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How Environmental Regulation Affects Green Investment of Heavily Polluting Enterprises: Evidence from Steel and Chemical Industries in China

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Abstract: Environmental protection is the top priority in the development process of all countries in the world, which directly affects public health. In response to growing environmental challenges, the government is implementing increasingly stringent industry supervision and environmental regulations. However, the impact of environmental regulation on investment has not formed a unified conclusion, and few studies have discussed this effect at the micro-enterprise level. This paper uses multiple regression analyses to investigate the effect of environmental regulation on green investments of heavily polluting enterprises in China. Using the data of listed companies in the steel and chemical industries of the Shanghai Stock Exchange and Shenzhen Stock Exchange, we find that the increasing intensity of government environmental regulation will inhibit green investments of heavily polluting enterprises. This paper further classifies the property rights of these enterprises and discusses the role of regional environmental quality. From the perspective of property rights, increased government environmental supervision will inhibit green investments of state-owned enterprises (SOEs) and promote green investments of non-state-owned enterprises (NSOEs). From the perspective of the environmental quality of the region where the company is located, government environmental regulation will inhibit green investments of heavily polluting companies, regardless of the regional environmental quality. This paper not only provides new empirical evidence about the steel and chemical industries for Porter’s hypothesis, but also compensates for the lack of research on the impact of environmental regulation on corporate green investment at the micro-level.

Keywords: environmental regulation; industrial development; green investment; heavily polluting enterprises; low-carbon transformation

1. Introduction

In the past few decades, high-carbon industries represented by the steel and chemical industries have made great contributions to China’s economic growth. It is well known that the steel and chemical industries are very important to the national economic development system. Compared with other industries, these industries are large scale, have high productivity and energy consumption, and are heavily polluting. Although their development can drive other related industries, the damage to the environment is serious. For example, China’s atmosphere was seriously affected by pollution, resulting in severe haze weather around 2011, and a large number of harmful substances, carbon dioxide, carbon monoxide and other emissions have caused serious harm to public health, attracting global attention to China’s environmental issues [1]. Therefore, it is urgent to take certain measures to deal with the environmental issues [2]. This is not only related to environmental quality, but also has some impact on public health [3] and human affective responses [4]. Hamaguchi (2021), who considers human capital in relation to education and health, shows a non-monotonic relationship between environmental policies and economic growth [5].
As the world’s highest level environmental decision-making body, the United Nations Environment Assembly is held every two years, convincing the Chinese government to attach great importance to environmental governance. With the requirements for quality of life, more and more people gradually realize that air pollution has greatly increased the cost of environmental governance and greatly hindered economic growth. Some diversified environmental regulation policies to deal with regional pollution control urgently need to be put forward. Whether the effect of reducing pollution can be achieved by strengthening environmental regulation and promoting economic development is gradually being explored. Liao et al. (2021) [6] pointed out that ignoring the environment and focusing only on short-term economic growth will have serious consequences.

Faced with the significant increase in public attention to the environment, companies are under enormous pressure [7]. However, it is not something that can be accomplished overnight for enterprises to address the environmental issue. There are two factors that may restrict their progress. First, enterprises need to make additional investment, which will restrict the realization of their short-term profit-seeking goals. Under the financial goal of maximizing corporate operating profit and shareholder value, companies have not generated a large investment motivation for governance projects. Second, the strong externality of pollution will limit the effect of environmental governance when an enterprise reduces pollution while surrounding enterprises do nothing. At this time, the pressure of the public cannot be relieved. Therefore, government intervention is needed when dealing with externality-induced market failures, also known as environmental regulation.

Therefore, the government has put the protection and supervision of the ecological environment on the agenda in recent years [8]. With the increasing social attention caused by environmental pollution and industrial excess capacity, traditional high-carbon industries encounter conflicts between development and environmental governance [9,10]. In January 2019, “Notice on Doing a Good Job in the Compilation of Carbon Emission Report Verification and Emission Monitoring Plan in 2018” requires key industries, such as the steel and chemical industry, to carry out the reporting of emission data of companies in 2018, providing a data basis for carbon emission quota allocation and enterprise performance. On 11 November 2021, the Chinese President gave a speech on “Adhering to Sustainable Development and Building an Asia-Pacific Community with a Shared Future” at the APEC Business Leaders Summit. He pointed out that “green and low-carbon transformation is a systematic project, which must be coordinated and promoted as a whole. Without development, we can’t gather the economic power of green transformation. Ignoring people’s livelihood will lose social support for green transformation. We should accurately understand the concept of sustainable development, adhere to the people-centered principle, and achieve greater development in green transformation”.

The above environmental policies and systems reflect the urgency and importance of environmental governance. The environmental efficiency of pollution-intensive companies is low, and a few have even become a burden on the industry [11,12]. These make steel and chemical companies face increasingly strict industry and environmental regulations. The government’s mandatory environmental protection regulations force iron and chemical enterprises to invest a lot of resources in their daily production and operation activities to reduce the discharge of pollutants. In order to meet the corresponding environmental governance standards as much as possible and reduce the cost of environmental protection compliance, steel and chemical companies must change their traditional investment methods and take the road to sustainable development. The above regulatory pressure is not the only factor for enterprises’ green investment, but environmental regulations will also affect their production and operation costs, leading to green investment decisions. Chuah et al. (2020) [13] proposed that the rules and regulations set by the legislators that companies should abide by are also factors that influence their green investments. Based on some surveys, several factors, including comprehensive regulations related to the environment, influence green investments. Cortez et al. (2022) [14] used evidence from Europe
to confirm that stricter environmental regulations for polluting companies affect green investments and financial performance.

