.560)	1.500		
VI					0.079 ** (7.705)	1.323			0.069 ** (6.620)	1.400
Moderating effect										
CACER * ownership							0.012 ** (4.152)	1.244		
VI * ownership									0.011 ** (4.002)	1.276
Model statistics										
R ²			0.728		0.722		0.733		0.727	
F value			84.287 **		59.368 **		17.236 **		16.018 **	

Note: t values are in parentheses, * $p < 0.05$ ** $p < 0.01$. Hierarchical regression is used to test the hypotheses. Abbreviation: ROA, return on asset; CACER, command and control environmental regulation; VI, voluntary instruments.

4.3. Endogenous Analysis

To validate the findings, an endogeneity analysis was conducted. Independent variables of CACER and voluntary instruments are contextualized by the state [25]; therefore, there is a likelihood of having endogenous problems in the research model. This problem is resolved by introducing an instrumental variable and using two-stage least squares (2SLS) regression [8,13]. As noted earlier, referring to the point of view of Wong et al. (2018) and Chen et al. (2017), it is obvious that the degree of environmental regulation implementation correlates to regional disparities between Eastern China and other areas [1,53]. Accordingly, the home regions of firms were selected to be the instrumental variable for the independent variables. I used a dummy variable of regional difference with “1” for the Eastern and “0” for the Central and Western regions. The 915 of original raw data were used. As shown in Table 4, the result of 2SLS supports the original hypotheses, which indicates that endogeneity is not a serious concern.

Table 4. The 2SLS (two-stage least squares) regression for endogenous test.

Instrumental Variable	Regions		
	(1)	(2)	(3)
	Coeff. (z-Value)	Coeff. (z-Value)	Coeff. (z-Value)
Control variable			
Firm size	2638 ** (46.62)	1761 ** (6.94)	2348 ** (15.30)
Firm age	-1.35×10^8 (-0.89)	-5.32×10^7 (-0.41)	-6.22×10^8 * (-2.06)
Debt ratio	6.99×10^9 * (1.97)	8.91×10^9 ** (2.90)	-5.14×10^9 (-0.70)
City GDP	89.940 ** (5.69)	93.341 ** (6.90)	78.561 ** (3.56)
City population	-3904 * (-1.66)	-4259 * (-2.13)	3710 (0.79)
Independent variable			
CACER		423.137 ** (3.52)	
VI			55.986 * (2.20)
Model Statistics			
R ²	0.767	0.830	0.571

Note: z values are in parentheses, * $p < 0.05$ ** $p < 0.01$. Abbreviation: CACER, command and control environmental regulation; VI, voluntary instruments.

4.4. Robustness Test

I undertook further checks for robustness by adopting alternative estimations. First, I used an alternative sample to rule out the possibility that the large size of the sample is biased to effectively confirm the hypotheses. Hence, I focused on a smaller sample. Since environmental regulations may spur green innovation, which affects firm financial performance [4], I screened the initial data and used firms that had green patent applications such as ISO 14001, eco-label product certification during the period 2013 to 2017 [57]. The data on patent applications by firms were collected from the China National Intellectual Property Administration (<https://www.cnipa.gov.cn>). As a result, 425 data sets from 80 firms were used for the robustness test. Secondly, I changed the performance measure and used the dependent variable as EBITDA normalized instead of ROA during the period 2013–2017 [15]. Finally, I used the fixed-effect model to test robustness. According to Bramati and Croux (2007) and Jiang et al. (2019), the fixed-effect model is less sensitive to outliers and appropriate to test panel data [13,60]. In addition, the results of the Hausman test shows that the p-value is less than 0.01 (Prob > chi2 = 0.0062), which further supports the use of a fixed-effect model. The raw data were used, and I mean-centered independent variables and moderating variables before computing terms to reduce multicollinearity concerns.

The results of the robustness tests are shown in Table 5. The results show that Hypotheses 1a, 1b, and 2a are significantly positive, and the Hypothesis 2b is negative significant. All the hypotheses are supported in the robustness check, thus, the strength indicated in the initial results was confirmed.

Table 5. The result of the robustness test.

