

4 IMPACTS OF ENVIRONMENTAL REGULATION ON CORPORATE ESG PERFORMANCE – EVIDENCE FROM CHINA

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Abstract

This paper examines the impact of the new Environmental Protection Law on corporate ESG performance and the moderating effects of executive compensation and government subsidies using the difference-in-differences (DID) model. The study found that the implementation of the new Environmental Protection Law significantly improved the ESG performance of listed companies in China's heavily polluting industries. Executive compensation and government subsidies can positively moderate the relationship between the new Environmental Protection Law and ESG. The boosting effect of the new Environmental Protection Law on corporate ESG performance is stronger in the grouping of high rule of law levels, high media attention and large corporations. Under the double carbon target, this study is of great significance to realize the sustainable development of enterprises and the high quality development of national economy.

Keywords: Environmental regulation; ESG; Executive compensation; Government subsidies; China's new environmental protection law

JEL Classification: C33, K32, Q56

1. Introduction

Since the reform and opening up, China's economy has grown vigorously under the enthusiasm of the whole society to pursue economic value creation (Cui and Huang, 2018). However, economic growth models that pursue speed are inevitably accompanied by problems in terms of ecological environment and social responsibility (Duanmu *et al.*, 2018), which are barriers to the sustainable development process that all countries face (Ramalingam *et al.*, 2018). While urbanization, industrial production and transportation have contributed to rapid economic development, they have also put significant pressure on the ecological environment. In 2013, China discharged 69.54 billion tons of sewage, and in 2014, only 16 cities met air quality standards, accounting for 10% of the monitored volume. In 2019, China accounts for 24.3% and

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28.8% of global energy consumption and CO₂ emissions, both sets of values ranking among the highest in the world. All signs indicate that China is facing the challenge of resource and environmental crisis, and it is urgent to strike a good balance between economic development and ecological environment.

Environmental, Social and Governance (ESG) performance is an important measure of corporate sustainability. In the context of China's efforts to achieve carbon peaking and carbon neutrality, ESG provides companies with ideas for development that take into account the economic, environmental and social spheres. In recent years, the influence of this sustainable development concept has gradually expanded in the capital market, distinguishing ESG from the values of single focus on the performance of financial indicators and seeking market profits, which has led to a significant conceptual change in value creation. It shifts the value orientation from shareholder supremacy to stakeholderism, and extends the scope of value from economic value to social and environmental value, so that the sustainable development concept, which integrates economic, social and environmental impacts, is gradually integrated into market behavior. Green companies in the market tend to get better feedback (Bolton and Kacperczyk, 2021) and investors are more inclined to buy stocks with high corporate ESG scores (Avramov *et al.*, 2022). According to the 2021 China Sustainable Investment Review, the size of domestic pan-ESG public funds has increased by more than RMB 300 billion compared to last year. Broad ESG investments, such as bank green credit balances, have also grown from RMB 12 trillion last year to RMB 14 trillion. It is clear that ESG growth is strong and the signal from asset owners to support ESG is clear.

The concept of sustainability is becoming increasingly popular, but companies can still be short-sighted when driven by the goal of "profit maximization". Coupled with the negative externalities of the environment, it is difficult for individual enterprises to take the initiative in environmental and social responsibility in their economic activities. Substantial steps in the sustainable development of enterprises have a decisive impact on the national economy to achieve high-quality development. Therefore, to address the negative externalities of environmental pollution, the inclusion of environmental regulatory instruments is an effective governmental initiative to address the problem of incomplete markets (Rugman and Verbeke, 1998; Crafts, 2006). China promulgated the Environmental Protection Law of the People's Republic of China as early as 1989, but environmental problems did not improve due to the development philosophy of pressing for economic growth at that time (Li *et al.*, 2019). Drawing on its extensive early development experience, in recent years China has increased its focus on the importance of environmental protection to sustainable development (Liu and Wang, 2017; Liu, 2021). At the stage when China's economy is shifting from high-speed growth to high-quality development, the planning of building a resource-saving and environment-friendly society is highly valued by the country. The Fourteenth Five-Year Plan for National Economic and Social Development and the Outline of Vision 2035 clearly put forward the goal of forming a green production and lifestyle and building a beautiful China. The Fourth Plenary Session of the 19th Central Committee elevated the construction of ecological civilization to the height of a millennium plan and proposed to implement the strictest ecological environmental protection system. The new Environmental Protection Law was revised and passed in 2014 and came into force on January 1, 2015. This law is known as the "strictest environmental protection law in history", and has undergone significant changes in environmental protection philosophy, system design, supervision and investigation, and administrative enforcement compared to previous environmental protection laws (Cai and Ye, 2020), and it is of great relevance to examine its impact on enterprises at the micro level.

Although the new Environmental Protection Law is a national law that all industries must comply with, heavy polluters are more affected by the regulation than other industries, which provides a quasi-natural experimental setting for the article to study the impact effects of the policy on micro firms. Using a sample of A-share listed companies from 2011-2020, this paper empirically tests

the impact of the new Environmental Protection Law on corporate ESG performance using the difference-in-differences model. The moderating effects of executive compensation and government subsidies on the relationship are also incorporated. In a further study, we also explore the impact of differences at the level of the rule of law and media attention.

The innovations and contributions of this paper are mainly reflected in the following aspects. (1) Most of the existing studies on the new Environmental Protection Law focus on the effectiveness of policy implementation on corporate performance, environmental investment and operational efficiency, but less on corporate environmental, social responsibility and governance performance, which this paper remedies. (2) The research object of this paper is a widely distributed heavy polluting enterprise, and this objective and natural scenario makes the research conclusions have strong credibility. Meanwhile, with the specific environmental regulation policy as the background, the causal relationship between economic variables is effectively identified with the help of double difference model, which can avoid the endogeneity problem. (3) The inclusion of the moderating role of executive compensation and government subsidies in this paper expands the research chain of factors influencing corporate ESG performance and enriches the existing theory and practice in this field.

