Who Drives Environmental Governance of Enterprise: Official Tenure Evaluation or Five-Year Plan Target Assessment?

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Based on the non-financial listed enterprises data from 2000 to 2014, this paper calculates the level of environmental governances of enterprises with environmental investment, and empirically analyzes the impact of provincial official tenure and Five-Year Plan target assessment on the environmental governance of enterprises. The results show that the enterprise environmental investment presents a significant periodic trend in the Five-Year Plan, while the trend is not significant in official's tenure. The further test suggests that with the clear requirement of "environmental performance" incorporated into the performance evaluation system of local government officials, it has become significant in the periodic trend in the impact of officials' tenure on environmental investment. In contrast, the trend has become less prominent in the Five-Year Plan, which indicates that there is a substitute relation between the two evaluation systems. The mechanism test also finds that both environmental subsidies and pollution abatement expenditures present a significantly periodic trend in the Five-Year Plan. And official's tenure plays a regulatory role in the Five-Year Plan periodic trend in the environmental governance of enterprise, showing that it is more significant when the time about officials' tenure evaluation is earlier than Five-Year Plan target assessment. The above results indicate that it is beneficial to improve local environment governance from the perspective of top institutional design by both strengthening the environmental evaluation.

Keywords: five-year plan, target assessment, official's tenure evaluation, environmental governance of enterprises

1. Introduction

Since the reform and opening up, Chinese economy with the rapid development has created a miracle in the history of world economic development (Lin, 2014). At the same time, ecological environment has also become a great pain point. In the rapid economic development of nearly 40 years, there are many environmental problems that are same with that appeared in the process of developed countries' industrialization

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during hundreds of years (Sun *et al*., 2014; Luo and Lai, 2016). Statistically, the total cost of the state's investment in preventing environmental deterioration and resource depletion has accounted for about 10% of GDP. Air and water, as the direct necessities of human life activities, have been seriously polluted. In the two sessions held in 2017, Premier Li Keqiang made a speech at the press conference that China would firmly make the skies blue again, and the blue sky would not be a luxury in the future.

Chinese government has always put a high value on environmental protection in the process of economic development. The first national environmental protection conference was held in August 1973, and the "environmental protection" has been identified as a basic national policy in the second National Conference held in 1983. In order to control the increasingly serious environmental problems, China has formulated a series of laws and regulations, such as *Environmental Protection Law*, *The Law on Prevention and Control of Air Pollution*, *Five-Year Plan for National Environmental Protection* and *The Comprehensive Assessment and Evaluation Method of Leading officials of Local Party and Government (trial implementation)* (hereinafter referred to as "Assessment and Evaluation Method"), which gradually formed a multi-dimensional environmental governance system in law, economy and administration.

This paper uses the environmental governance of listed enterprises as the sample. On the one hand, listed enterprises are the major participants of market economy activities, which play an increasingly important role in national economy, and the enterprises have become a booster and backbone in the development of national economy. On the other hand, the rapid economic development is usually accompanied by the depletion of natural resources, ecological destruction and environmental pollution. Statistically, enterprises contribute to 80% of the environmental pollution (Luo and Lai, 2016) and it shows an increasing trend in recent years. The environmental behavior of listed enterprises would have an important impact on environmental quality of regions or country in which enterprises locate. Therefore, how to effectively improve the environmental governance would be directly related to the success of social control of pollution. In view of this, with the non-financial listed enterprises from 2000 to 2014 as the sample, this paper empirically examines the impact of tenure assessment and Five-Year Plan target assessment on environmental governance.