The existing literature on whether environmental regulation affects firm performance positively or negatively has sparked an ongoing debate. The literature is divided into three categories holding diametrically opposing views, and there is still no consensus yet. (1) From a positive point of view, most of these studies found that stricter environmental practices lead to higher levels of firm performance [15]. This may be because the current global climate-neutral economic transition and more sustainable long-term economic growth require private companies to invest in environmentally friendly and green technologies. These technologies can not only improve the quality of the environment, but also promote the competitiveness and quality of products in companies [16]. Li et al. (2022) [17] demonstrate that environmental regulations help companies steer investment decisions toward pollution reduction goals. Higher-intensity environmental regulation often leads to an increase in the number of innovative patents, especially in industrial enterprises, supporting the “Porter Hypothesis”. (2) From a negative point of view, some studies believe that if the intensity of environmental regulation is too high, it will inhibit the innovation of enterprises to a certain extent. Yu and Zhang (2022) [18] argued that stricter environmental regulations negatively impacted innovation and led to lower labor demand and foreign direct investment, all of which impose additional costs on manufacturing. (3) From a neutral point of view, Tian and Feng (2022) [19] argue that different types of environmental regulations have effects in different directions: command-and-control environmental regulation is conducive to technological innovation. However, the role of market-based regulation is the opposite, and it plays a negative role by inhibiting innovation.

The above studies mainly illustrate the impact of environmental regulation on enterprise production from the perspective of technological innovation. However, there are some other important factors that have been ignored, such as green investments. In fact, investing in active environmental management can help improve a company’s competitiveness and financial performance. This is confirmed by empirical evidence from Korean and Chinese companies that environmental governance helps companies improve long-term performance by increasing green investments [20]. As a new investment strategy, green investment is an important means to restore the ecological environment and promote technology innovation, and it is the best choice for enterprises to effectively fulfill their social responsibilities [21]. Green investments help to convey good information, such as corporate fulfillment of social responsibilities, to investors and enhances corporate valuation [22]. Furthermore, Li et al. (2021) suggested that enterprises that invest in green technologies can also receive more government subsidies, bring in more profits, and induce greater green marketing outcomes [23]. In recent years, the Chinese government has been exploring how to carry out environmental governance by influencing green investments of enterprises in the context of green development [24]. For example, green investments are popular for China’s B&R (Belt and Road) construction [25] and, especially, the increasing investment in renewable energy can help achieve sustainability goals [26].

Existing literature increasingly confirms that environmental regulation may have a greater impact on green investments [27]. Siedschlag and Yan (2021) [28] proposed that government environmental regulations can force companies to change investment decisions. Xu et al. (2022) [29] showed that the positive impact of environmental regulations on green finance could be achieved through a company’s external financing activities. Businesses that act as enforcers of environmental regulations should increase their investments in clean or renewable energy. Therefore, government environmental regulation should be taken into account as a variable when estimating green investments.

Although environmental regulation and green investments have been studied for a long time, there is still no consensus on whether their relationship is positive or negative, so it is necessary to provide sufficient empirical evidence to support the empirical conclusion. Moreover, few scholars conduct empirical analysis with enterprises in more micro-level high-carbon and heavily polluting industries as research objects, and ignoring this is not
conducive to the enrichment of existing literature research. As heavily polluting enterprises are resource-consuming enterprises, research on their green investment behavior is important for industrial upgrading and regional development. Based on the analysis of the above research motivations, we chose A-share listed companies in the steel industry and chemical industry from 2014 to 2017 as the research object to empirically examine the impact of government environmental regulation on green investments. Our contribution to the existing literature is novel in three ways.

First, this paper will be a useful supplement to the existing literature on the influencing mechanism between environmental regulation and green investments. Existing empirical evidence in green investments is far from conclusive. Previous studies have not reached a consistent conclusion, which leaves a certain space for this paper to further study this issue.

Second, we studied the property rights heterogeneity of companies under the incentives of environmental regulation policies. All enterprise samples are divided into two groups: state-owned enterprises (SOEs) and non-state-owned enterprises (NSOEs). The results show that the policy implementation response of SOEs to government environmental regulation is less significant than NSOEs. In contrast, NSOEs tend to be more active in building a good corporate image by responding to government policies for green investments, ultimately attracting more investment. Moreover, we found that the financial leverage of SOEs has a negative correlation with green investment, while NSOEs financial leverage has a positive correlation with green investment. This indicates that SOEs will reduce green investment while NSOEs will increase green investment when the company’s asset–liability ratio is high and its development capability is weak.

Third, we examined the possible impact of regional heterogeneity of heavily polluting companies on corporate green investment. This paper uses the four-year average air quality index (AQI) of the regions where the samples of all enterprises are located and divides the samples of all enterprises into two groups: regions with high environmental quality and regions with low environmental quality. The study found that environmental regulation in both regions with better environmental quality and regions with poorer environmental quality was negatively correlated with the correlation coefficient of corporate green investment. However, in regions with poor environmental quality, the correlation between the two is greater than that in regions with better environmental quality.

The rest of this study is arranged as follows. Section 2 describes the theoretical analysis and research hypothesis. Section 3 describes data and model specifications. Section 4 discusses the results of empirical analysis. Finally, Section 5 draws conclusions and policy implications.

2. Theoretical Analysis and Research Hypothesis

2.1. Environmental Regulation and Green Investment

At present, there is no consistent definition of environmental regulation in academic circles. Generally, it can be understood as a series of regulations and policies to reduce the impact on supervised enterprises. Government environmental regulation policies are usually divided into two categories: administrative policies and market-oriented policies [30]. The former is mandatory, while the latter is voluntary. Some scholars have proposed that environmental regulation can be divided into formal policy and informal policy. The former is similar to the administrative environmental regulation mentioned above, while the latter means the impact of public pressure on heavily polluting enterprises, and it is a useful complement to the former. Based on them, this paper defines environmental regulation as policy measures issued by the management authority in order to urge enterprises to undertake social responsibilities and ecological protection. At present, more mandatory system reforms mainly driven by national policies are adopted to restrain the environment [31]. When this regulatory intensity is low, green investment cost in compliance with regulatory requirements is minor compared to the penalty cost, as regulatory requirements are easily met. Under this circumstance, enterprises will be motivated to meet mandatory environmental regulations by increasing green investments [32]. However, when the policy
intensity of government-mandatory regulation is enhanced, enterprises should passively accept excessive regulatory requirements. When the heavily polluting enterprises’ green investment cost to meet regulation is too high, or even exceeds punishment, enterprises are usually more likely to accept non-compliance penalties rather than increase green investments to meet regulation [33].