The rest of the paper is organized as follows: Section 2 summarizes the previous literature. Section 3 presents hypothesis based on theoretical analysis. Section 4 explains the data and methodology. Section 5 reports the empirical results. Section 6 concludes the paper and provides policy implications.

2. Literature review

2.1. Environmental regulation

Environmental regulation is an environmental policy tool necessary for governments to respond to environmental impacts (Frondel *et al.*, 2007) and can be effective in mitigating pollution problems (Mandal, 2010). With the process of socio-economic development and the evolution of institutional environment, the types of environmental regulation are increasingly enriched in application (Liu *et al.*, 2021), and combined with the literature studies can be divided into three types of environmental regulation policies (Ren *et al.*, 2018). Command-and-control regulation uses laws and regulations to coercively intervene in organizations that harm the environment, for example, by requiring firms to reduce emissions through a system of emission limits (Leiter *et al.*, 2011). Market-based regulation, including emissions trading, government subsidies and emissions taxes, are designed to encourage companies to reduce emissions. Voluntary regulation is not mandatory and include disclosure guidelines, environmental agreements, etc., developed by social or business groups on their own initiative (López-Gamero *et al.*, 2010), and companies can choose to join them or not. In practice, voluntary environmental regulation is often an important complement to mandatory environmental regulation, and the two can have positive synergistic effects (González *et al.*, 2008). But a combination of environmental regulations can also have negative effects. Peuckert (2014) finds that when different kinds of environmental regulatory objectives conflict, the practical power of regulation is diminished.

The existing studies mainly explore the utility of environmental regulation from the perspective of its impact on the productivity and financial performance of enterprises, and are divided into the following three main views. One is the traditional hypothesis that environmental regulatory policies will force firms to pay higher costs for environmental protection and crowd out original production funds, thus inhibiting firms' economic performance (Gary, 1987; Zhang *et al.*, 2018). The second is the Porter hypothesis, which argues that environmental regulation increases the innovation capacity of firms, achieving the effect of offsetting the cost of environmental regulation and improving firm performance (Porter and Van der Linde, 1995). The third is the uncertainty

hypothesis, which argues that there is uncertainty in the relationship between environmental regulation and firm efficiency, i.e., a nonlinear U-shaped relationship (Lanjouw and Mody, 1996; Zhang *et al.*, 2020; Wu *et al.* 2020).

2.2. Environmental, Social and Governance (ESG) performance

Currently, environmental, social and governance (ESG) is becoming an important measure of the level of corporate sustainability. Sustainability is defined as the adaptability of a company in a changing external environment and originated in the field of ecology (Seuring and Müller, 2008). Global Reporting Initiative (Hedberg and Von Malmborg, 2003), Socially Responsible Investment, Governance, and Triple Bottom Line (Elkington, 1994) have all discussed the sustainability aspects in depth. After discussion and integration, the concept of "Environment, Society and Governance" was first introduced in the 2004 UN report "Who Cares Wins". In addition, the ESG concept was reaffirmed in 2006 by the United Nations Environment Programme Financial Institution (UNEPFI) to guide investors in promoting responsible investment (Crifo and Forget, 2013).

Existing research revolves around ESG ratings, ESG performance and ESG disclosure, and there has been a wealth of findings in the literature. In terms of economic consequences, scholars have focused on the relationship between ESG and financial performance (Aouadi and Marsat, 2018), stock market performance and market value (Duque-Grisales and Aguilera-Caracuel, 2021). The results of the study include positive, negative and uncorrelated views. However, the vast majority of these studies concluded that ESG had positive economic consequences and was closely linked to corporate profitability and sustainability (Brogi and Lagasio, 2019; Rajesh and Rajendran, 2020). Di Giuli and Kostovetsky (2014) hold the opposite view, arguing that the expansion of ESG policies by firms can make stocks underperform.

In terms of influencing factors, the existing literature covers a much wider range of research perspectives. Market characteristics are an important factor influencing a firm's ESG performance, and market differences are often based on geographic location. Also, economic development, law and culture play a role in these differences. For example, ESG themes are more active in high-income economies located on different continents, where people are more interested in corporate sustainability and global sustainable development policies (Singh *et al.*, 2022). A large body of literature has examined the relationship between characteristics of corporate governance and corporate ESG activities, including boards of directors, executives, and executive compensation. They believe that good management decisions (B'énabou and Tirole, 2010), female leadership or director involvement (Borghesi *et al.*, 2014), and young CEO tenure contribute to a company's ESG performance. In addition, institutional investors' preferences, ownership characteristics and corporate risk are often mentioned.

As mentioned above, there is a wealth of research on both environmental regulation and ESG, but the theoretical community has not reached a consensus conclusion on the relationship between environmental regulation and ESG. From the perspective of environmental regulation, previous studies have provided insights into the role of different regulatory instruments on firm performance and production efficiency. However, these studies mainly point to economic performance or environmental performance, lacking the study of sustainability, and rarely argue for ESG as a whole. Moreover, there are fewer articles on how to improve the ESG performance of companies. This paper incorporates the impact of environmental regulations in the context of China's efforts to achieve carbon neutrality and carbon peaking and to promote sustainable development, in order to investigate whether the introduction of the new Environmental Protection Law can strengthen the concept of green development of enterprises and thus promote the construction of ecological civilization, and become a driving force to improve the ESG performance of corporate companies.

3. Hypothesis development

3.1. *The new Environmental Protection Law and corporate ESG performance*

Distinguished from traditional financial performance indicators, ESG considers corporate sustainability by integrating environmental, social and corporate governance. Firms are an important part of the market economy, and while they consume resources to create value, they also impose negative externalities on the ecological environment (Huang and Lei, 2021). According to stakeholder theory, a company will only gain legitimacy support and gain social acceptance if its behavioral performance is consistent with legal requirements and social norms. The new Environmental Protection Law, as a means of environmental regulation, internalizes the problem of negative environmental externalities in the form of laws and regulations. According to Porter's hypothesis, reasonable environmental regulation stimulates firm innovation and thus offsets some or all of the compliance costs of environmental regulation, and firms are able to gain competitive advantage without presupposing circumvention of environmental investments, especially market-based environmental policies (Porter and Van der Linde, 1995).

