The Impact of the New Environmental Protection Law on the Leverage Manipulation Behavior of Heavy Polluters

Jiangyi Guo

Department of Agricultural and Forestry Economics and Management, College of Economics and Management, China Agricultural University, Beijing, 100083, China

2020311320402@cau.edu.cn

Abstract. The new Environmental Protection Law effectively improves China's environmental governance level but also increases enterprises' sewage costs and operating expenses, which may increase the incentives for leveraged manipulation behavior. This paper explores the impact of the introduction of the new Environmental Protection Law on the leverage manipulation behavior of heavily polluting enterprises by using the double difference model (DID) with the data of China's A-share non-financial listed companies from 2010 to 2021. It is found that the introduction of the new Environmental Protection Law has significantly exacerbated the leverage manipulation behavior of heavy polluters. At the same time, the introduction of the new Environmental Protection Law has a stronger exacerbating effect on the leverage manipulation behavior of heavy polluters in the presence of increased regulatory uncertainty. Heterogeneity analysis shows that the introduction of the new Environmental Protection Law will further exacerbate corporate leverage manipulation under the condition that executives do not have political affiliation and the green background; tax incentives can alleviate the exacerbating effect of the new Environmental Protection Law on corporate leverage manipulation, while the new Environmental Protection Law significantly exacerbates the leverage manipulation of corporations under the condition of more government subsidies. Finally, based on the above findings, this paper puts forward policy recommendations for the relevant departments to formulate policies and regulate the leverage manipulation behavior of heavily polluting enterprises.

Keywords: new EPA, heavy polluters, leverage manipulation behavior, regulatory uncertainty.

1 Introduction

On the one hand, the introduction of the new Environmental Protection Law can force the technological enterprise transformation and improvement by enhancing the role of external supervision and implementing punitive measures for polluting enterprises; on the other hand, the new Environmental Protection Law increases the challenge of financing highly polluting businesses, while the process of transformation and up-

K. Elbagory et al. (eds.), *Proceedings of the 9th International Conference on Financial Innovation and Economic Development (ICFIED 2024)*, Advances in Economics, Business and Management Research 281,
https://doi.org/10.2991/978-94-6463-408-2_65

grading of enterprises may likewise cause a decline in their performance. Most of the existing literature focuses on discussing the impact of the new Environmental Protection Law on the environmental effects of corporate green innovation[1], environmental governance behavior [2], and environmental protection investment [3]. Under the pressure of the new Environmental Protection Law, when the performance of microenterprises is poor and their accumulated debts are too high, the leverage of microenterprises increases, which not only affects their production and operation activities, but even leads to the fact that they are forced to sell their assets cheaply to cope with the liquidation of their debts, which in turn triggers the financial crisis and economic recession [4], which makes the enterprises have incentives for leverage manipulation.

Is there a link between the introduction of the Law and corporate leverage manipulation behavior? What are the factors influencing the introduction of the Law on corporate leverage manipulation behavior? To address this, this paper conducts an empirical study on the relationship. This paper introduces regulatory uncertainty as a moderating variable and conducts a heterogeneity analysis from the aspects of whether the executives have political affiliation and a green background and the differences in tax incentives and government subsidies in each province to test the differential impact of the "New Environmental Protection Law" on the leverage manipulation behaviors of enterprises. On the basis of clarifying that the Law has effectively improved the level of environmental governance in China, the systematic analysis of the contradictions faced during the introduction of the Law, the impact on other policies, and the consequences brought about by the Law will be conducive to the further development of the advantages of the Law, and at the same time, improve the relevant complementary policies and measures, so as to ensure that enterprises can truly realize the sustainable development of green, rather than "self-deceiving". At the same time, the study of the introduction of the new "Environmental Protection Law" on the impact of corporate leverage manipulation behavior can better improve the "corporate leverage manipulation" aspects of the relevant theories by finding out the corporate leverage manipulation of the various factors affecting the behavior and its related impact mechanism, which can better help the relevant departments of the corporate leverage manipulation of the behavior of control and supervision.

2 Theoretical basis and research hypothesis

H1: The introduction of the new Environmental Protection Law affects the leverage manipulation behavior of heavy polluters and has an exacerbating effect on the leverage manipulation behavior of heavy polluters.