The main contributions of this paper are as follows. First, integrating the environmental governance function of tenure assessment and Five-Year Plan target assessment, and analyzing the effect and the mechanism of both tenure assessment and Five-Year Plan target assessment, which clarifies the institutional incentives of poor environmental governance in China for a long time, and is conducive to optimize the environmental governance system from the aspect of top-level system design. Second, this paper finds that compared with the official tenure assessment, Five-Year Plan target has a more significant effect of environmental governance of enterprises, which

clarifies the specific functions of two target assessment systems in environmental governance, and further enriches and expands the study of officials' incentives in environmental governance. Third, this paper also finds that, with the clear requirement of "energy saving and environmental protection" incorporated into the performance evaluation system of local government officials in 2009, the effect of tenure assessment and Five-Year Plan target assessment on environmental governance has changed, which shows that official tenure has a more significant effect on environmental governance. There is a substitutional relation between official tenure and Five-Year Plan. This paper further enriches and expands study on the interaction effect between official tenure and Five-Year Plan on environmental governance.

2. Institutional Background, Literature Review and Hypothesis

2.1. Institutional Background

As the guiding documents of public environmental governance, the Five-Year Plan of environmental protection plays an important role in the national environmental governance system. Making the targeted plans, the Five-Year Plan of environmental protection could consciously and theoretically formulate strategy and guide resource allocation to achieve the goal. Table 1 shows the main targets, planning and implementation of emission reduction from 10th Five-Year Plan to 13th Five-Year Plan according to the "Parton Environmental Protection" in each Five-Year Plan. Obviously, the Five-Year Plan has clearly defined the specific assessment indicators of environmental protection since 10th Five-Year Plan. In addition to the period of 10th Five-Year Plan and 11th Five-Year Plan, the sulfur dioxide emission and chemical oxygen requirement were not completed, other emission reduction targets were achieved by exceeding the requirement of planning target. The existing literature has found that Five-Year Plan significantly intensified the political periodicity of environmental pollution governance, which confirms the role of Five-Year Plan in environmental governance (Zheng, 2016).

Official tenure assessment is another important gripper of environmental governance. In order to solve the increasingly serious environmental problem, central government has continuously promoted the importance of environmental and energy indicators in the official assessment system (Zheng, 2016). In 1996, the State Council announced the implementation of responsibility system of local administrative leaders in environmental governance. Both *The Decision on Strengthening Environmental Protection in the Implementation of Scientific Outlook on Development* in 2005 and *The Notice of Issuance of a Comprehensive Energy Reduction Program* in 2007 clearly fit the environmental protection into the assessment system of leadership and officials (Luo and Lai, 2016). In July 2009, central government established a

scientific rating system of official assessment and formulated the Assessment and Evaluation Method to strengthen the construction of central local Party leadership and officials (Li and Zheng, 2016). At the same time, the energy saving and emission reduction are incorporated into the performance assessment of local officials, and are also used as a reference for changing term of office, as well as appointment of official (as shown in Table 1). According to the incentive theory of the political tournament (Zhou, 2007), the performance appraisal of local government officials would directly affect the administrative behavior of local officials in China, which is ultimately reflected in the difference of economic and social development. Therefore, the administrative behavior of local officials would be adjusted according to the quantitative requirements of assessment methods in order to complete the examination and promotion.

2.2. Literature Review

The existing literature on environment mainly focuses on environmental governance and economical performance of environment. Literature on environmental governance is more closely related to the subject of this paper. If the environmental governance system is divided into formal and informal institution, the informal environmental governance system would include public opinion, identity and disclosure of corporate social responsibility while the formal environmental governance system would include laws, regulations, emission trading, tax penalties and administrative system. The informal system and environmental governance focus on finding a new way of environmental governance (Shen and Feng, 2012; Zheng, 2013; Hu *et al.*, 2017). Although many studies show the informal system plays a certain role in environmental governance, non-mandatory governance means (Yang, 2012) and the externality of public goods result in appearance of "free rider" and "tragedy of the commons" in the implementation of non-institutional measures.