Compared with the old law, the new Environmental Protection Law is more flexible, adopting a combination of rewards and punishments to strengthen the strength of punitive measures while rewarding enterprises that have made significant contributions to protecting and improving the environment. Therefore, the new law brings pressure and motivation to the listed companies in the heavy pollution industry, and can guide them to start focusing on their future sustainable development to avoid the economic and political consequences of violating the law, improve their resource allocation efficiency and enhance resource utilization. Daft *et al.* (1988) point out that companies often conduct environmental scans to identify the external environment and respond to environmental regulations based on economic, legal and social conditions. After identifying the legal environment created by the new Environmental Protection Law, companies will react according to its impact on them. The new law will prompt companies to elevate environmental protection to a strategic level, fully mobilize their internal governance systems, develop sustainable development strategies, increase investment in environmental protection, promote green research and development, and reduce pollution emissions.

Improvements in corporate governance and environmental performance will enable companies to produce greener and safer products while presenting a good social image. In conjunction with consistency theory, the similarities that firms exhibit in their behavioral performance are widely present in corporate decision making (Cain and McKeon, 2016), and firms will focus on aspects of social responsibility in complying with environmental regulations to enhance their environmental performance (Epstein, 1979). Therefore, the new Environmental Protection Law will also have a positive impact on the social dimension of corporate performance, which will generally improve corporate ESG performance. Based on the above discussion, we hypothesize that:

H1. The new Environmental Protection Law has a positive impact on corporate ESG performance.

3.2 *The moderating role of executive compensation*

The goal of the new Environmental Protection Law is to use regulatory efforts to make companies change their production methods, reduce pollution emissions during production, and improve resource efficiency in order to achieve environmental strategies. In the process, the internal processes of the company will face various decision problems such as upgrading production processes, staff training and allocation of green funds. According to the high-level ladder theory, the expertise and organizational competence of senior managers will play an irreplaceable role in these decisions, and in the absence of top-level instructions, plans to advance corporate sustainability goals will be unsustainable (Zou *et al.*, 2015; Shahab *et al.*, 2020). Therefore, the

behavior and attitude of executives can be a major factor influencing the implementation of a company's environmental strategy.

Unlike shareholders who are able to reduce risk by diversifying their investments, managers' reputation and credibility are all focused on the company they work for. Whenever there is a departure due to management failure or reputation damage, it is difficult for them to get another chance to apply for the same position (Desai *et al.*, 2006), and naturally there is a clear risk aversion preference among executives (Coles *et al.*, 2006). At a time when the new Environmental Protection Law poses compliance risks and raises the risk of uncertainty in environmental investments, executives will be reluctant to invest in long-term abatement projects because of the short-term need for large-scale capital costs (Haque, 2017), and risk appetite will force management to take a conservative approach. Combined with the principal-agent theory, since shareholders cannot monitor management's due diligence at all times, compensation is paid primarily on the basis of historical and current performance, which can lead managers to favor short-term performance improvement in order to obtain more compensation (Darrough, 1987). The dual pressure of investment uncertainty and short-term performance declines is largely responsible for executives abandoning riskier but positive return investment projects, such as long-term environmental investments. This will seriously damage the overall interests of the company and weaken the role of environmental regulations in promoting sustainable business development.

To get management to look beyond the confines of focusing on private interests and focus on long-term corporate earnings, the focus is on implementing incentives. Compensation contract is an effective tool for solving principal-agent problems, reducing management opportunism, and, when properly designed, have risk compensation effects (Michael and William, 1976). Existing research suggests that increasing compensation levels can reinforce management's willingness to take risks. By increasing the private benefits that executives receive and compensating for the costs of the risks they bear, executives can be incentivized to implement proactive environmental regulatory response programs (Kanashiro, 2020). For example, Berrone and Gomez-Mejia (2009) found a positive relationship between CEO compensation and pollution response decisions for heavy polluters in the United States. Mahoney and Thorn (2006) also found that compensation has an incentive effect on social responsibility performance in their study of the relationship between stock-based compensation and corporate social responsibility performance of Canadian corporate executives. Sustainable compensation policies based on ESG can motivate executives to make choices that are more in line with corporate sustainability in terms of environmental performance (Haque and Ntim, 2020). To the best of our knowledge, companies are increasingly using compensation policies to motivate management to do well in environmental and social programs. Therefore, we put forward our second hypothesis.

H2. Executive compensation will reinforce the positive effect of the new environmental protection law on corporate ESG performance.

3.3. The moderating role of government subsidies

With the rise in the intensity of the new law's environmental regulations, the scale of technological innovation and environmental investment by companies to meet compliance for pollution control will increase compared to the past, but whether companies can ultimately implement environmental initiatives will also depend on their resources. Green technology research and development innovation, generating process optimization and equipment installation are generally characterized by long lead times, low upfront returns and high risks, making it difficult for companies to achieve environmental investment and pollution control in the absence of financial support (Liang *et al.*, 2022). The unilateral pursuit of environmental goals in the absence of economic incentives may result in companies failing to prioritize sustainable management (Schaltegger and Hörisch, 2017) and even threaten their survival in the marketplace. In addition,

the fulfillment of social responsibility by enterprises also requires a large amount of resources, and such social investment will certainly increase the operating costs of enterprises. As "rational economic agents", companies are bound to weigh the benefits and risks of participating in social activities without compromising their own interests (Nikolaeva and Bicho, 2011). In this case, government subsidies act as an external incentive to compensate firms for environmental costs and diversify firm risk (Horbach *et al.*, 2012). Meanwhile, government subsidies are an effective means to alleviate financial constraints and encourage firms to innovate (Howell, 2017; Yang *et al.*, 2019).