The new Environmental Protection Law has significantly increased the punishment for heavy polluters, which makes heavy polluters face higher environmental risks, including direct risk, default risk, reputation risk and other three risks, increasing the uncertainty of heavy polluters: direct risk caused by environmental pollution, i.e., daily fines, seizure, administrative detention and other severe penalties for polluting behaviors; the Law has caused some of the heavy polluters to The new Environmental Protection Law has caused some heavy polluting enterprises to experience a certain

degree of operational difficulties and deterioration in financial status, which may not be able to return investors' funds on schedule, thus causing default risk; heavy polluting enterprises have a greater intensity of emissions, which may easily lead to lawsuits and negatively affect investors, thus bringing reputational risk to the enterprise. The increase in internal financial and external risks and uncertainties will have an impact on the behavior and motivation of corporate leverage manipulation. In practice, with the rising leverage of enterprises, creditors either choose not to provide loans to enterprises anymore, or set harsh debt covenant terms to increase the cost of enterprise debt financing, or even directly restrict the debt level of enterprises not to exceed a certain standard, so enterprises with excessive leverage have incentives to hide their debts through leverage manipulation and reduce the explicit leverage, so as to achieve the goal of fulfilling debt covenants and lowering financing costs with creditors. contract with creditors and reduce financing costs[5].

H2: The introduction of the new Environmental Protection Law further exacerbates leverage manipulation by heavy polluters at a maketime of increased regulatory uncertainty.

In terms of firms externally, there is uncertainty about the regulation of firms when there is a change in the main leadership of the SEC. The SEC has the power to decide on the regulatory policies and supervision of all aspects of the capital market, such as information disclosure and investor protection, and the chairman of the SEC has overall responsibility for the work of the SEC. From a cost perspective, when the chairman of the SEC is replaced, the direction and focus of regulation are often new, and the original regulatory mechanism will be slackened, while the new regulatory mechanism has yet to be perfected, and is in a period of "green and yellow" [6]. Therefore, in the short term, the intensity of regulation will be reduced, which makes the "cost" of corporate leverage manipulation lower, and enterprises will be more inclined to "exploit the loopholes", through corporate leverage manipulation to whitewash the performance for personal gain. From a revenue perspective, in the short term, in terms of the policy direction of regulation, the change of the chairman of the Securities and Futures Commission (SFC), the adjustment of regulatory policy and changes in regulatory direction will release risk signals to the market. It has been pointed out that higher uncertainty will make investing tougher and monetary institutions to judge the future direction of the capital market, implement more cautious investment and credit strategies, and expose heavily polluting firms to higher financing thresholds and more severe financing constraints [7], and this theory has been discussed in the context of economic policy uncertainty[8] and macroeconomic uncertainty studies[9].

In order to win the favor of the capital market and reduce the cost of financing, when regulatory uncertainty intensifies, heavy polluters tend to engage in more leverage manipulation, embellish their financial statements, reduce risks, and obtain financing by meeting the psychological expectations of potential investors and creditors through "excellent" performance[10]. The regulatory efforts of the SEC have not been very strong. In terms of regulatory efforts, the change of the chairman of the Securities and Futures Commission (SFC) has led to a relaxation of the original regulatory system, resulting in a temporary decline in regulatory efforts, which has left potential investors

and creditors without a clear signaling mechanism to identify good and bad enterprises, and enterprises have incentives to engage in more leverage manipulation.

3 Research design

3.1 Variable Definition

Explained variable: degree of corporate leverage manipulation (ExpLEVM). When measuring leverage manipulation, firstly, the measurement will only include the degree of leverage manipulation using off-balance-sheet liabilities and nominal equity financing, named as the basic XLT-LEVM method; taking into account that some upward manipulation of profits by accounting measurement means are also more common, the appropriate expansion of the measurement scope, as far as possible, can be more clearly estimated accounting measurement means resulting in leverage manipulation part of the scope of the measurement is also included, named as the Extended XLT-LEVM method[5]. In this paper, the method is used to measure corporate leverage manipulation, as shown in Equation (1) below, and the specific statistical values are shown in Table 2 below.

$$\text{ExpLEVMit} = \frac{(DEBTB_{TOTALit}+DEBT_{OBot}+DEBT_{NSRDit})}{(ASSETB_{TOTAL}+DEBT_{OBit}-DM_{ASSET}-RDMASSETit)} - LEVBit \quad (1)$$

ExpLEVMi, t: extent of firm's leverage manipulation under the extended XLT-LEVM method (direct method);

DM_ASSETi, t : firm's overestimation of RDM_ASSETi using depreciation of fixed assets, t : firm's overestimation of total assets using capitalization of R&D expenditures;

LEVMi, t : extent of firm's leverage manipulation;

DEBTB_TOTALi, t : firm's total book liabilities;

DEBT_OBi, t : total off-balance sheet liabilities of the firm;

DEBT_NSRDi, t : total nominal equity of the firm;

ASSETB_TOTALi, t : total book assets of the firm;

LEVBi, t : leverage of the firm on its books.