Table 1. The Emission Reduction Targets from 10th Five-Year Plan to 13th Five-Year Plan

Name of Five-Year Plan	Period	Emission reduction targets	Planning goals	Completed situation
10th Five-Year Plan	2000–2005	Sulfur dioxide (SO_2)	–10%	27.8%
		Chemical oxygen demand (CDO)	–10%	–2.1%
		Industrial solid waste emission	–10%	–48.1%
11th Five–Year Plan	2006–2010	Sulfur dioxide (SO_2)	–10%	14.29%
		Chemical oxygen demand (CDO)	–10%	–12.45%
		Industrial solid waste emission	–10%	

Name of Five-Year Plan	Period	Emission reduction targets	Planning goals	Completed situation
12th Five-Year Plan	2011–2015	Sulfur dioxide (SO_2)	–8%	–18%
		Chemical oxygen demand (CDO)	–8%	–12.9%
		Ammonia nitrogen emission (NH)	–10%	–13%
		Total amount of nitrogen and oxygen (NO)	–10%	–18.6%
13th Five-Year Plan	2016–2020	Sulfur dioxide (SO_2)	Undetermined	Undetermined
		Chemical oxygen demand (CDO)	Undetermined	Undetermined
		Ammonia nitrogen emission (NH)	Undetermined	Undetermined
		Total amount of nitrogen and oxygen (NO)	Undetermined	Undetermined
		Fine particles ($PM_{2.5}$)	Undetermined	Undetermined

Sources: 10th Five-Year Plan, 11th Five-Year Plan, 12th Five-Year Plan and 13th Five-Year Plan of national environmental protection.

Therefore, the official system dominated by government is the main force that forces the polluting enterprises to improve the environmental governance. The formal system could be subdivided into two types: market regulation and government regulation. The existing literature on environmental regulation of environmental governance is mainly based on these two kinds of environmental regulations. The market environmental regulation mainly focuses on trading mechanism of carbon emission (Marshall, 1998; Zhang and Li, 2012) and emission trading (Stavins, 1995; Montero, 1998; Färe *et al*., 2013; Tu and Chen, 2015). It can be found that although the theory of market mechanism is effective, but the market regulation and supporting system in the institutional environment with Chinese characteristics are not perfect. This indicates the main role of environmental regulation must depend on the government and its officials.

As the final fallback of environmental governance, government should take the responsibility of losses that caused by the external economics. Government environmental regulations could be divided into legal and administrative regulations. Since the environmental interests appeal in central government and local government are different, a large number of scholars research on the implementation effect of environmental law and specific environmental regulation, as well as the game between local government and central government on environmental supervision. For the environmental protection law, Dasgupta *et al*. (2001) find that environmental supervision inspection could better explain the environmental performance of industrial pollution. Ge *et al*. (2015) find that interview system has a positive effect on the rectification of local government. For game between central government

supervision and local government supervision, However, the above literature ignores the heterogeneity of government officials in implementing specific environmental regulations and policies.

To sum up, existing literature has studied the governance effect of different environmental regulation systems from the perspective of informal and formal institutions. The conclusions of these researches highlight the important role that government and officials play in environmental governance. However, the above literature has two limitations at least: First, with the exception of Zheng (2016), the literature ignores how government officials coordinate the two environmental assessment systems when face with tenure assessment and Five-Year Plan target assessment at the same time. Second, the literature ignores which environmental assessment system has the more obvious effect on enterprise environmental governance, and how the introduction of Assessment and Evaluation Methods affects the environmental governance.

2.3. Research Hypothesis

Chinese economy has made remarkable achievements in the past years, and the political incentive system and fiscal decentralization system contribute to the achievements (Li and Zhou, 2004; Qian and Roland, 1998; Maskin, 2000). In the theory of political championship, central government evaluates the economic growth to further assess the performance of local government officials. In comparing with the former officials or officials who are at the same rank, only the officials who have better performance would have opportunity to be promoted. The political promotion incentive stimulates officials to strive on economic development (Zhou, 2007).