The government will strengthen its control over heavy polluters for the sake of environmental management, and the acquisition of this control requires the government in exchange for resources, of which government subsidies are an important part. The greater the government subsidy, the greater the control over the company, and the greater the degree to which the company can be required to comply with environmental regulations and make practical moves. The new Environmental Protection Law will give financial incentives and support to companies with significant pollution control results. Companies will also enhance their environmental social responsibility performance to meet government demand in order to obtain this free money from government grants. Shleifer and Vishny (1994) argue that there is a game between government and business, with politicians using subsidies to induce firms to comply with political goals. Environmental governance is becoming an important political goal for governments today, and government subsidies can become a bargaining chip for governments to demand stronger sustainable investments from companies. From the above discussion, we formulate the following hypothesis.

H3. Government subsidies will reinforce the positive effect of the new environmental protection law on corporate ESG performance.

4. Data and methodology

4.1. Sample selection and data sources

In this paper, A-share listed firms on the Shanghai Stock Exchange and Shenzhen Stock Exchange from 2011 to 2020 were selected as the research sample. We processed the sample data according to the following criteria: (1) exclude ST and ST* firms; (2) exclude financial firms; (3) exclude firms with missing ESG performance data or other indicators that are abnormal during the sample period. Eventually, we obtained 7670 observations. As for the access to data, ESG performance data are obtained from Bloomberg database, and financial data are obtained from the China Stock Market and Accounting Research (CSMAR) database. To avoid the effect of extreme values on the empirical results, all continuous variables were winsorized shrunken at the 1% level.

4.2. Variable definitions

4.2.1. Dependent variable

Corporate Environmental, Social and Governance Performance (ESG). Environmental performance is an evaluation of a company's environmental responsibility perspective, such as resource consumption, ecological and environmental protection, and energy use. Social performance aims to consider the contribution of corporate social responsibility and its response to strategic decisions on national economic development. Governance is the evaluation of corporate governance system, including governance structure, governance mechanism, governance strategy, etc. This paper uses the corporate ESG performance score from the Bloomberg database as a measure, which weights the individual scores of three aspects of corporate environmental, social and corporate governance to arrive at a composite score.

4.2.2. Independent variable

Dummy variables for the implementation of the new Environmental Protection Law (Tp). Heavy polluters were more affected than other industries after the enactment of the new law, so this paper evaluates the policy impact of the new Environmental Protection Law implemented in 2015 and examines its effect on ESG performance of heavy polluters. The heavily polluting industries are mainly selected according to the "Guidelines for Disclosure of Environmental Information of Listed Companies" issued by the Ministry of Environmental Protection in 2010 and combined with the 2012 edition of the SFC's "Industry Classification Guidelines for Listed Companies", including mining, brewing, textile, tanning, paper making, petroleum, chemical, pharmaceutical, chemical fiber, ferrous (non-ferrous) metal smelting and rolling processing, rubber and plastic, thermal power, etc. When the enterprise belongs to the heavy pollution industry and the year is in 2015-2020, Tp=1; otherwise, Tp=0.

4.2.3. Moderating variables

(1) Referring to existing studies (Firth *et al.*, 2006) and taking into account the reality that monetary compensation dominates executive compensation in China, this paper selects the natural logarithm of the total compensation of the top three executives as a measure of executive compensation (Ln_{pay}). (2) According to Liang *et al.* (2022), the natural logarithm of the amount of government grants in the annual report of the firm is used as an indicator of government subsidies (Insub_s).

4.2.4. Control variables

Referring to previous scholars' studies, the control variables are selected in this paper as follows. (1) Size, the natural logarithm of the total assets of the enterprise at the end of the period; (2) Lev, total liabilities to total assets; (3) ROA, the return on assets, measured as net profit to total assets; (4) Board, the size of the board of directors, measured as the natural logarithm of the number of board members; (5) Age, the years of listing; (6) Top1, equity concentration, measured as the shareholding of the first largest shareholder; (7) Cashflow, Cash flow from operating activities, measured as the ratio of net cash flow from operating activities to total assets at the end of the period. In addition, this paper controls the year and firm fixed effect.

4.3 Model specification

This paper uses the new Environmental Protection Law introduced in 2015 as a quasi-natural experiment to examine the impact of environmental laws on corporate ESG performance using a double difference method. The basic idea is to identify the average treatment effect of the policy using the difference in the intensity of the policy shock to the experimental and control groups.

To test the impact of the new Environmental Protection Law on corporate ESG performance, we specify the following basic model:

$$ESG_{i,t} = \beta_0 + \beta_1 Tp_{i,t} + \sum Control + Year + Firm + \varepsilon_{i,t} \quad (1)$$

Among them, Tp is the core explanatory variable of the model, which is used to measure the extent to which the experimental group is affected by the policy and is a dummy variable to distinguish the experimental group from the control group. The new Environmental Protection Law was officially implemented on January 1, 2015. Tp=1 when the enterprise belongs to a heavy polluting industry and the year is in 2015 and later, otherwise Tp=0. $\sum Control$ denotes other control variables, while the year fixed effect Year and individual firm fixed effect Firm are also included in the model, and $\varepsilon_{i,t}$ is a random disturbance term.

$$ESG_{i,t} = \beta_0 + \beta_1 Tp_{i,t} + \beta_2 Ln_{pay}_{i,t} + \beta_3 Tp_{i,t} \times Ln_{pay}_{i,t} + \sum Control + Year +$$

$$+ Firm + \varepsilon_{i,t} \tag{2}$$

Model (2) adds the interaction term of the policy dummy variable Tp with executive compensation Ln_{pay} to model (1) to examine the moderating effect of executive compensation incentives on the relationship between the new EPA and corporate ESG performance.

$$ESG_{i,t} = \beta_0 + \beta_1 Tp_{i,t} + \beta_2 Insubs_{i,t} + \beta_3 Tp_{i,t} \times Insubs_{i,t} + \sum Control + Year + Firm + \varepsilon_{i,t} \tag{3}$$

Model (3) adds the interaction term of the policy dummy variable Tp with government subsidy Insubs to model (1) to examine the moderating effect of government subsidy on the relationship between the new Environmental Protection Law and corporate ESG performance.