Core explanatory variables: time dummy (Post) and industry dummy (Treat). In this paper, the year 2015, when the new Environmental Protection Law was implemented, is used as the baseline, and the samples are selected according to the year of the event, and the changes in the three periods before and after the sample are observed. Before the implementation of the Law (before 2015) is assigned the value 0, and after the implementation ((2015 and later) is assigned a value of 1. For the industry dummy variable (Treat), the heavy polluters are assigned a value of 1, and the others are assigned a value of 0, and at the same time, the interaction term between the time dummy variable (Post) and the industry dummy variable (Treat) is set up for the analysis.

Control variables. The paper selects control variables from the dimensions of the institutional environment, corporate governance, financial status, and firm size, including profitability, gearing ratio, growth capacity, and firm size, and sets individual, annual, and industry dummy variables[5,11,12].

Moderating variable: regulatory uncertainty. Listed companies are mainly regulated by the Securities and Exchange Commission (SEC), and the chairman of the SEC, as the primary leader of the SEC, has an important influence on the deployment of the work of the SEC and the fulfillment of its duties, and the change of the chairman of the SEC results in listed companies facing higher regulatory uncertainty[6]. Therefore, this paper mainly uses whether the chairman of the SEC changes his term to measure the regulatory uncertainty of listed companies (SU) as shown in table 1. If the chairman of the SEC changes between the previous year and the current year's annual report disclosure of the firm, the SU takes the value 1; otherwise, the SU takes the value 0. For example, if the annual report of a listed company is required to be disclosed by April 30th of the following year, and the chairman of the SEC changed his term of office in February 2016, the regulatory uncertainty is considered to be higher and the SU takes the value of 1 in 2015, because before April 30th, which is the deadline for the disclosure of the annual report, the Listed companies have the opportunity to engage in leveraged manipulation.

Table 1. Variable Definition Table

Variable type	variable name	variable symbol	Variable Description
explanatory variable	Degree of corporate leverage manipulation	ExpLEVM	please see above
Core explanatory variables	time dummy variable	Post	1 for 2015 and beyond, 0 for others
	Industry dummy variables	Treat	Heavily polluting enterprises take 1, others take 0
moderator variable	Regulatory uncertainty	SU	The SEC Chairman undergoes a change in metrics
control variable	profitability	ROA	Net profit/average total assets
	gearing	LEV	Total liabilities/total assets
	growth capacity	GROWTH	Revenue growth rate
	Enterprise size	SIZE	Logarithmic value of total assets
	Age of business	AGE	Logarithmic value of enterprise age [ln (time of annual report - time of inception + 1)]
	shareholding concentration	TOP10	Shareholding ratio of top ten shareholders
	Whether the chairman and general manager are two positions in one	DUAL	If the chairman and general manager are both appointed by the same individual, 1 is assigned; otherwise, 0 is assigned.
	Percentage of independent directors	Indep	The percentage of independent directors to all directors
	Annual dummy variables	Year	Controlling for yearly fixed effects
	Industry dummy variables	Industry	Controlling for industry fixed effects

3.2 Sample selection and data sources

In order to study the impact of the introduction of the new Law on the leverage manipulation behavior of heavy polluters and to ensure the continuity of the policy, this paper selects the financial data of China's A-share listed companies in the five years before the introduction of the Law and the six years after the introduction of the Law, i.e., 2010-2021, as the research sample, and screens them according to the following criteria on this basis: excluding the financial industry (J) of the Listed company samples; eliminating non-ST class companies[1], data incoherent enterprises, and all continuous variable data except for the variables that need to be analyzed for heterogeneity are subjected to 1% and 99% shrinking of the tails to exclude the impact of extreme values on the regression results. A total of 26,907 valid samples were obtained after screening. The sample data selected for this paper were obtained from the Cathay Pacific database, and data processing was performed using Excel and Stata 17.