Further, this paper studies heavily polluting enterprises, such as iron and chemical enterprises, which have been greatly impacted by the promotion of economic transformation and upgrading, and require a large amount of investment in technological upgrading. In this case, the production and operation costs of enterprises will further increase. At this time, the willingness of enterprises to make green investments will decline, and the “green paradox” effect will appear [34]. The “green paradox” refers to the phenomenon that environmental regulation policies lead to accelerated exploitation of fossil energy, which in turn accumulates more greenhouse gases and causes a worse environment. Good policy intentions may not always lead to good results. Therefore, the following hypotheses are put forward.

H1. The intensity of government environmental regulation is negatively correlated with green investments of heavily polluting enterprises.

2.2. Property Rights and Green Investment

Chinese enterprises have the heterogeneity of property rights, which affects their green investment decisions [35]. According to property rights, all enterprise samples are divided into two groups: state-owned enterprises (SOEs) and non-state-owned enterprises (NSOEs). The general theoretical point of view is that SOEs are regarded as the backbone of national economic development, and their behavior depends on the interests and wishes of the government. In this sense, SOEs are generally considered to be subject to stricter environmental regulations and their investment decisions are seen as less independent.

However, this is not the case. We believe that, to draw empirical conclusions in China, the actual context of the country needs to be taken into account. For example, the annual “GDP champion” policy implemented in previous years has misled Chinese local governments to pursue short-term economic growth figures that are more short-sighted rather than long-term growth driven by green investments [36]. Moreover, the managers of SOEs can easily receive preferential treatment in environmental enforcement because of their political background. However, the opposite is true for NSOEs. They may actively meet environmental requirements and increase green investments due to the need to maintain their own social image. Therefore, this study proposes the following hypotheses:

H2-1. When environmental regulation is intensified, NSOEs will make more green investments than SOEs.

H2-2. When environmental regulation is intensified, SOEs will make more green investments than NSOEs.

2.3. Regional Environmental Quality and Green Investments

It is not only necessary to classify the nature of corporate property rights, but also to consider the heterogeneity of environmental quality in different regions of China. First, local government is the implementer of regulations, and their behaviors will naturally affect the implementation of these regulations, resulting in regional differences in environmental management [37]. Previous studies have found that the pressure of local governments’ economic growth goals will significantly reduce the implementation standards of environmental regulation [38]. After in-depth analysis, we found that regional development has different characteristics. In addition, the environmental management level of local governments varies greatly. Local governments in regions with high environmental management levels often intervene in the market for the benefit of their own political achievements,
which affects investment behavior. Secondly, the main reason for the low green investment activities of heavily polluting enterprises is that the regulation cost is high and the investment income is low. Generally, when the environmental quality of the place where the enterprise is located is good, the enterprise invests less environmental governance funds, the cost of environmental regulation to the enterprise is smaller, and the enterprise is more willing to make green investments. However, when the environmental quality of the location where the enterprise is located is poor, the cost of environmental regulation to the enterprise is relatively large, and the willingness of the enterprise to make green investments may be weakened, it thereby reduces green investments. Therefore, the level of regional environmental quality may greatly affect the implementation of environmental regulations. This paper proposes the following hypotheses:

**H3-1.** When the environmental quality of the heavily polluting enterprises is good, government environmental regulation will promote the green investment of enterprises.

**H3-2.** When the environmental quality of heavily polluting enterprises is poor, government environmental regulation will inhibit the green investment of enterprises.

### 3. Data and Model Specification

#### 3.1. Sample Selection and Data Description

As representative industries of heavy pollution in China, steel and chemical enterprises have made great contributions to China’s economic development, but at the same time, they have also caused a certain burden on the environment. We chose A-share listed companies in the steel and chemical industries from 2014 to 2017 as a sample. When processing samples, the incomplete data during the sample period are eliminated, and several ST and ST* samples during the sample period are retained. We finally obtained 212 samples of 53 enterprises from steel and chemical industries for empirical analysis.

The data sources in this paper are as follows. Green investments of enterprises are obtained from the financial statements in the annual report of enterprises. Each enterprise uses different names including environmental protection fees, greening fees, sewage charges and resource compensation fees. The data on the ratio of green investment to gross domestic product (GDP) in various regions of China are obtained from the China Environmental Statistical Yearbook. The judgment of the regional environmental quality uses the air quality index (AQI) of the company’s location, and the data comes from the weather network. Data for other research variables are derived from the China Stock Market and Accounting Research (CSMAR) database and annual reports disclosed by companies.

#### 3.2. Variable Definition

1. **Explained variable: Green investment (GI)**

   This study defines enterprise green investment as greening expenses including environmental protection equipment investment, cleaner production technology investment and ecological expenditure, followed by Huang and Lei (2021) [33].

2. **Explanatory variable: Environmental regulation (ER)**

   Considering the representativeness of regulatory tools, the intensity of environmental regulation is calculated by the ratio of environmental governance investment to gross domestic product (GDP), referring to some literature [18,23].