5. Empirical results

5.1. Descriptive statistics

Table 1 presents descriptive statistical information on the main variables. The mean value of corporate ESG performance is 21.170 and the median value is 20.250, with a right-skewed distribution. The minimum value of ESG is 9.091 and the maximum value is 44.630, with a standard deviation of 6.819, indicating that ESG performance is volatile and varies widely among companies. The mean value of the policy dummy variable Tp is 0.239, indicating that the sample of heavily polluting enterprises belonging to the post-policy implementation period accounts for 23.9% of the total sample.

Table 1. Descriptive statistics

Variable	N	Mean	Std. Dev.	Min	P50	Max
ESG	7670	21.170	6.819	9.091	20.250	44.630
Tp	7670	0.239	0.427	0.000	0.000	1.000
Ln _{pay}	7670	14.62	0.729	12.90	14.58	16.72
Insubs	7670	16.720	3.220	0.000	17.140	23.230
Size	7670	23.200	1.381	20.430	23.100	26.950
Lev	7670	0.486	0.202	0.069	0.500	0.887
Roa	7670	0.046	0.058	-0.181	0.038	0.240
Board	7670	2.191	0.201	1.609	2.197	2.708
Age	7670	18.010	5.647	5.000	18.000	32.000
Top1	7670	37.900	16.170	8.650	36.990	77.330
Cashflow	7670	0.055	0.067	-0.141	0.053	0.248

5.2. Regression results analysis

5.2.1. Impact of the new Environmental Protection Law on ESG performance

Columns (1) and (2) of Table 2 report the results of the difference-in-differences regression based on model (1), both controlling for the year fixed effect and the firm fixed effect. The regression results after including the control variables show that the coefficient of Tp is 0.794, which is significantly positive at the 1% level. It shows that the implementation of the new Environmental

Protection Law has effectively improved the ESG performance of heavy polluters and H1 has been verified.

Based on the above analysis, it can be found that this paper's study on the utility of environmental regulation policies is consistent with the research methodology and findings of Wang *et al.* (2022). Although the two studies are not on the same policy, both the new Environmental Protection Law and Central Environmental Protection Inspection come under environmental regulation, i.e., the results of the studies report the facilitating effect of environmental regulation on firms' ESG performance. Currently, academics have not explored the impact on ESG in terms of the new Environmental Protection Law as a policy, therefore, the findings of this paper complement the current research gap between environmental regulation and ESG in terms of specific policies.

Moreover, the theoretical deductions and findings of this paper are in line with most of the previous studies that have explored the role of environmental regulation from a single dimension of environment, society and corporate governance. In the environmental dimension, strict monitoring and enforcement is the main motivation for firms to improve environmental quality (Greenstone and Hanna, 2014), and environmental regulation with the help of the government hand is an important means to internalize externalities (Shapiro and Walker, 2018). In the social dimension, the new Environmental Protection Law adds a special chapter on information disclosure and public participation, further clarifies and regulates the disclosure of corporate environmental information, and encourages the public to participate in the supervision of the environmental protection system (Zhang *et al.*, 2018), which can promote the fulfillment of corporate social responsibility. In the corporate governance dimension, institutional factors such as environmental regulations are often closely related to corporate environmental strategies (Sharma, 2000). The institutional pressure of new environmental laws can stimulate the effect of corporate technological innovation in pursuit of innovation compensation, which leads to higher strategic governance performance (Porter and Van der Linde, 1995). Based on previous studies, this paper integrates the three dimensions to explore the role of environmental regulation on ESG as a whole, leading to the above research conclusions.

5.2.2. The moderating effect of executive compensation

The regression results based on model (2) are reported in column (3) of Table 2. The coefficient of the cross product term of T_p and executive compensation $Lnpay$ is significantly positive at the 1% level and H2 is verified. The results suggest that firms' executive compensation promotes the incentive effect of environmental regulation, i.e., executive compensation positively moderates the relationship between the new Environmental Protection Law and ESG.

The relationship between corporate environmental stress and executive compensation has been explored in the literature (Berrone and Gomez-Mejia, 2009; Hartikainen *et al.*, 2021), but it is mainly based on the context of developed capital markets and does not take into account exogenous systemic shocks of environmental regulation. The findings of this study provide evidence of the moderating ESG performance that executive compensation has in the context of the new Environmental Protection Law. This finding is consistent with the chain of logic in existing studies, where the increase in executive compensation compensates for the uncertainty caused by regulatory pressures (Haque, 2017), while increasing the motivation of management in environmental strategy formulation, (Zou *et al.*, 2015; Shahab and Chen, 2020), which enhances firms' ESG performance.

5.2.3. The moderating effect of government subsidies

The regression results based on model (3) are reported in column (4) of Table 2. The coefficient of the cross product term of T_p and government subsidy $Insubs$ is significantly positive at the 1% level and H3 is verified. The results indicate that the higher the government subsidy, the stronger

the promotion effect on environmental regulation, i.e., the government subsidy positively moderates the relationship between the new Environmental Protection Law and ESG.

The conclusion that government subsidies have a positive moderating effect between the new Environmental Protection Law and ESG is consistent with the research of Shleifer and Vishny, who found that government subsidies can incentivize firms to comply with government goals (Shleifer and Vishny, 1994). Specifically, in the process of the government's introduction of the new environmental protection law to guide the development of enterprises in the direction of sustainable development, the government subsidies given to enterprises can reduce the risk of enterprises and enhance the motivation of enterprises to innovate and develop (Peng and Liu, 2018).