3.3 Modeling

This paper chooses to establish a double difference model (DID) for empirical testing, the law and policy have significant quasi-natural experiment characteristics, and the double difference model can effectively overcome the endogeneity problem of OLS estimation, so as to accurately measure the impact of the introduction of the Law on the leverage manipulation behaviors of heavily polluting enterprises; the double difference model is a model based on the quasi-natural experiment for empirical testing, and it can ensure that the sample is fully randomly assigned to the treatment group or the control group, which can effectively detect the changes in the leverage manipulation behavior of heavy polluting firms before and after the deleveraging policy's adoption. Therefore, this paper establishes the following DID model:

$$\text{ExpLEVM} = \beta_0 + \beta_1\left(Treat_{i,t} * Post_{i,t}\right) + \beta_2 Controls + Firm_i + Year_i + Industry_i + \varepsilon_{it} \quad (2)$$

Among them, $Treat_{it} * Post_{it}$ is the time dummy variable and industry dummy variable. After passing the parallel trend test, if the coefficient of the interaction term is greater than zero, it proves that the introduction of the Law exacerbates the behavior of corporate leverage manipulation, and vice versa, it mitigates the behavior of corporate leverage manipulation. Controls are the eight control variables selected in this study, and the same equation contains individual, yearly, and industry dummies, and εit is a random perturbation term.

In this paper, regulatory uncertainty (SU) is selected as a moderating variable to test the moderating mechanism. There is little literature to study the impact of the introduction of the Law on the leverage manipulation behavior of heavy polluters from the perspective of regulatory uncertainty, so the interaction term between regulatory un-

[1] When a company loses money for two consecutive years or its net assets fall below the par value of the stock, the name of the stock will be preceded by "ST", which means "special treatment", and the daily rise or fall is limited to 5%.

certainty and DID is constructed, and the interaction term of the multiplication of the three explanatory variables appears, and the model is established as follows:

$$\text{ExpLEVM} = \beta_0 + \beta_2\left(Treat_i, t * Post_{i,t}\right) + \alpha_1 SU_{i,t} + \alpha_2\left(Treat_{i,t} * Post_{i,t} * SU_i\right) + \beta_2 Controls + Firm_i + Year_i \quad (3)$$

3.4 Descriptive statistics

As can be seen from Table 2, the mean value of the degree of corporate leverage manipulation is 0.121 , the minimum value is 0, and the maximum value is 1.499, which indicates that China's current heavily polluting enterprises do have corporate leverage manipulation, and there is a large difference in the leverage manipulation behavior between enterprises. The industry dummy variables and time dummy variables are 0-1 variables, and their mean values are all far from 0.5, indicating that the samples selected in this paper are asymmetric sample data, which may have an impact on the significance of some regressions. At the same time, the standard deviation of the control variable enterprise size in the study of this paper is 1.293, indicating that the research subjects in this paper differ significantly in enterprise size.

Table 2. Descriptive statistics of core variables

	average value	(statistics) standard deviation	minimum value	upper quartile	maximum values
ExpLEVM	0.1214	0.2112	0.0000	0.0442	1.4986
Post	0.6913	0.4620	0.0000	1.0000	1.0000
Treat	0.2049	0.4036	0.0000	0.0000	1.0000
ROA	0.0337	0.0622	-0.2744	0.0345	0.1880
LEV	0.4511	0.2007	0.0782	0.4426	0.9290
GROWTH	0.1460	0.2544	-0.3132	0.0911	1.4206
SIZE	22.2949	1.2925	19.9076	22.1047	26.3017
AGE	2.9422	0.2956	2.0794	2.9444	3.5835
TOP10	0.5763	0.1556	0.0878	0.5838	0.9599
DUAL	0.2640	0.4408	0.0000	0.0000	1.0000
Indep	0.3744	0.0549	0.0000	0.3333	0.8000

4 Results and Analysis

4.1 Regression results

As can be seen from Table 3, model (1) is to test the impact of the introduction of the new Environmental Protection Law on the leverage manipulation of heavy polluting enterprises under the premise of adding only individual fixed effects, and the regression coefficient of the new Environmental Protection Law is 0.0202, and it is significantly positive at the 1% level, demonstrating that enterprise leverage manipulation has sig-

nificantly improved following the enactment of the Law. In model (2), the regression coefficient of the new Environmental Protection Law is still positive but not significant under the premise of adding individual and year fixed effects, indicating that the Law still has an exacerbating effect on the leverage manipulation behaviors of heavy-polluting enterprises. In model (3), the regression coefficients of the Law and the leverage manipulation behavior of enterprises are still significantly positive after adding individual, industry and year-fixed effects, indicating that the introduction of the Law does exacerbate the degree of leverage manipulation of heavily polluting enterprises.