3. **Control variables**

   This paper selects the following control variables shown in Table 1. (i) Operating cash flow (OCF) is the ratio of net cash flow from operating activities to average total assets; (ii) Financial leverage (FLEV) is the asset–liability ratio; (iii) Return on Equity (ROE) is the return on net assets; (iv) Enterprise scale (ES) is the natural logarithm of total assets.
Table 1. Variable definition.

| Variable Type          | Variable Name      | Symbol | Definition                                      |
|-----------------------|--------------------|--------|------------------------------------------------|
| Explained variable    | Green investment   | GI     | Natural logarithm of expensed green input       |
| Explanatory variable  | Environmental regulation intensity | ERI    | Ratio of investment in environmental governance to GDP |
| Control variable       | Financial leverage | FLEV   | Total liabilities/Total assets                  |
|                       | Operating cash flow| OCF    | Net cash flow from operating activities/average total assets |
|                       | Return on equity   | ROE    | Percentage of net profit to average shareholder equity |
|                       | Enterprise scale   | ES     | Natural logarithm of total assets               |

3.3. Model Specification

To examine the influence of government regulation on green investment, this paper establishes the following model:

\[
GI = \beta_0 + \beta_1 \text{ERI} + \beta_2 \text{OCF} + \beta_3 \text{FLEV} + \beta_4 \text{ROE} + \beta_5 \text{ES} + \epsilon
\]  

(1)

where GI represents green investment; \(\beta_0\) is the constant item of the regression equation; \(\beta_1\) is the coefficient of explanatory variable ERI, which represents the intensity of environmental regulation; \(\beta_2, \beta_3, \beta_4, \beta_5\) are the coefficients of control variables including OCF, FLEV, ROE, ES, which represent operating cash flow, financial leverage, return on equity and enterprise scale; and \(\epsilon\) is the random interference items of the regression equation.

4. Empirical Analysis

4.1. Descriptive Statistics

The descriptive statistics, correlation test and regression analysis are carried out on the sample data. From the statistical results of Panel A in Table 2, the standard deviation of green investment is 1.675, which shows that green investments of enterprises has certain individual differences. The standard deviation of environmental regulation intensity is 0.641, which shows that there are some regional differences in environmental regulation intensity. The average and median of operating cash flow, financial leverage, enterprise profitability and enterprise scale are not much different, indicating that the selected samples are evenly distributed from these four indicators.

To further study the green investment situation of enterprises with different property rights, we divided all samples into SOEs and NSOEs according to the property rights. From Panel B in Table 2, the median of green investment in NSOEs is greater than the average, which shows that the overall level of green investment in NSOEs is high. In addition, the average and median of the environmental regulation intensity of SOEs are not much different from that of NSOEs, which shows that both are subject to environmental regulation to a certain extent.

To further study the green investment situation of enterprises in regions with different levels of environmental quality, this paper divides all sample enterprises into high environmental quality regions (HEQRs) and low environmental quality regions (LEQRs), and makes a descriptive statistical analysis. From the statistical results of Panel C in Table 2, the average and median of environmental regulation intensity in HEQRs are not much different from that of LEQRs, which shows that both are subject to environmental regulation to a certain extent.
Table 2. Descriptive statistics of the whole sample and grouped samples.

| Variables | Mean  | Median | Maximum | Minimum | Standard Deviation |
|-----------|-------|--------|---------|---------|--------------------|
|           |       |        |         |         |                    |
| Panel A: The whole sample | | | | | |
| GI        | 2.583 | 2.685  | 8.294   | 0.569   | 1.675              |
| ERI       | 1.273 | 1.180  | 4.240   | 0.400   | 0.641              |
| OCF       | 0.064 | 0.065  | 0.437   | −0.136  | 0.070              |
| FLEV      | 0.501 | 0.509  | 0.979   | −0.111  | 0.223              |
| ROE       | 0.044 | 0.051  | 1.467   | −1.584  | 0.248              |
| ES        | 4.601 | 4.448  | 7.550   | 1.875   | 1.306              |

Panel B: Subsamples grouped by different property rights

State-owned enterprises (SOEs) and Non-state-owned enterprises (NSOEs)

| Variables | Mean  | Median | Maximum | Minimum | Standard Deviation |
|-----------|-------|--------|---------|---------|--------------------|
| GI        | 2.208 | 2.033  | 6.438   | 0.569   | 1.655              |
| ERI       | 1.274 | 1.190  | 4.030   | 0.400   | 0.568              |
| OCF       | 0.057 | 0.054  | 0.251   | −0.098  | 0.063              |
| FLEV      | 0.535 | 0.622  | 0.979   | −0.111  | 0.242              |
| ROE       | 0.032 | 0.040  | 1.467   | −1.584  | 0.272              |
| ES        | 4.889 | 5.075  | 5.875   | 1.875   | 1.421              |

| Variables | Mean  | Median | Maximum | Minimum | Standard Deviation |
|-----------|-------|--------|---------|---------|--------------------|
| GI        | 3.090 | 3.182  | 8.294   | 0.000   | 1.573              |
| ERI       | 1.281 | 1.165  | 4.240   | 0.400   | 0.732              |
| OCF       | 0.075 | 0.074  | 0.437   | −0.136  | 0.078              |
| FLEV      | 0.455 | 0.424  | 0.826   | 0.152   | 0.185              |
| ROE       | 0.062 | 0.068  | 0.677   | −1.400  | 0.211              |
| ES        | 4.221 | 4.123  | 6.115   | 2.113   | 1.000              |

Panel C: Subsamples grouped by different regional environmental quality

High environmental quality regions (HEQRs) and Low environmental quality regions (LEQRs)

| Variables | Mean  | Median | Maximum | Minimum | Standard Deviation |
|-----------|-------|--------|---------|---------|--------------------|
| GI        | 2.838 | 2.867  | 8.294   | 0.046   | 1.661              |
| ERI       | 1.115 | 1.015  | 3.160   | 0.400   | 0.581              |
| OCF       | 0.063 | 0.071  | 0.299   | −0.136  | 0.072              |
| FLEV      | 0.510 | 0.498  | 0.979   | 0.078   | 0.225              |
| ROE       | 0.038 | 0.050  | 1.467   | −1.584  | 0.274              |
| ES        | 4.420 | 4.312  | 6.581   | 1.875   | 1.157              |

| Variables | Mean  | Median | Maximum | Minimum | Standard Deviation |
|-----------|-------|--------|---------|---------|--------------------|
| GI        | 2.318 | 2.545  | 6.438   | 0.569   | 1.655              |
| ERI       | 1.437 | 1.330  | 4.240   | 0.790   | 0.662              |
| OCF       | 0.066 | 0.054  | 0.437   | −0.098  | 0.069              |
| FLEV      | 0.491 | 0.515  | 0.832   | −0.111  | 0.222              |
| ROE       | 0.051 | 0.054  | 0.668   | −1.400  | 0.218              |
| ES        | 4.789 | 4.727  | 7.550   | 2.113   | 1.427              |