In addition, against the background of high R&D and investment pressures faced by most of the heavily polluting firms in China, this paper and existing studies agree that government subsidies can effectively solve the problem of firms' insufficient funds and thus enhance the policy effects of environmental regulation (Howell, 2017; Yang *et al.*, 2019).

Table 2. Regression results of the impact of the new Environmental Protection Law on corporate ESG performance

	(1)	(2)	(3)	(4)
	ESG	ESG	ESG	ESG
Tp	0.658***	0.794***	-5.070***	-1.563**
	(3.89)	(4.65)	(-3.14)	(-2.29)
Lnpay			0.035	
			(0.46)	
Tp×Lnpay			0.401***	
			(3.64)	
Insubs				-0.055***
				(-2.79)
Tp×Insubs				0.138***
				(3.48)
Size		1.262***	1.199***	1.280***
		(8.63)	(9.16)	(8.67)
Lev		-1.323**	-1.223**	-1.363***
		(-2.55)	(-2.38)	(-2.63)
Roa		1.421	1.289	1.426
		(1.38)	(1.20)	(1.39)
Board		-0.136	-0.129	-0.127
		(-0.31)	(-0.32)	(-0.29)
Age		0.450***	0.455***	0.451***
		(2.97)	(2.60)	(2.99)
Top1		0.020***	0.020***	0.020***
		(2.63)	(2.67)	(2.60)
Cashflow		0.324	0.318	0.255
		(0.41)	(0.39)	(0.32)

	(1)	(2)	(3)	(4)
	ESG	ESG	ESG	ESG
Constant	21.013***	-16.294***	-15.498***	-15.787***
	(366.42)	(-3.73)	(-3.50)	(-3.61)
Year	YES	YES	YES	YES
Firm	YES	YES	YES	YES
N	7,670	7,670	7,670	7,670
R ²	0.777	0.781	0.781	0.781

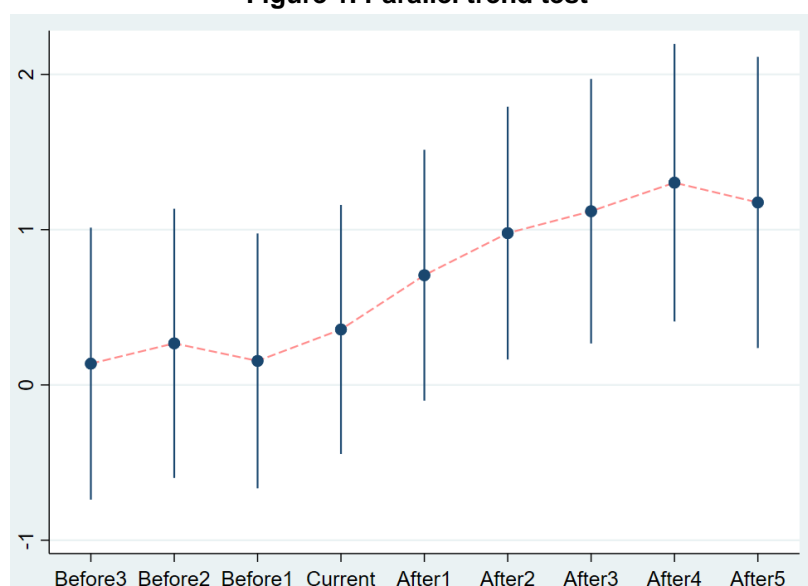
Note: ***, **, and * indicate significant at the 1%, 5%, and 10% levels, with t-values in parentheses.

5.3. Robustness tests

5.3.1. Parallel trend and dynamic effect

Passing the parallel trend test is a prerequisite for valid estimation of the difference-in-differences model, and the experimental group should have the same time trend in ESG as the control group in the absence of policy shocks. The estimation results of model (1) are biased if there are other significant policy effect shocks before the policy implementation. To ensure the robustness of the empirical results, referring to Hong and Kacperczyk (2010), this paper replaces the T_p variable with a dummy policy effect for each year of the sample period on the basis of model (1) and conducts a parallel trend test.

Figure 1. Parallel trend test



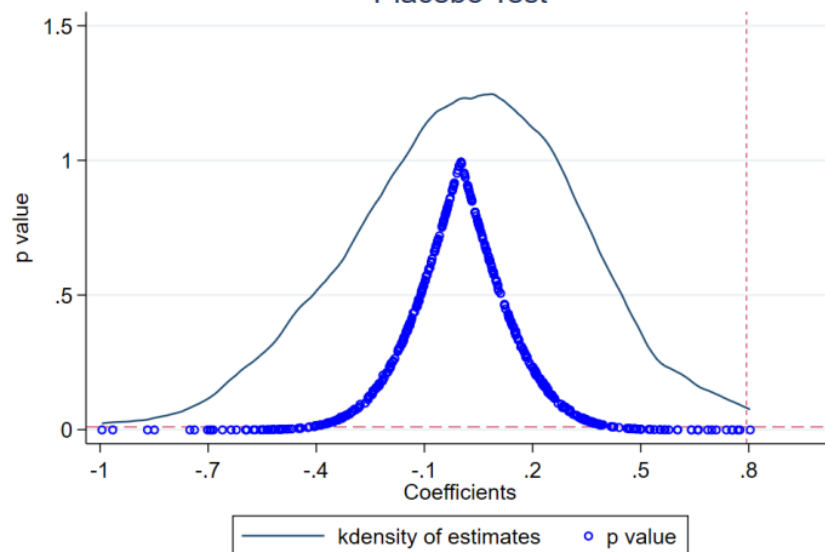
The test is shown in Figure 1, with Current indicating the current period of policy implementation, Before1-3 indicating periods 1 to 3 before policy implementation, and After1-5 indicating periods 1 to 5 after policy implementation. The results showed that there was no significant difference in ESG performance between the experimental and control group samples before the implementation of the new Environmental Protection Law, and the model passed the parallel trend

assumption. The graph also shows that the ESG performance of the companies in the experimental group gradually shows a significant growth trend after the implementation of the environmental law. The growth in ESG performance of the experimental group was positive but not significant in the current period of environmental law implementation, and over time, the ESG performance of the experimental group significantly improved starting in the post-policy implementation period. This indicates that there is a certain lagged effect of the policy impact, and also implies that the new Environmental Protection Law plays a positive role in enhancing corporate ESG performance, further validating the robustness of the regression results.