Dependent Variable	EBITDA				
	(1)	(2)	(3)	(4)	(5)
	Coeff. (t-Value)	Coeff. (t-Value)	Coeff. (t-Value)	Coeff. (t-Value)	Coeff. (t-Value)
Control variable					
Firm size	−0.037 (−1.44)	−0.064 * (−2.42)	−0.024 (−0.98)	−0.069 ** (−2.64)	−0.024 (−0.99)
Firm age	113.222 ** (2.68)	102.345 * (2.48)	99.951 * (2.47)	112.768 ** (2.76)	89.934 * (2.24)
Debt ratio	−2139.905 ** (−3.02)	−2235.985 ** (−3.23)	−2004.611 ** (−2.95)	−2175.075 ** (−3.18)	−1805.602 ** (−2.68)
City GDP	0.000 ** (4.52)	0.000 ** (3.50)	0.000 ** (4.67)	0.000 ** (3.13)	0.000 ** (4.74)
City population	−2.248 (−0.44)	−2.002 (−0.40)	−3.959 (−0.81)	−2.077 (−0.42)	−2.582 (−0.53)
Main Effect					
CACER		17.221 ** (4.18)		15.011 ** (3.63)	
VI			1.431 ** (5.54)		4.144 ** (4.57)
Moderating effect					
CACER * ownership				21.822 ** (3.08)	
VI * ownership					−7.336 ** (−3.12)
Model statistics					
Prob > F	0.000	0.000	0.000	0.000	0.000

Note: t values are in parentheses, * $p < 0.05$ ** $p < 0.01$. Fixed-effect model is used. Abbreviation: EBITDA, Earnings Before Interest Tax Depreciation and Amortization; CACER, command and control environmental regulation; VI, voluntary instruments.

5. Practical Implications

Among environmental studies, the type of regulation that is best in spurring innovation and higher financial performance has been long debated. Underlying the debate is the fact that drivers are needed to achieve effective results, but studies on specific stimulants have received little attention [61]. By drawing on institutional theory, the results imply that institutions may be the factor that invigorates the effectiveness of environmental protective measures. Institutions determine a firm's social behavior, provide stability, and steer corporate growth, particularly with emerging economies, which generally have weak regulatory frameworks [34]. Among various institutions, the findings indicate that ownership structure is especially impactful in strengthening the relationship between environmental regulations and financial performance. However, this novel perspective is based on the unique context of China's ownership structure. Considering the different institutional environment among countries, policy makers obviously need to be aware that the effect of corporate governance in their nation may not be the same as in China.

Ownership structures among countries are quite heterogeneous. Firms in developed markets tend to be privatized, while those in emerging economies are primarily state-controlled. Some studies report that centralized ownership structures and SOEs enhance financial performance, particularly in emerging markets such as China, since they are more relevant to the state's policy. The Chinese government's intervention in pollution control is more forceful than other countries, and China's SOEs are central to environmental protection policies [1,45,58]. Other studies argue that dispersed ownership is more beneficial to financial performance since market-based capabilities more significantly drive a firm's performance [34]. Therefore, policy makers in all types of countries need to realize that appropriate variables need to be identified and considered in accordance with institutions.

6. Conclusions

The question of whether environmental regulation affects financial performance has long been studied, but no overriding conclusion has emerged [9,25]. This paper draws on the Porter Hypothesis and institutional theory and attempts to verify whether environmental regulations influence financial performance and if ownership structure moderates the relationship between environmental regulations and financial performance. Unlike many papers relying on survey data, this study empirically tests the A-Shares listed on China's Shanghai and Shenzhen Stock Exchanges from 2013 to 2017. I gauge two types of environmental regulations, CACER and voluntary instruments, according to economic rationale, and test ownership as a moderator. This study confirms that both environmental regulations are positively associated with financial performance. This paper also finds that ownership positively moderates the relationship between CACER and financial performance. Based on the findings, I suggest the following theoretical contributions.

First, this paper enriches the theoretical underpinning of the Porter Hypothesis by identifying the mechanism in further detail. Unlike current studies that explore the impact of one type of environmental regulation, this paper attempted to gauge both environmental regulations and examine the relationship between them. It is interesting to note that the findings demonstrate that both environmental regulations CACER and voluntary instruments have positive impacts on financial performance. The results illustrate that a top-down approach, CACER, can promote enough competitiveness to affect financial performance. Considerable evidence suggests that stringent CACER practices may not function well enough to improve financial performance. The empirical results that were examined in developed countries, such as the U.S. and countries in Europe, particularly have supported this perspective [62,63]. However, the contradictory results of this paper show that CACER not only activates the improvement of resources in terms of technical competence but also realizes green business opportunities [2]. Stringent environmental regulations may be particularly effective in China because the nation's implementation of CACER is based on environmental protection laws and government monitoring agencies. The government has initiatives which motivate firms to adopt

CACER practices [1]. Taken together, the findings may show that the direct application of government regulations is a significant determinant for a green system to boost financial performance.