4.2. Correlation Analysis

To examine the relationship between the variables, a Pearson correlation test is carried out for each variable in this paper. From Table 3, the correlation coefficient between enterprise green investment and environmental regulation intensity is 0.196, which shows that environmental regulation intensity is a key influencing factor of green investment. There is a certain correlation between green investment and enterprise operating cash flow, financial leverage, return on equity and enterprise scale. Moreover, the correlation between variables is small, so collinearity can be excluded.
Table 3. Pearson correlation analysis.

| Variables | GI   | ERI  | OCF  | FLEV | ROE    | ES   |
|-----------|------|------|------|------|--------|------|
| GI        | 1    |      |      |      |        |      |
| ERI       | 0.196*** | 1    |      |      |        |      |
| OCF       | 0.172**   | 0.015 | 1    |      |        |      |
| FLEV      | 0.368*** | 0.269*** | −0.100 | 1    |        |      |
| ROE       | −0.044 | 0.007 | 0.364*** | −0.234*** | 1    |      |
| ES        | 0.594*** | 0.396*** | 0.069 | 0.634*** | −0.035 | 1    |

Note: ** and *** represent significance at the level of 5% and 1%, respectively.

4.3. Regression Analysis of Full Sample

To test whether the hypothesis holds, this paper conducts regression analysis on all samples. Table 4 indicates that there is a negative correlation between enterprise investment and regulation intensity, which can verify Hypothesis 1. It suggests that stronger regulation will inhibit green investments to a certain extent. The reason may be that enterprises pay more attention to the economic benefits of investment projects. When the economic benefits brought by green investments are lower, and the regulation cost is higher, companies choose to decrease green investments. The result obtained in this paper before analyzing the heterogeneity of property rights is consistent with the classical assumption of “environmental cost theory” [39]. Citing this theory, a more detailed explanation is shown below. The “environmental cost theory” believes that government environmental regulation affects corporate financing by setting environmental access thresholds, especially for heavily polluting companies, which are constrained by negative financing constraints and lack funds, thereby crowding out green investments by companies. The coefficient between green investment and operating cash flow is 3.831, indicating a positive relationship. It suggests that, when the ability of enterprise assets to generate cash is high, enterprises will increase green investments. There is also a positive correlation between enterprise scale and enterprise green investment, which shows that the larger the enterprise, the better the operating condition and the stronger the sense of social responsibility. As Chuah et al. (2020) [13] suggested, the improvement of corporate social responsibility will help to increase their willingness to invest in green technologies, products or projects to a certain extent.

Table 4. Results of multiple regression model.

| Variables | Full Sample | Subsamples Grouped by Different Property Rights | Subsamples Grouped by Different Regional Environmental Quality |
|-----------|-------------|------------------------------------------------|---------------------------------------------------------------|
|           |             | SOEs                                           | NSOEs                          | HEQRs                     | LEQR                     |
| ERI       | −0.111**    | −0.534***                                      | 0.437*                         | −0.122                   | −0.252                  |
|           | (−0.707)    | (−2.638)                                       | (1.699)                        | (−0.512)                 | (−1.150)                |
| OCF       | 3.831***    | 5.922***                                       | 2.402                          | 3.670*                   | 3.467                   |
|           | (2.708)     | (3.158)                                        | (1.150)                        | (1.892)                  | (1.654)                 |
| FLEV      | −0.023      | −0.726                                         | 1.558                          | −0.742                   | 0.945                   |
|           | (−0.042)    | (−1.264)                                       | (1.205)                        | (−0.960)                 | (1.117)                 |
| ROE       | −0.561      | −0.487                                         | −0.291                         | −0.365                   | −0.637                  |
|           | (−1.364)    | (−1.122)                                       | (−0.329)                       | (−0.714)                 | (−0.917)                |
| ES        | 0.767***    | 0.844***                                       | 0.291                          | 0.961***                 | 0.607***                |
|           | (7.889)     | (8.227)                                        | (1.233)                        | (6.117)                  | (4.656)                 |
| R²        | 0.378       | 0.499                                         | 0.250                          | 0.410                   | 0.356                   |
| Adj-R²    | 0.362       | 0.478                                         | 0.204                          | 0.381                   | 0.323                   |
| F-Statistics | 24.994 | 23.548                                         | 5.457                          | 14.175                  | 10.834                  |

Note: *** p < 0.01, ** p < 0.05, * p < 0.1, value t in brackets.
4.4. Discussions of Heterogeneity

(1) Heterogeneity analysis of property rights

In order to further study whether enterprises with different property rights will make different green investment decisions under regulations, this paper divides all enterprise samples into two groups, SOEs and NSOEs, and conducts regression analysis. The regression results are shown in Table 4. From the results, there is a significant negative correlation between green investments and environmental regulation intensity of SOEs, while there is a significant positive correlation between green investments and regulation intensity of NSOEs, so Hypothesis 2-1 and Hypothesis 2-2 can be verified. This shows that state-owned heavily polluting enterprises do not have good enforcement of government environmental regulations. Huang and Lei (2021) [33] suggested that SOEs are less sensitive to environmental regulation than NSOEs, resulting in a less obvious increase in green investments brought about by environmental regulation policy responses. The reason may be that SOEs lack competition awareness or pay more attention to the profitability of investment projects, while NSOEs have stronger competition awareness, and will establish a good corporate image by responding to government policies to make green investments, thus attracting more investment. Consistent with the results of NSOEs obtained in this paper, Gu et al. (2021) [27] found that heavily polluting enterprises can alleviate the pressure of government environmental regulation faced by enterprises by increasing green investments. In other words, environmental regulation promotes green investments in certain types of firms, mainly in those policy-sensitive industries. As Cortez et al. (2022) [14] explained, increasingly stringent environmental regulatory requirements appear to be forcing polluting companies to implement environmentally responsible practices, such as increased investment in green energy.