5.3.2. Placebo test

This paper uses a randomly generated experimental group for the placebo test. The same number of enterprises as the heavily polluting enterprises were randomly selected from the sample as the experimental group and the remaining sample as the control group, and the random sampling was repeated 500 times. Figure 2 shows the distribution of the regression coefficients under the placebo test, and it can be found that the estimated coefficients are concentrated around 0, much smaller than the estimated true value of 0.794. The vast majority of p-values were greater than 0.1 and were not significant at the 10% level. It indicates that there is no significant effect of the simulated policy constructed under the randomly specified state, suggesting that the enhanced ESG performance of heavy polluters is not perturbed by other random factors, which is consistent with the inference that the original hypothesis is caused by the implementation of the new Environmental Protection Law.

Figure 2. Placebo test
Placebo Test



5.3.3. Estimation results of shortened sample period

The longer the sample period, the more likely it is to be impacted by other external policies, such as the environmental fee-to-tax policy implemented in 2018, which may also affect corporate ESG performance. Therefore, this paper shortens the sample period to 2012 - 2017 to re-run the regression. The results in column (1) of Table 3 reveal that the coefficients of the policy dummy variables are still significantly positive, indicating the presence of a significant positive effect on

the ESG performance of heavily polluting firms, supporting the conclusion of the benchmark regression.

5.3.4. PSM-DID

Considering that the differences between enterprises in heavy polluting industries and non-heavy polluting industries due to their own characteristics will affect the empirical results, this paper further adopts the PSM-DID method to find a control group sample for the experimental group sample. The control variables in the baseline regression were used as covariates, and propensity score matching was performed using a nearest neighbor 1:1 matching, and the baseline regression was repeated with the matched samples. The results in column (2) of Table 3 show that the policy dummy variable *TP* remains significantly positive at the 1% level and the estimated coefficients are slightly higher than the baseline regression results, validating the robustness of the baseline regression results.

Table 3. Robustness tests

	(1)	(2)
	ESG	ESG
<i>TP</i>	0.399**	0.847***
	(2.40)	(3.28)
<i>Size</i>	0.644***	1.571***
	(3.34)	(6.12)
<i>Lev</i>	-0.138	-1.585**
	(-0.21)	(-2.13)
<i>Roa</i>	2.801**	0.229
	(2.03)	(0.14)
<i>Board</i>	-0.476	-0.280
	(-0.88)	(-0.42)
<i>Age</i>	0.377	0.567***
	(1.18)	(2.71)
<i>Top1</i>	0.028***	0.022*
	(3.08)	(1.83)
<i>Cashflow</i>	-0.860	1.260
	(-0.95)	(0.95)
<i>Constant</i>	-0.863	-25.021***
	(-0.12)	(-3.54)
<i>Year</i>	YES	YES
<i>Firm</i>	YES	YES
<i>N</i>	4,602	3,762
<i>R</i> ²	0.841	0.802

Note: ***, **, and * indicate significant at the 1%, 5%, and 10% levels, with t-values in parentheses.

5.4. Additional analyses

5.4.1. Test for differences in levels of rule of law

Established studies have found that the effects of policy implementation can show regional differences due to the different legal environments and levels of government intervention faced

by firms in different regions. The actual implementation of each regional government agency can greatly affect the operational effectiveness of environmental regulation (Zhang *et al.*, 2022). Laws and regulations enacted by the government in a good legal environment tend to be better and will prompt companies to incorporate legal policies into rational decision-making. On the contrary, when there are cases where local governments interfere with the enforcement of laws and regulations by the judiciary to accomplish economic goals and achieve political advancement, the relevant laws and regulations will not be effectively enforced (Allen *et al.*, 2005).

To explore the impact of differences in the level of the legal system on the effectiveness of the implementation of the new Environmental Protection Law in different regions, this paper uses the Legal System Environment Level Index from the China Provincial Marketization Index Report to measure the regional level of rule of law. The median score of the legal system level in the region where the company is located is used as the classification criterion. Column (1) of Table 4 shows that the regression coefficient of the policy dummy variable Tp is significant at the 1% level in the sample with a high level of rule of law. Column (2) of Table 4 shows that the samples with lower levels of rule of law did not pass the significance test. This suggests that the contribution of environmental protection laws to corporate ESG performance is more significant when the level of rule of law is high.

5.4.2. Media attention effect test

The new Environmental Protection Law encourages the public to actively participate in the supervision of environmental governance, and the media, as a channel of information transmission, builds a bridge between enterprises and the public. The media will expose the negative events that occur in the company and praise the positive behavior of the company in fulfilling environmental protection and social responsibility, so that stakeholders can make value judgments about the events after learning about the company's behavior (King and Lenox, 2001). This public attention creates public pressure on companies and acts as a reinforcement of corporate social norms (Dyck *et al.*, 2008). Faced with different levels of media attention, companies' behavioral performance may vary. This paper uses the natural logarithm of the number of online media reports to measure media attention, and classifies companies with higher and lower media attention based on their median. Column (3) of Table 4 shows that the regression coefficient of Tp is significant at the 1% level in the sample with high media attention. Column (4) of Table 4 shows that the regression coefficient of Tp is significant at the 10% level in the sample with low media attention, which is less significant than in the sample with high media attention. The results suggest that when media attention is high, environmental protection law policies are more effective in promoting corporate ESG.