Theoretically, the central government's assessment of officials in the local government includes not only economic performance, but also other indicators, such as educational quality, environmental governance and people's livelihood. However, economic performance is more explicit and objective, which could rapidly improve the performance appraisal. Educational quality, environmental governance and people's livelihood are relatively implicit and subjective, which has the uncertainties in political promotion. Therefore, in the tournament incentive of political promotion, local governments give priority to economic development, which may distort the implementation of other public policies. Environmental governance has obvious external characteristics, which is often more likely to be ignored.

The Kuznets hypothesis holds that economic growth could affect the environmental governance through scale effect, technology effect and structural effect, which results in an inverted U relationship between economic growth and environmental quality. But obviously, China is still in the stage of extensive economic

development, and has not crossed the so-called Kuznets turning point of environment. Currently, economic development and environmental protection cannot be taken into account simultaneously for China. In the dilemma, environmental protection with the obvious externalities becomes a sacrificed public function. It is due to the externality of environmental pollution that the cost of private enterprises is lower than the social cost (profit of private enterprises is greater than that social profit). Without government intervention, the optimal input of environmental governance of enterprises would be lower than that of social and enterprises do no have enough motivation to actively carry out environmental governance. In order to rectify the problem of market failure in solving environmental pollution, public power of government needs to be introduced. Therefore, governments usually carry out the environmental governance through environmental subsidies, sewage charges and sewage penalties. However, officials in local government face the two conflicting indicators of economic development and environmental governance, and they should balance the dual objectives of economic development and environmental governance when pursuing political promotions. Therefore, the behavior of environmental governance mainly depends on the relative pressure of local government and environmental governance (Li and Zheng, 2016).

The target assessment system is one of the most widely used governance methods in the current system of environmental governance, which has the characteristics of task concretion, responsibility clarification and assessment rigidities (Xia, 2011). With the increasing severe pollution in China, central government began to reduce the proportion of economic performance in the performance appraisal of local government officials, and to gradually increase the proportion of environmental performance. After the various assessment methods issued by government, the environmental assessment indicators have become much clearer and more indexing. It is in the situation of promotion assessment that the incentive mechanism of tournament in the background of goal assessment system has become a decisive tool in environmental governance. The goal of Five-Year Plan has not only made the clear regulation for economic development, but also made clear requirement for energy saving and emission reduction, which forms a rigid constraint.

Official tenure assessment and Five-Year Plan target assessment are the two important grippers that central governments assess the environmental performance of officials. Which is effective in promoting environmental governance? From the perspective of explicit and implicit indicators to analysis, compared with the tenure assessment of officials, the Five-Year Plan target assessment is more specific, clear and rigid on environmental production and energy emission. Although the proportion of environmental performance has been gradually increased in the tenure assessment of officials, the assessment is relatively recessive. Therefore, the incentive of tenure assessment is more effective than that of Five-Year Plan target assessment on

environmental governance. Therefore, the Five-Year Plan target assessment has a more significant impact on environmental governance. Accordingly, the following research hypothesis is proposed:

Hypothesis: in comparison with the official tenure, Five-Year Plan target assessment has a more significant effect on environmental governance.

3. Sample Selection and Research Design

3.1. Sample Selection

This paper uses the data of A-share listed companies as the sample, and collects the change data of the secretary of provincial Party Committee since 2000. This paper also uses Baidu, Sogou, 360 and other search tools for inspection to ensure the authenticity and accuracy of the data. The environmental capital expenditure data of enterprises is manually collected from the notes on the projects of construction, management and other accounts payable in the annual reports of the listed companies. The samples are screened according to the following principles: (1) the listed enterprises that are ST and PT are excluded; (2) financial listed companies are excluded; (3) samples with missing financial data are excluded. Dealing with the above samples, this paper finally uses 6138 annual observational values. The rest of the data are from the databases of CSMAR and WIND. In order to avoid the effect of outliers, all continuous variables are treated with Winsorize in the upper and lower 1% levels.