Second, based on the Porter Hypothesis, this paper further confirmed that the effect of voluntary instruments on financial performance is also positive. This finding shows that flexible environmental regulations and market-based voluntary instruments, such as subsidies and green investments, function properly and ultimately lead to competitiveness. China has strived to make marketization and incremental transition changes to institutional models. Among the Chinese firms who have adapted to the marketization and incentive mechanism, voluntary instruments are likely to encourage a green system that affects financial performance [18]. The findings are also congruent with the viewpoint of extant studies. Government policy generally employs performance-based standards that are inefficient in directing the allocation of resources and are unlikely to be cost-effective [3]. However, the voluntary instruments adopted under the proactive technique encourage green practices and provide the firm with flexibility [2,3]. Thus, traditional economists have long advocated that market-friendly policy tools with high efficiency and flexibility for expenses such as taxes, subsidies, and emission trade are effective in developing a green system that ultimately raises financial performance [61]. Overall, the results prove that voluntary instruments, a market-based system, positively influence financial performance.

The aforementioned findings are valuable, since scholars have long argued over which types of environmental regulation and which version of the Porter Hypothesis is more beneficial to a firm's competitiveness and financial performance [10]. This study confirms that adopting both stringent and voluntary instruments simultaneously can have a positive impact on financial performance. Scholars have argued over which environmental regulations are more impactful on financial performance; however, this study shows that the design of regulations matters. Revisionists such as Porter and van der Linde (1995) claim that "well-designed" environmental regulations can promote a firm's competitiveness and financial performance, while traditional economists oppose government intervention, arguing that market-based regulations are more beneficial than command and control approaches. They advocate the "narrow" version of the Porter Hypothesis [4,10]. In the meantime, some scholars have argued that the desirability of relying more on CACER and applying voluntary instruments to promote green practice development has attracted studies [64]. In line with Thornoto et al. (2009), the findings clearly illustrate that coercive environmental regulation and flexible regulations function simultaneously, and demonstrate that properly designed environmental regulation can benefit a firm's financial performance [65]. When coalesced, the findings not only deepen the academic understanding of environmental regulation but also expand the theoretical framework of the Porter Hypothesis.

Finally, this paper contributes to broadening the literature on environmental research and business and management studies. By integrating the Porter Hypothesis and institutional theory, this paper explored the moderating effect of ownership structure in this relationship. The results present the circumstances in which the relationship between environmental regulation and financial performance is spurred and fortified. That is the academic contribution of the paper. There is a scarcity of current environmental literature that examines the moderating role of ownership structure from an institutional theory-based perspective. The findings confirm that the ownership structure of firms, SOEs, positively moderates the relationship between command and control environmental regulation and financial performance. The results imply that environmental regulations and financial performance are not detached from the background of firms, which suggests that independent environmental behaviors are driven by institutions such as the ownership structure [45,64]. The finding also implies that China's SOEs are the vanguard of implementing environmental regulations, and the environmental responsibility behavior of SOEs positively affects financial performance. This finding is somewhat consistent with the results of existing studies [19,45,64]. Ali et al. (2019) confirmed that the performance of SOEs in China is more strongly related to environmental and social responsibility, since they are more socially responsible than non-SOEs. This is due to the fact that SOEs are pivotal in adopting green practices that exemplify China's commitment to curb environmental damage [19]. Clò and

Massimo Florio (2017) also suggested the positive effect of public ownership on environmental business performance in European electricity industries. This paper argues that government control and regulations cannot only create economic incentives to improve environmental quality but also compensate firms when achieving societal expectations. In contrast to the perspective that government intervention may function in developing countries based on the institutional-based perspective, it is noteworthy that recent literature provides evidence that efficient bureaucracy with control power may yield benefits in mitigating environmental damage as well as business performance in both developed and developing countries [51]. In conclusion, the results provide a new approach to environmental research which helps to expand the academic understanding of environmental regulations.

7. Limitations and Future Directions

This paper is not without limitations. From a methodological perspective, although this paper refers to the methodologies such as the fixed-effect model, it would need to be applied to econometric models to convey a more in-depth analysis of panel data. One way to eliminate concerns about methodological limitations would be analysis through econometric models. In line with the empirical results of recent papers [66], future studies could adopt more detailed econometric methodologies. To be specific, by examining and presenting the comparison results between the fixed-effect model and Panel Fully Modified Least Squares (FMOLS) and Panel Dynamic Least Squares, an in-depth understanding of link between variables and a firm's financial performance will emerge.

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