5.4.3. Analysis of enterprise size heterogeneity

Enterprises of different sizes may be affected differently by the new Environmental Protection Law due to differences in their development models, resource endowments, and competitive advantages. This paper divides the sample into two groups of large-scale and small-scale firms by the median value of their total assets to examine whether the role of environmental law policies in promoting corporate ESG performance has a heterogeneous effect on firms of different sizes. Columns (5) and (6) of Table 4 show that the implementation of the new Environmental Protection Law is significantly and positively associated with corporate ESG performance in both large-scale and small-scale firms. However, the contribution of the new Environmental Protection Law to corporate ESG performance is stronger in the sample of large-scale firms than in the sample of small-scale firms, with a coefficient of 1.191 higher than the benchmark regression and much higher than the coefficient of 0.581 for the small-scale subgroup. The reason for this may be that large-scale enterprises are usually the focus of environmental regulatory inspections and are more sensitive to environmental regulations. Whether it is proactive or reactive behavior, large companies will have better substantial legal compliance measures compared to small-scale companies.

Table 4. Study on the level of rule of law, media attention and firm size

	Level of Rule of Law		Media attention		Enterprise size	
	(1)	(2)	(3)	(4)	(5)	(6)
	High level	Low level	High	Low	Large	Small
Tp	0.853***	0.560	0.827***	0.464*	1.191***	0.581***
	(3.69)	(1.55)	(2.99)	(1.90)	(3.94)	(2.73)
Size	0.988***	1.689***	1.083***	1.122***	1.177***	0.855***
	(5.60)	(4.82)	(3.99)	(5.93)	(3.97)	(4.05)
Lev	-1.284**	-1.358	-0.165	-1.721***	0.372	-0.973*
	(-2.00)	(-1.29)	(-0.18)	(-2.64)	(0.32)	(-1.68)
Roa	2.115*	1.755	4.653***	-0.435	5.997***	-1.367
	(1.83)	(0.82)	(2.77)	(-0.35)	(2.63)	(-1.23)
Board	-0.163	0.472	-0.224	0.450	-0.053	-0.081
	(-0.33)	(0.43)	(-0.31)	(0.82)	(-0.08)	(-0.14)
Age	0.464***	0.015	0.761***	0.155	0.968***	-0.086
	(2.89)	(0.03)	(2.58)	(0.91)	(4.23)	(-0.32)
Top1	0.030***	-0.025*	0.038***	0.006	0.010	0.039***
	(3.23)	(-1.65)	(3.00)	(0.55)	(0.82)	(3.59)
Cashflow	-0.323	2.238	-1.837	1.408	-2.736**	0.714
	(-0.35)	(1.38)	(-1.46)	(1.33)	(-2.19)	(0.73)
Constant	-10.328**	-19.142*	-18.251**	-8.588*	-24.399***	0.615
	(-2.04)	(-1.73)	(-2.18)	(-1.65)	(-2.91)	(0.09)
Year	YES	YES	YES	YES	YES	YES
Firm	YES	YES	YES	YES	YES	YES
N	5,720	1,869	3,752	3,787	3,814	3,806
R ²	0.811	0.776	0.816	0.778	0.810	0.734

Note: ***, **, and * indicate significant at the 1%, 5%, and 10% levels, with t-values in parentheses.

6. Conclusions and policy implications

The report of China's 19th National Congress clearly proposes to translate the concept of green water and green mountains is the silver mountain of gold into practice, highlighting the determination to integrate the construction of ecological civilization into economic construction. It is of great practical significance to investigate the impact of environmental regulation on ESG performance of enterprises, in order to promote the construction of ecological civilization and achieve the national goal of "double carbon" and high-quality economic development. This study uses the new Environmental Protection Law as a quasi-natural experiment to empirically test the impact of environmental regulation policies on the ESG performance of companies in heavy pollution industries by using the difference-in-differences (DID) method with the A-share listed companies in China from 2011 to 2020. The results show that the implementation of the new Environmental Protection Law has significantly improved the ESG performance of listed companies in China's heavily polluting industries. Executive compensation and government subsidies can positively moderate the relationship between the new Environmental Protection Law and ESG. This proves the effectiveness of environmental regulation in China, and the new Environmental Protection Law plays a good role in regulating the behavior of micro-economic agents.

Based on the empirical results, this study provides the following policy implications for the relevant sectors. First, the government should enhance the enforcement of environmental regulations and incorporate diverse institutional tools to guide the effective operation of the market with government regulations. The government should do a good job in formulating and improving laws and regulations to improve the level of local rule of law and the efficiency of law enforcement. The implementation of environmental policies should be fully integrated with national conditions and take into account regional differences, so as to achieve scientific and reasonable, according to local conditions. Second, we should establish and improve the financing mechanism for environmental protection, optimize the external financing conditions of enterprises, relieve the pressure of external financing, and provide sufficient financial support for enterprise technological innovation. The government should increase subsidies to promote the development of green transformation of heavy polluting enterprises. While promoting the overall development of the capital market, it is also important to focus on mechanism design and policy guidance to improve the effectiveness of resource allocation. Third, introduce media attention in addition to government supervision. Emphasize the role of the media in environmental governance and encourage the media to pay attention to the fulfillment of corporate environmental responsibility. Improve the construction of media monitoring platform to inspire enterprises with reliable public opinion on the concept of green environmental protection and actively implement environmental strategic management, and guide heavy polluters from "after the fact" pollution treatment to "before the fact" prevention.

There are also some limitations to this study. First, environmental regulations are behavioral norms set by the government for all micro-entities, but only Chinese listed companies are included in this paper, and the performance of other firms cannot be comprehensively observed. Second, while this paper explores the moderating effect of some internal and external factors on the utility of environmental regulation implementation, other influences may exist. Therefore, future research could further explore the possible existence of influencing factors or transmission mechanisms, such as internal governance and technological innovation.

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