3.2. Research Design and Variable Definition

Model 1 is used to examine the effect of official tenure and planning period on environmental investment.

$$\text{Ln}invest=\beta_0+\beta_1 Ptenure+\beta_2 Inetenure+\alpha X'+Industry+Year+\varepsilon \quad (1)$$

Ln*einvest* is the explained variable, which refers to the environmental investment of enterprises. The ratio of enterprise environmental investment to the total assets is small with the average of 0.016, and the ratio of more than 50% of the sample enterprises is less than 0.3%. Therefore, this paper uses the natural logarithm of environmental investment in the main test, and in the robustness test, the standardization of environmental investment based on the total asset is used to measure the value of explained variable. *Ptenure* and *Indtenure* are the main explanatory variables, which refers to official tenure and Five-Year Plan tenure respectively. Official tenure is measured by the year minus the year of the secretary

of provincial Party Committee. The planning tenure is measured by the year minus the first year of Five-Year Plan, and plus 1. Based on the existing literature, this paper also used the other controlled variable: financial leverage (*Leverage*), enterprise growth (*Growth*), per capita GDP (*Avgdp*), the proportion of first shareholder (*Shrcr1*), market concentration (*Hhi*), enterprise size (Ln*size*), regional legal system index (*Law*) and nature of ownership (*State*). Besides, the industry effect and annual effect are controlled by the dummy variables. The detailed definition of the above variables is shown in Table 2.

Table 2. Definition of the Main Variables

Variable type	Variable name	Variable definition
Explained variable	environmental investment (Ln*einv*)	Natural logarithm of environmental investment
Explanatory variable	Tenure period (*Ptenure*)	The year minus the year of the secretary of provincial Party Committee
	Planning tenure (*Indtenure*)	The year minus the first year of Five-Year Plan, and plus 1
Control variable	Financial leverage (*Leverage*)	The ratio of total liabilities to total asset at the end of the term
	Growth (*Growth*)	The growth rate of main business income
	Per capita gross product (*Avgdp*)	Per capita GDP (unit: ten thousand yuan)
	The first largest shareholder (*Shrcr1*)	The proportion of the first large shareholders
	Industry concentration (*Hhi*)	The Geffenda index based on the operating income
	Enterprise size (Ln*size*)	Natural logarithm of total assets at the end of term
	Law system (*Law*)	Regional legal environment index disclosed by Fan (2011), and values that after 2009 are replaced by the value of 2009
	Nature of owership (State)	According to the nature of final controller, the value of state-owned enterprise is 1, otherwise is 0.

3.3. Descriptive Statistics

Table 3 shows the descriptive statistical results of the main variables. Average of the environmental investment of enterprise (Ln*einv*) is 15.987. The actual investment amounted to 8.77 million yuan and the maximum value reached 3.1 billion yuan, which indicates that environmental investment of enterprises has a large variance and the environmental governance is lower. The average tenure of secretary of provincial Party Committee is 2.254, and the maximum is 15. The average tenure of planning is 2.8, which is slightly larger than planning tenure. Other variables are the controlled variable, and the distribution is not obviously different from the existing literature. All of them are within a reasonable range, which ensures the stability of the regression results.

Table 3. Descriptive Statistics of the Main Variables

Variable	N	Mean	Std	Min	P25	Median	P75	Max
Ln*einv*	6 138	15.994	2.548	9.693	14.247	16.082	17.791	21.856
Ptenure	6 138	2.255	2.195	0	1	2	3	15
Indtenure	6 138	2.808	1.421	1	2	3	4	5
Leverage	6 138	0.489	0.204	0.061	0.337	0.496	0.637	1.009
Growth	6 138	0.166	0.307	–0.497	–0.006	0.124	0.288	1.507
Avgdp	6 138	2.863	1.313	0.790	1.660	3.057	3.954	4.663
Shrcr1	6 138	0.401	0.162	0.094	0.277	0.389	0.519	0.805
Hhi	6 138	0.272	0.065	0.201	0.223	0.253	0.302	0.472
Ln*size*	6 138	21.883	1.205	19.683	20.987	21.726	22.616	25.414
Law	6 138	8.849	5.366	0.000	4.980	6.710	13.560	19.890
State	6 138	0.515	0.500	0	0	1	1	1
Roa	6 138	0.032	0.059	–0.238	0.010	0.031	0.059	0.200
Stock5_hhi	6 138	0.205	0.138	0.014	0.100	0.174	0.283	0.657