By adding regulatory uncertainty as a moderator variable in model (4), there are two more items in the base model, namely, "regulatory uncertainty, time dummy*industry dummy*regulatory uncertainty". The regression results show that regulatory uncertainty is inversely proportional to corporate leverage manipulation, and when there is regulatory uncertainty, companies are more motivated to engage in speculative behavior, which increases the probability of leverage manipulation by heavy pollution companies. The coefficient of the interaction term "time dummy*industry dummy*regulatory uncertainty" and the interaction term "time dummy*industry dummy" are both positive, while the coefficient of the interaction term "time dummy*industry dummy" is 0.5 compared to the coefficient of the interaction term "time dummy*industry dummy". The coefficient on the interaction term "time dummy*industry dummy*regulatory uncertainty" is larger in absolute value at 0.0175 compared to the coefficient on the interaction term "time dummy*industry dummy*regulatory uncertainty" at 0.0077, and is significant at the 5% level, so that the effect of the EPA on the leverage of heavy polluters is more pronounced in the context of increased regulatory uncertainty. The effect of increased manipulation is more significant.

Table 3. Table of basic regression tests

explanatory variable	ExpLEVM Model (1)	ExpLEVM Models (2)	ExpLEVM Models (3)	ExpLEVM Models (4)
Treat*Post	0.0202***	0.0093	0.0130**	0.0077
	(3.3946)	(1.4956)	(2.0013)	(1.1077)
SU				-0.0203
				(-1.3519)
Treat*Post*SU				0.0175**
				(2.2148)
ROA	0.2153***	0.2228***	0.2199***	0.2204***
	(8.2166)	(8.4843)	(8.3541)	(8.3737)
LEV	0.0927***	0.0962***	0.0976***	0.0973***
	(7.1002)	(7.2910)	(7.3455)	(7.3199)
GROWTH	-0.0591***	-0.0646***	-0.0634***	-0.0632***
	(-10.7573)	(-11.6294)	(-11.3854)	(-11.3374)
SIZE	-0.0306***	-0.0314***	-0.0325***	-0.0326***
	(-9.7966)	(-9.8943)	(-9.9755)	(-10.0109)
AGE	0.0146	0.0296	0.0259	0.0264

	(1.3598)	(0.9908)	(0.8623)	(0.8792)
TOP10	-0.0168	-0.0103	-0.0093	-0.0089
	(-1.0659)	(-0.6431)	(-0.5758)	(-0.5511)
DUAL	-0.0065	-0.0067	-0.0072*	-0.0072*
	(-1.5485)	(-1.5793)	(-1.7153)	(-1.7026)
Indep	0.0298	0.0296	0.0236	0.0234
	(0.8466)	(0.8424)	(0.6701)	(0.6667)
individual fixed effect	YES	YES	YES	YES
Annual fixed effects		YES	YES	YES
industry fixed effect			YES	YES
N	26,907	26,907	26,907	26,907
R^2	0.0144	0.0180	0.0274	0.0276

Note: *, ** and *** indicate significance at the 10%, 5% and 1% statistical levels, respectively.

4.2 Robustness tests

Parallel trend test. As shown in Figure 1, the horizontal coordinate represents the year, the vertical coordinate represents the size of the coefficient of the impact of the introduction of the Law, the point in the figure is the specific value of the coefficient, and the line where the point is located represents the confidence interval. If the confidence interval of the coefficient value represented by the point falls outside of 0, it represents that the coefficient is significantly different from zero, violating the original hypothesis (i.e., the policy coefficient is zero), and the implementation of the Law has a significant impact on the degree of leverage manipulation of enterprises. If the confidence intervals of the coefficients in the years before the implementation of the policy contain zero, and do not contain zero after the implementation of the policy, it indicates that the parallel trend test was passed and that there is an effect after the implementation of the policy. Before the implementation of the Law, the confidence intervals intersect the horizontal axis, but after the implementation of the law, the confidence intervals do not intersect the horizontal axis and are above the horizontal axis, so it passes the parallel trend test, and the DID model established in this paper is effective in the analysis.