In addition, the correlation coefficient between financial leverage and green investment of SOEs is $-0.726$, showing a negative correlation, while the correlation coefficient between financial leverage and green investment of NSOEs is 1.558, showing a positive correlation. It shows that, when the asset–liability ratio of enterprises is high and the development ability of enterprises is weak, SOEs will reduce green investment, while NSOEs will increase green investment. There is a negative correlation between the profitability and green investment of SOEs and NSOEs, which shows that the stronger the profitability, the more inclined enterprises are to invest in profitable projects, instead of making green investments with higher costs and lower economic benefits.

(2) Heterogeneity analysis of regional environmental quality

According to Hamaguchi (2021) [40], the environmental level of site selection will have a certain impact on corporate environmental investment, which may be related to the different regulatory measures taken by local governments. The study shows that stringent environmental regulations hinder environmental investment and contribute to environmental degradation. It is similar to the research of [41,42]; however, it has been suggested that the increase in environmental tax can reduce this effect [43]. In order to further study whether the environmental quality of the regions where the heavily polluting enterprises are located has an impact on the correlation between regulation intensity and green investment, we selected the four-year average air quality index (AQI) of all the regions where the enterprises are located, and divided all samples into two groups according to the median. As the larger the air quality index means the more serious the pollution, the group with poor environmental quality is above the median, and the group with better environmental quality is below the median. The statistical results are shown in Table 4.

From the results, the correlation coefficient is $-0.122$ in regions with good environmental quality, and $-0.252$ in regions with poor environmental quality. It is indicated that there is a negative correlation between them, regardless of the environmental quality of the region. Moreover, the correlation between them in regions with poor environmental quality is greater than that in regions with good environmental quality. Therefore, hypothesis 3-2 can be verified and hypothesis 3-1 cannot be verified. This shows that no matter what the
environmental quality of heavily polluting enterprises is, the increase in regulation intensity will reduce green investments of enterprises, but in regions with poor environmental quality, this inhibition is more significant. This result is similar to the research of Chai et al. (2022) [44], which found that the green development level of the enterprise location area will also have a certain impact on the enterprise’s financial decision-making.

4.5. Robustness Test

In order to verify the reliability of the results, we carried out robustness tests.

(1) Variable substitution method

As green investment in different enterprises may be affected by the scale of the company’s own assets, this will lead to the deviation of the empirical results. We took the ratio of green investment to corporate assets to replace green investment in the original regression model, including environmental protection fees, greening fees, sewage fees and resource compensation fees. This ratio was re-substituted into the model. The re-examined results indicate that there is no substantial difference after variable substitution, which is consistent with previous findings.

(2) Endogeneity elimination method

The constructed model may have endogeneity problems due to the following three reasons: (i) Missing variables. If the missing variables are not related to other explanatory variables, it will generally not cause problems. (ii) Interdependent. The explanatory variable and the explained variable influence each other. (iii) Errors. Due to the error in the measurement of the key variable, there is a deviation that may become part of the regression error, resulting in endogeneity problems. To solve the endogeneity issue, 2SLS regression is carried out, and Hypotheses 1 to 3 are re-tested.

The re-examined results show consistency with the original regression results. Therefore, we can confirm that the research model that we established is relatively robust and that the empirical conclusions have sufficient credibility.

5. Conclusions and Policy Implications

This paper selected sample data from China’s A-share listed companies in the steel and chemical industry to examine the relationship between government environmental regulation and green investments. The conclusions of the study are as follows.

First, there is a negative correlation between the intensity of government environmental regulation and green investments. Environmental regulation inhibits green investments of heavily polluting enterprises to a certain extent.

Second, after grouping all samples according to property rights, the results show that the green investment of SOEs is negatively correlated with regulation intensity, while the green investment of NSOEs is positively correlated with regulation intensity. This shows that regulation intensity will inhibit the green investment of SOEs, while it will promote the green investment of non-state-owned heavily polluting enterprises.

Third, after grouping all samples according to the environmental quality of the place where the enterprise is located, the results show that regulation intensity negatively influences green investments regardless of the environmental quality in the region where the enterprise is located. Moreover, the correlation between environmental regulation and green investments in a region with poor environmental quality is greater than that in a region with good environmental quality, and the inhibition effect is more obvious.

Based on the conclusions mentioned above, some policy implications can be suggested as follows.

First, it is suggested that the government establishes and improves the system and mechanism of environmental regulation. The original intention of the government to carry out environmental regulation is to induce more green investments. However, according to the empirical results, the government blindly increasing the regulation intensity will inhibit green investments of enterprises. Therefore, it is necessary for the government to reasonably
determine regulation intensity according to the actual development of enterprises, rather
than adopting uniform standards for all enterprises. For example, for enterprises with
poor operating conditions, regulation intensity can be weakened accordingly, and certain
policy subsidies can be provided for the green investment behavior of enterprises. For
enterprises with good operating conditions and large scales, the government can impose
certain penalties to urge those enterprises that do not actively invest to increase green
investments and assume social responsibilities.

In addition, informal environmental regulation should also play a further role. Infor-
mal environmental regulations such as public appeals and social media will also motivate
companies to take on more social responsibility and green investments. Therefore, the
government needs to continuously improve the environmental regulation mechanism and
improve the applicability of environmental regulation policies.

Second, relevant government departments should urge state-owned enterprises to
take an active role in environmental responsibility and play an exemplary and leading
role. Based on the conclusions, the greater the regulation intensity, the green investment
of SOEs will be inhibited, while the green investment of NSOEs will be promoted. SOEs
should have stronger executive power over the government’s environmental regulation
policies. However, at present, state-owned heavily polluting enterprises have a weak sense
of competition and will not take the initiative to make green investments in order to reduce
costs. On the contrary, NSOEs have a stronger sense of competition, and will undertake
social responsibility and maintain corporate image through green investments to attract
more investment. Therefore, the government should urge SOEs to actively respond to the
policy requirements and actively carry out green investments.