4. Empirical Process and Result Analysis

4.1. Test of Hypothesis

Table 4 shows the regression results. Column (1) and (2) are the effect of official tenure assessment and Five-Year Plan target assessment on environmental governance respectively. Column (3) is the effect of both these two systems on environmental governance. The results show that the coefficients of official tenure (*Ptenure*) in column (1) and column (3) are not significant while that of Five-Year Plan tenure (*Indtenure*) is significant positive. This indicates the official tenure with the secretary of provincial Party Committee as the representatives cannot significantly affect the environmental investment while the behavior of environmental investment shows a significant law of Five-Year Plan, which is consistence with Liang and Gao (2014). One reason for this phenomenon is that the central government has not made the "energy saving and environmental protection" into the tenure assessment of officials in local government. At the same time, the Five-Year Plan has a clearer assessment target in energy saving and emission reduction. The finding confirms the conclusion of Zheng (2016).

Table 4. Official Tenure, Five-Year Plan and Environmental Investment

	(1)	(2)	(3)
	Dependent variable= Ln*einv*		
Ptenure	0.004		0.004
	(0.21)		(0.21)
Indtenure		0.079***	0.078***
		(7.16)	(7.03)
Leverage	0.370*	0.370*	0.370*
	(1.66)	(1.66)	(1.66)
Growth	0.262***	0.262***	0.262***
	(2.92)	(2.91)	(2.92)
Avgdp	0.097***	0.016	0.016
	(2.80)	(0.65)	(0.68)
Shrcr1	0.645	0.651	0.645
	(0.68)	(0.69)	(0.68)
Hhi	–0.069	–0.069	–0.069
	(–0.07)	(–0.07)	(–0.07)
Lnsize	0.957***	0.957***	0.957***
	(17.70)	(17.87)	(17.70)
Law	–0.001	–0.001	–0.001
	(–0.12)	(–0.12)	(–0.12)
State	0.364***	0.363***	0.364***
	(2.95)	(2.93)	(2.95)
Roa	0.465	0.462	0.465
	(0.50)	(0.50)	(0.50)
Stock5_hhi	0.226	0.220	0.226
	(0.21)	(0.21)	(0.21)
_cons	–6.691***	–6.622***	–6.627***
	(–6.04)	(–5.92)	(–5.96)
Industry effect	Control	Control	Control
Annual effect	Control	Control	Control
Adj. R^2	0.299	0.299	0.299
F Value	70.296	72.013	70.296
N	6138	6138	6138

Notes: Values in brackets are the T values after the cluster of enterprises and years. ***,** and * are the statistically significant level at 1%, 5% and 10%, respectively.

4.2. Test of Expansibility

As discussed in the institutional background, to examine the effect of official tenure

and Five-Year Plan on environmental governance, Assessment and Evaluation Method formulated by Central Committee in July 2009 could not be ignored. Assessment and Evaluation Method explicitly incorporated the "energy reduction and environmental protection" into renewal of local officials and promotion assessment, which changes the relative importance of official tenure and Five-Year Plan on environmental governance.