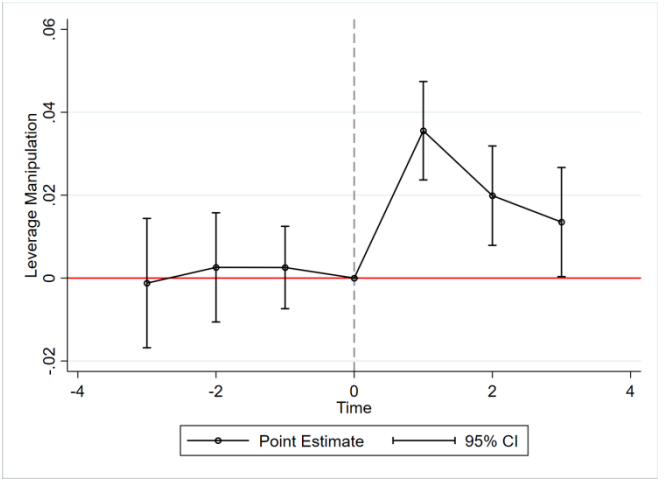

Fig. 1. Parallel trend test

Change the sample data metric interval. Due to the introduction of the "green credit policy" in 2012, in order to exclude the impact of green credit policy on the research of this paper, we only choose the data of 2012 and later to carry out a new regression on the base model, the results are shown in Table 4 model (5). The regression coefficient of the interaction term of the core explanatory variables on the leverage manipulation behavior of heavy polluting enterprises is significantly positive at the 5% significance level, with the size of 0.0167, indicating that the introduction of the Law has indeed exacerbated the degree of leverage manipulation of heavy polluting enterprises after excluding the impact of the green credit policy, and that the results of the previous paper are robust.

Add more control variables. In order to test the robustness of the previous regression results, a new regression of the base model is conducted by adding environmental protection expenditure as a proportion of general public budget expenditure (EPER) to the base regression, and the results are shown in model (6) of Table 4. The regression coefficient of the interaction term of the core explanatory variables on corporate leverage manipulation is significantly positive at the 10% significance level, with a size of 0.0115 , indicating that the introduction of the Law does exacerbate the degree of leverage manipulation of heavy polluting firms after excluding the effect of green credit policy, and the previous results are robust.

Placebo test. To further rule out the interference of other unknown and potential factors and to ensure that the intensification of leverage manipulation by heavy polluters is caused by the introduction of the Law, this paper conducts a placebo test. Specifically, a placebo test is conducted by randomly sampling the interaction term 500 times to see if the coefficients are significantly different from the baseline estimates. The results

show that the random simulation yields a distribution of regression coefficients around 0, while the coefficient estimate of the benchmark regression is 0.0130 and completely independent of this coefficient distribution. At the same time, the vast majority of the placebo test results had p-values greater than 10% and were statistically insignificant according to figure 2. This suggests that the previous paper's conclusion that the Law significantly exacerbated the leverage manipulation of heavy polluters is not due to randomness or chance.

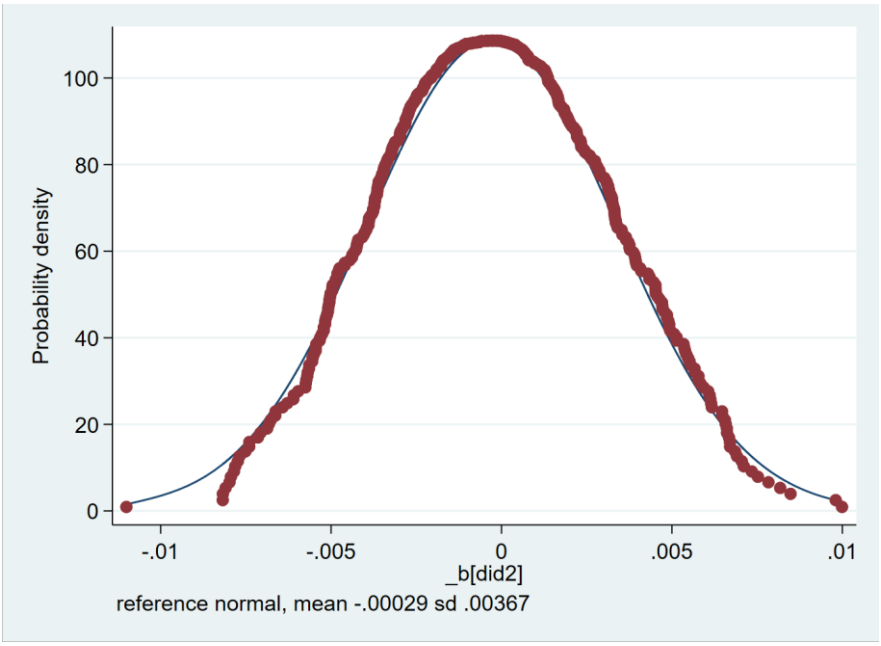

Fig. 2. Placebo test

Changing the way explanatory variables are measured. Model (7) in Table 4 is a re-test of the impact of the implementation of the Law on the leverage manipulation behavior of firms after replacing the explanatory variables. Under the basic XLT-LEVM method, the extended XLT-LEVM method (indirect method) takes into account the degree of leverage manipulation generated by all accounting instruments (surplus management instruments) Under the basic XLT-LEVM method, it is expressed as the existence of leverage manipulation by the company using off-balance-sheet liabilities, nominal shares and accounting instruments. Under the extended XLT-LEVM method (indirect method), the degree of leverage manipulation per company per year can be measured according to equation (4).