Third, heavily polluting enterprises should change their investment philosophy as
soon as possible to adapt to the growing demands for environmental improvement. Due to
the weak concept of environmental governance of Chinese enterprises for a long time in
the past, the main consideration when investing is economic efficiency. Many enterprises
do not make green investments voluntarily, but are more supervised by the government
and public opinion to passively protect the environment. With the increasing demands
and expectations of today’s public opinion on enterprises, enterprises have begun to issue
“Social Responsibility Reports”. However, very few companies can clearly disclose the
amount of environmental protection investment in the “Social Responsibility Report”,
and most companies only disclose green investment expenses. The government should
urge enterprises to change their investment and environmental governance concepts,
and urge enterprises to actively undertake social responsibilities. Enterprises should
pay attention to social benefits in addition to economic benefits, actively participate in
environmental governance and green investments, and actively disclose information related
to environmental protection. In this way, enterprises can fulfill good social responsibilities,
establish a good social image in front of the public and contribute to green development.

This study has certain limitations, which provide potential directions for future re-
search. First, the sample only selected data from the steel and chemical industries. Although
these two industries are the most prominent in the field of high-pollution and high-emission
enterprises, they cannot be generalized. Taking these data cannot fully explain the role
of environmental regulation. Therefore, future research may need to further expand the
sample, include all enterprises significantly affected by environmental regulations, and con-
duct comprehensive and in-depth research. Second, the investment behavior of enterprises
may be affected by environmental regulations and industrial policies from the Chinese
government at the same time. To distinguish the roles of the two policies is a problem that
needs to be solved. Third, environmental regulation should be divided into formal (or
hard regulation) and informal (or soft regulation). The former refers to mandatory policy
measures by the government, while the latter refers to environmental constraints imposed
by the public. The impact of different types of environmental regulations on corporate
green investment needs to be further studied in future work.
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References

1. Zheng, S.Q.; Cao, J.; Kahn, M.E.; Sun, C. Real Estate Valuation and Cross-Boundary Air Pollution Externalities: Evidence from Chinese Cities. *J. Real Estate Financ. Econ.* 2014, 48, 398–414. [CrossRef]

2. Sun, H.; Edziah, B.K.; Sun, C.; Kporsu, A.K. Institutional quality, green innovation and energy efficiency. *Energy Policy* 2019, 135, 111002. [CrossRef]

3. Chang, T.Y.; Huang, W.; Wang, Y. Something in the Air: Pollution and the Demand for Health Insurance. *Rev. Econ. Stud.* 2018, 85, 1609–1634. [CrossRef]

4. Dong, R.; Fisman, R.; Wang, Y.; Xu, N. Air pollution, affect, and forecasting bias: Evidence from Chinese financial analysts. *J. Financ. Econ.* 2021, 139, 971–984. [CrossRef]

5. Hamaguchi, Y. Environmental policy and social status preference for education in an Uzawa–Lucas model. *Bull. Econ. Res.* 2021, 73, 456–468. [CrossRef]

6. Liao, L.; Du, M.; Chen, Z. Air pollution, health care use and medical costs: Evidence from China. *Energy Econ.* 2021, 95, 105132. [CrossRef]

7. Alam, M.S.; Muhammad, A.; Chu, C.C.; Ugur, S. Does corporate R&D investment affect firm environmental performance? Evidence from G-6 countries. *Energy Econ.* 2019, 78, 401–411. [CrossRef]

8. Aidononjie, P.; Idahosa, M.E.; Agbale, O.P.; Oyediji, A.I. The Environmental Conservation, Legal and Ethical Issues concerning Herbal Products in Nigeria. *J. Environ. Sci. Econ.* 2022, 1, 26–32. [CrossRef]

9. Bakare, O.D.; Okuonghie, N. Information Managers as Change Agents in achieving Sustainable Development in the 21st Century. *J. Environ. Sci. Econ.* 2022, 1, 58–66. [CrossRef]

10. Jiang, Y.; Qin, J.; Khan, H. The Effect of Tax-Collection Mechanism and Management on Enterprise Technological Innovation: Evidence from China. *Sustainability* 2022, 14, 8836. [CrossRef]

11. Jamil, M.N. Critical Analysis of Energy Consumption and Its Impact on Countries Economic Growth: An empirical analysis base on Countries income level. *J. Environ. Sci. Econ.* 2022, 1, 1–12. [CrossRef]

12. Banerjee, K. FDI flow in Energy Sector among BCIM, BIMSTEC+1 and ASEAN+4 sub-regional alignments. *J. Environ. Sci. Econ.* 2022, 1, 33–50. [CrossRef]

13. Chuah, S.H.-W.; El-Manstrly, D.; Tseng, M.-L.; Ramayah, T. Sustaining customer engagement behavior through corporate social responsibility: The roles of environmental concern and green trust. *J. Clean. Prod.* 2020, 262, 121348. [CrossRef]

14. Cortez, M.C.; Andrade, N.; Silva, F. The environmental and financial performance of green energy investments: European evidence. *Ecol. Econ.* 2022, 197, 107427. [CrossRef]

15. Zhang, D. Environmental regulation, green innovation, and export product quality: What is the role of greenwashing? *Int. Rev. Financ. Anal.* 2022, 83, 102311.