2010 is the last year of the 10th Five-Year Plan while 2011 is the beginning of the 11th Five-Year Plan. Therefore, this paper uses the year of 2011 when Assessment and Evaluation Method is issued as the boundary and divides the sample interval into "before promulgation" and "after promulgation". The specific result is shown in Table 4. This paper finds that official tenure has an obvious significant effect on environmental governance in the situation that environmental performance is incorporated in official tenure. And before the promulgation of Assessment and Evaluation Method, it is the Five-Year Plan target assessment that has the obvious effect on environmental governance. At the same time, official tenure has a negative but not significant effect on environmental governance before the promulgation of the Assessment and Evaluation Method, which is similar with the effect of Five-Year Plan target assessment after the promulgation of Assessment and Evaluation Method. This indicates Aassessment and Evaluation Method significantly improves the effect of official tenure on environmental governance, but weakens the effect of Five-Year Plan target assessment, which achieves the goal of Assessment and Evaluation Method that standardies the performance assessment and clarifies specific indicators. This indicates the two environmental assessment systems present a substitutional relation.

As an important mechanism of environmental governance, the Five-Year Plan target assessment must rely on the specific execution of local officials. Therefore, the tenure assessment and Five-Year Plan target assessment may be mutually nested and promoted. Therefore, this paper studies the effect of nesting relationship between "tenure assessment" and "goal assessment" on environmental governance from the perspective of nesting relationship between official tenure and Five-Year Plan tenure. Specifically, this paper uses the absolute value of official tenure minus the Five-Year Plan tenure, and the higher the value, the greater degree of dislocation, and the smaller mutual nesting effect. If the value that official tenure minus the Five-Year Plan tenure is negative, this situation is defined as left wrong, which indicates official tenure assessment is before Five-Year Plan target assessment. If the value that official tenure minus the Five-Year Plan tenure is positive, this situation is defined as right wrong, which indicates Five-Year Plan target assessment is before official tenure assessment. The specific inspection is shown in column (3) and column (4) in Table 5.

The results show that in the situation of left wrong, which refers to that official tenure assessment is before the Five-Year Plan target assessment, official tenure has a more significant effect on environmental governance and the Five-Year Plan

target assessment is marginal significant on environmental governance (the value of T is 1.59). In the situation of right wrong, which refers to that Five-Year Plan target assessment is before the official tenure assessment, the effect of Five-Year Plan target assessment is more obvious. The coefficient of interlacing degree (*Delttenure*) is significant negative, which indicates the greater the degree of interlacing between these two assessment systems, the weaker the motivation of environmental governance. Conversely, the more synchronized the two, the stronger the degree of interlacing between these two assessment systems is. This indicates that when official tenure assessment is within or close to Five-Year Plan tenure, local officials have stronger motivation to govern the environment to meet the officials' tenure assessment. On the other hand, local officials would give priority to the Five-Year Plan target assessment.

Table 5. Change of Assessment System and Environmental Governance of Enterprises

	(1)	(2)	(3)	(4)	(5)
	Dependent variable=Ln*einv*		Dependent variable=Ln*einv*		
	After the promulgation of Assessment and Evaluation Method	Before the promulgation of Assessment and Evaluation Method	Left wrong	Right wrong	Sample
Ptenure	0.050**	–0.012	0.074**	–0.005	
	(2.00)	(–0.75)	(2.39)	(–0.20)	
Indtenure	–0.015	0.103***	0.035	0.048*	
	(–1.41)	(7.20)	(0.022)	(1.81)	
Delttenure					–0.047***
					(–2.05)
Control variable	Control	Control	Control	Control	Control
Industry and annual effect	Control	Control	Control	Control	Control
	0.314	0.296	Control	Control	Control
	2 692	3 446	0.287	0.319	0.299

When faced with different demands of local governments, different enterprises have different responses, especially for state-owned enterprises and private enterprises. Therefore, this paper examines whether the empirical results are significantly different between the state-owned enterprises and private enterprises. For this purpose, this paper divides the enterprises into two groups, in which the value of state-owned enterprise is 1 and the value of private enterprise is 0. The results are as follows in Table 6.