$$ExpLEVMI_{it} = (DEBTB\_TOTAL_{it} + DEBT_{OB_{it}} + DEBT_{NSRD_{it}})/(ASSETB_{TOTAL_{it}} + DEBT\_OB_{it} - DA_{it}) - LEVB_{it} \quad (4)$$

Where ExpLEVMIit is the degree of firm leverage manipulation under the extended XLT-LEVM method (indirect method), DAit is the estimated value of firm manipula-

tion accruals, and the other variables are the same as in equation (1). The results show that the implementation of the Law still has a significant positive impact on corporate leverage manipulation as. In particular, the cross terms DID of the time dummy and industry dummy variables are both positively significant at the 10% level, which is consistent with the findings above and passes the robustness test.

Excluding the impact of deleveraging policies. In order to ensure that the policy effect of the implementation of the Law on the leverage manipulation behavior of heavy polluters is not the effect of other policies during the same period, this paper re-verifies the effect of the Law on the leverage manipulation behavior of heavy polluters after excluding the policy effect of the deleveraging policy. Construct the "time dummy variable * deleveraging policy effect variable", add this interaction term as a control variable in the basic regression, a new regression on the basic model, the regression results are shown in Table 4 model (8). The coefficient of the interaction term "deleveraging policy effect" is significantly positive at the 10% level, and the coefficient of the "time dummy variable * (new Environmental Protection Law) industry dummy variable" is significantly positive at the 5% level. This suggests that, after excluding the policy effect of deleveraging, the introduction of the Law still significantly exacerbates the leverage manipulation behavior of heavy polluters, which is consistent with the findings above and passes the robustness test.

PSM+DID regression. The sample time period analyzed in this paper is 2010–2021, in which the exogenous shock occurs in 2015. In order to narrow the differences between companies in the treatment group and the control group, and to avoid the impact of sample selection bias on the findings of this paper, the samples before the introduction of the Law are selected as matching variables. At the same time, the samples of heavily polluted industries are taken as the treatment group, and the rest of the samples are taken as the control group. Propensity score matching (PSM) is conducted through the near-neighbor 1:5 matching method, and 15,059 samples were successfully matched in the year. After PSM matching, this paper retains the matched successful samples here, extracts the samples of the treatment group and the control group in the co-sustained region, combines them into DID regression, and then re-conducts the PSM+ DID regression results, as shown in Table 4 Model 9. The Law does exacerbate the degree of leverage manipulation of enterprises through regression analysis of the PSM-matched successful samples, and it is significant at the 5% level, which once again illustrates the validity of the conclusions of the previous analysis. Compared with the main regression results, after removing the characteristic differences between the samples in the treatment group and the samples in the control group, the role of the Law on the exacerbation of leverage manipulation of heavily polluting enterprises has been weakened, mainly due to the fact that this paper defines the samples of the treatment group as the samples of the heavily polluting industries, which are faced with the shrinking of the market, the restriction of the financing ability and the impact of other industrial regulatory policies, and the impact of the above factors on the above factors may have a

certain impact on the "de-realization to virtualization" behavior, and the deviation will be weakened after removing the above impact.

Table 4. Robustness test table

explanatory variable	Changing the sample data metric interval Models (5)	Add more control variables Models (6)	Changing the way the explanatory variables are measured Models (7)	Excluding the impact of deleveraging policies Models (8)	PSM+DID regression Models (9)
	ExpLEVM	ExpLEVM	ExpLEVMI	ExpLEVM	ExpLEVM
Treat*Post	0.0167** (2.0454)	0.0115* (1.7439)	0.0114* (1.7062)	0.0131** (2.0261)	0.0193** (2.1034)
EPER		0.0358 (0.3343)			
Post*Policy				0.0095* (1.6965)	
control variable	YES	YES	YES	YES	YES
individual fixed effect	YES	YES	YES	YES	YES
Annual fixed effects	YES	YES	YES	YES	YES
industry fixed effect	YES	YES	YES	YES	YES
N	22,433	26,113	26907	26907	15,059
R2	0.0262	0.0274	0.0375	0.0275	0.0295

Note: *, ** and *** indicate significance at the 10%, 5% and 1% statistical levels, respectively.