16. Li, W.; Chen, X.; Huang, J.; Gong, X.; Wu, W. Do environmental regulations affect firm’s cash holdings? Evidence from a quasi-natural experiment. *Energy Econ.* 2022, 112, 106151. [CrossRef]

17. Li, X.; Du, K.; Ouyang, X.; Liu, L. Does more stringent environmental regulation induce firms’ innovation? Evidence from the 11th Five-year plan in China. *Energy Econ.* 2022, 112, 106110. [CrossRef]
18. Yu, Y.; Zhang, N. Environmental regulation and innovation: Evidence from China. *Glob. Environ. Chang.* 2022, 76, 102587. [CrossRef]
19. Tian, Y.; Feng, C. The internal-structural effects of different types of environmental regulations on China’s green total-factor productivity. *Energy Econ.* 2022, 113, 106246. [CrossRef]
20. Chen, Y.; Ma, Y. Does green investment improve energy firm performance? *Energy Policy* 2021, 153, 112252. [CrossRef]
21. Iraldo, F.; Testa, F.; Frey, M. Is an environmental management system able to influence environmental and competitive performance? The case of the eco-management and audit scheme (EMAS) in the European union. *J. Clean. Prod.* 2009, 17, 1444–1452. [CrossRef]
22. Martin, P.R.; Moser, D.V. Managers’ green investment disclosures and investors’ reaction. *J. Account. Econ.* 2016, 61, 239–254. [CrossRef]
23. Li, Z.; Pan, Y.; Yang, W.; Ma, J.; Zhou, M. Effects of government subsidies on green technology investment and green marketing coordination of supply chain under the cap-and-trade mechanism. *Energy Econ.* 2021, 101, 105426. [CrossRef]
24. Liu, L.; Zhao, Z.; Zhang, M.; Zhou, D. Green investment efficiency in the Chinese energy sector: Overinvestment or underinvestment? *Energy Policy* 2022, 160, 112694. [CrossRef]
25. Fan, Q.; Liu, J.; Zhang, T.; Liu, H. An Evaluation of the Efficiency of China’s green investment in the “Belt and Road” countries. *Struct. Chang. Econ. Dyn.* 2022, 60, 496–511. [CrossRef]
26. Zhang, L.; Saydaliev, H.B.; Ma, X. Does green finance investment and technological innovation improve renewable energy efficiency and sustainable development goals. *Renew. Energy* 2022, 193, 991–1000. [CrossRef]
27. Gu, Y.; Ho, K.-C.; Yan, C.; Gozgor, G. Public environmental concern, CEO turnover, and green investment: Evidence from a quasi-natural experiment in China. *Energy Econ.* 2021, 100, 105379. [CrossRef]
28. Siedschlag, I.; Yan, W. Firms’ green investments: What factors matter? *J. Clean. Prod.* 2021, 310, 127554. [CrossRef]
29. Xu, Y.; Li, S.; Zhou, X.; Shahzad, U.; Zhao, X. How environmental regulations affect the development of green finance: Recent evidence from polluting firms in China. *Renew. Energy* 2022, 189, 917–926. [CrossRef]
30. Liu, L.; Zhao, Z.; Zhang, M.; Zhou, C.; Zhou, D. The effects of environmental regulation on outward foreign direct investment’s reverse green technology spillover: Crowding out or facilitation? *J. Clean. Prod.* 2021, 264, 124689. [CrossRef]
31. Xu, Q.; Lei, Y.; Ge, J.; Ma, X. Did investment become green in China? Evidence from a sectoral panel analysis from 2003 to 2012. *J. Clean. Prod.* 2017, 156, 500–506. [CrossRef]
32. Muganyi, T.; Yan, L.; Sun, H.-P. Green finance, fintech and environmental protection: Evidence from China. *Environ. Sci. Ecotechnol.* 2021, 7, 100107. [CrossRef]
33. Huang, L.; Lei, Z. How environmental regulation affect corporate green investment: Evidence from China. *J. Clean. Prod.* 2021, 279, 123560. [CrossRef]
34. Xie, L.; Li, Z.; Ye, X.; Jiang, Y. Environmental regulation and energy investment structure: Empirical evidence from China’s power industry. *Technol. Forecast. Soc. Chang.* 2021, 167, 120690. [CrossRef]
35. Song, Z.; Feng, L.; Tan, X. State ownership, political participation of private entrepreneurs and convenience of enterprise financing: An empirical research on China’s private controlled listed companies. *J. Financ. Res.* 2014, 414, 133–147.
36. Li, H.Y.; Liu, D. Marketization process, voluntary disclosure and the cost of equity capital. *Account. Res.* 2016, 1, 71–78.
37. Lei, P.; Tian, X.; Huang, Q.; He, D. Firm size, government capacity, and regional environmental regulation: Theoretical analysis and empirical evidence from China. *J. Clean. Prod.* 2017, 164, 524–533. [CrossRef]
38. Wang, H.; Mamingi, N.; Laplante, B.; Dasgupta, S. Incomplete Enforcement of Pollution Regulation: Bargaining Power of Chinese Factories. *Environ. Resour. Econ.* 2003, 24, 245–262. [CrossRef]
39. Dinar, A.; Howitt, R.E. Mechanisms for Allocation of Environmental Control Cost: Empirical Tests of Acceptability and Stability. *J. Environ. Manag.* 1999, 49, 183–203. [CrossRef]
40. Hamaguchi, Y. Polluting firms’ choice of location and pollution havens in an R&D-based growth model for an international emissions trading market. *J. Int. Trade Econ. Dev.* 2021, 30, 625–642. [CrossRef]
41. Grimaud, A. Pollution Permits and Sustainable Growth in a Schumpeterian Model. *J. Environ. Econ. Manag.* 1999, 38, 249–266. [CrossRef]
42. Ono, T. The Effects of Emission Permits on Growth and the Environment. *Environ. Resour. Econ.* 2002, 21, 75–87. [CrossRef]
43. Ono, T. Environmental Tax Policy and Long-Run Economic Growth. *Jpn. Econ. Rev.* 2003, 54, 203–217. [CrossRef]
44. Chai, S.; Zhang, K.; Wei, W.; Ma, W.; Abedin, M.Z. The impact of green credit policy on enterprises’ financing behavior: Evidence from Chinese heavily-polluting listed companies. *J. Clean. Prod.* 2022, 363, 132458. [CrossRef]