5 Conclusions

This study shows that the Law has a significant exacerbating effect on the leverage manipulation behavior of heavy polluters. Meanwhile, the moderating test concludes that the Law significantly exacerbates the leverage manipulation behavior of firms that pollute heavily face heightened regulatory uncertainty.

Environmental regulations' impact on firm innovation, productivity, and environmental protection expenditures[13,14], or how economic policy uncertainty, capital market opening, and fintech affects the financialization of firms has been studied by many scholars[15,16,17]. This study focuses on the connection between environmental regulation and corporate leverage manipulation, and in the future, we will further explore the impact of the Law on corporate leverage manipulation behavior based on the internal and external perspectives of firms under the conditions that executives are not politically connected or do not have a green background; in addition, it is also important to study the impact of the local differences of tax incentives and government subsidies on the leverage manipulation behavior of firms. In addition, it is also important to study the impact of local differences in tax incentives and government subsidies on corporate leverage manipulation behavior.

References

1. China Population-Resources and Environment, Wang Xiaoqi, Hao Shuangguang, and Zhang Junmin, "The New Environmental Protection Law and Corporate Green Innovation: 'Forcing' or 'Squeezing'?" , Vol. 30, No. 7, 2020, pp. 107-117.
2. Economic Management, Cui Guanghui, Jiang Yingbing. The impact of environmental regulation on corporate environmental governance behavior - a quasi-natural experiment based on the new Environmental Protection Law [J].2019, (10): 54-72.
3. Accounting Research, Liu Yuanyuan, Huang Zhengyuan, Liu Xiaoxuan, "Environmental Regulation, Executive Compensation Incentives, and Corporate Environmental Protection Investments-Evidence from the Implementation of the 2015 Environmental Protection Law", Vol. 5, No. 2021, pp. 175 -192 pp.
4. ECONOMETRICA, Fisher, I., "THE DEBT-DEFLATION THEORY OF GREAT DEPRESSIONS", 1933, 1(4), 337-357.
5. Journal of Management Science, Xu Xiaofang, Lu Zhengfei, and Tang Taijie, "A Study on the Means, Measurement, and Causes of Leverage Manipulation of Listed Companies in China",2020, Vol. 07, No. 23, pp. 1-26.
6. Management World, Gu Park and Zhai Shiyun, "Regulatory Uncertainty and Corporate Surplus Quality - A Quasi-Natural Experiment Based on the Change of SEC",2020 Vol. 12 No. 36, pp. 186-202 pp.
7. Economic systems, Zhang, G., J. Han, Z. Pan and H. Huang, "Economic policy uncertainty and capital structure choice: Evidence from China", 2015, 39(3), 439-457.
8. Management World, D. Q. Chen, Y. S. Chen, and Z. Y. Dong, "Policy uncertainty, tax administration intensity and corporate tax avoidance",2016, Vol. 05, pp. 151-163.
9. Economic systems, Talavera, O. A. Tsapin and O. Zholud , "Macroeconomic uncertainty and bank lending: the case of Ukraine", 2012, 36(2), 279 -[11] The Journal of Finance (JFM).
10. Accounting Research, T. P. LU and D. X. ZHANG, "Financing Demand, Financing Constraints, and Surplus Management",2014, 01, pp. 35-41.
11. Management World, Xi Zhou, Xiaofang Xu, Zhengfei Lu, "Deleveraging, who is more active and prudent?" ,2020, Vol. 08, No. 36, pp. 127-148.
12. Research on Financial Issues, Zhibin Li and Xinyi Huang, "The New Environmental Protection Law, Corporate Strategy and Technological Innovation - A Study Based on Listed Companies in Heavily Polluted Industries", Vol. 07, 2021, pp. 130 -137 pp.
13. Nankai Management Review, Lv Peng, Huang Saiqin. Will environmental regulatory pressure promote corporate transformation and upgrading[J]. 2021,(3):1-20.
14. The Rand Journal of Economics, Jorgenson D. W., Wilcoxen P. J. Environmental Regulation and US Economic Growth[J]. 1990, 21(2): 314-340.
15. China Industrial Economy, Peng Yuchao, Han Xun, Li Jianjun. Economic policy uncertainty and corporate financialization[J]. 2018, (1):137-155.
16. Contemporary finance and economics, Wang Y, Lu Xueyao. Capital market liberalization and enterprise "deconcentration"-based on the perspective of dual governance mechanism[J]. 2021, (9):66-77.
17. Contemporary Finance and Economics, Xin Daleng. Fintech and corporate "deconcentration"---Evidence from Chinese A-share listed companies[J]. 2021,(7):65-76.