It can be found that official tenure assessment is not significant in the sample of state-owned enterprises and non-state-owned enterprises, while the Five-Year Plan assessment is significant in the sample of state-owned enterprises and the interaction

term supports the result. This indicates that in facing with the environmental interests of local government, state-owned enterprises have the stronger motivation to govern environment, which is due to the political promotion and performance appraisal of chairman or CEO in state-owned enterprises depending on local governments. Therefore, when faced with the demand for environmental governance, state-owned enterprises are more motivated in cooperating with local government to achieve the goal of environmental governance.

Table 6. Nature of Ownership, Environmental Assessment and Environmental Investment

	(1)	(2)	(3)
	Dependent variable=Ln*einv*		
	State-owned enterprise	Non-state-owned enterprise	Full sample
Ptenure	0.012	0.003	0.013
	(0.49)	(0.09)	(0.59)
Indtenure	0.107***	0.065***	0.061**
	(5.54)	(4.87)	(2.38)
State			0.344**
			(2.11)
State× *Ptenure*			–0.021
			(–0.63)
State× *Indtenure*			0.046*
			(1.79)
Control variable	Control	Control	Control
Industry and annual effect	Control	Control	Control
Adj. R^2	0.297	0.277	0.299
N	3 160	2 978	6 138

4.3. Mechanism Analysis

Existing literature shows environmental subsidies and environmental pollution charges are the main ways for environmental governance. To study the specific mechanism of official tenure and Five-Year Plan target assessment on environmental investment, this paper uses the environmental subsidies and environmental pollution charges as the effective means of environmental governance to test the effects of official tenure and Five-Year Plan target assessment, and the following regression model is set up:

$$Sub/Charges=\beta_0+\beta_1 Ptenure+\beta_2 Inetenure+\alpha X'+Year+Industry+\varepsilon \quad (2)$$

Sub is the environmental subsidies, and the data is from business income disclosed in the annual report of enterprises. The reports also provide the information about whether there are environmental costs. Obviously, the higher value of environmental subsidies' natural logarithm represents the greater degree of environmental governance. *Charges* represent the pollutant discharge cost levied by government, and the higher value of natural logarithm, the poor environmental performance, which means environmental investment is less. Since the enterprises with environmental investment do not necessarily have environmental subsidies or pollution charge cost, there are samples that the subsidy and pollution cost is 0. This paper uses Tobit regression method to empirically test and the results are shown in Table 7.

The results show that the coefficients of official tenure (*Ptenure*) in column (1), (2) and (3) are significantly negative while the coefficients of Five-Year Plan tenure (*Indtenure*) are significantly positive, which indicates along with the increasing of official tenure, the degree of environmental governance through environmental subsides shows a declining trend. The coefficients of official tenure (*Ptenure*) in column (1), (2) and (3) are negative but not significant, while the coefficients of Five-Year Plan tenure (*Indtenure*) are significantly positive which indicates that with the approaching of Five-Year Plan tenure, the degree of environmental governance through pollution cost charge is gradually increasing. The results are basically consistent with the previous findings of environmental investment and this also confirms that the specific mechanism of government officials governing enterprises through environmental subsidies and pollution cost charges.

Table 7. Official Tenure, Planning Tenure and Environmental Subsidies and Pollution Cost

	(1)	(2)	(3)	(4)	(5)	(6)
Ptenure	–0.205**		–0.216**	–0.105		–0.129
	(–2.03)		(–2.14)	(–0.55)		(–0.67)
Indtenure		0.425***	0.439***		0.867***	0.875***
		(2.93)	(3.02)		(2.81)	(2.83)
Control variable	control	control	control	control	control	control
Industry and annual effect	control	control	control	control	control	control
Pseudo R^2	0.099	0.099	0.099	0.076	0.077	0.077
N	6 138	6 138	6 138	6 138	6 138	6 138

4.4. Endogeneity and Robustness Test

In order to ensure robustness of the conclusions, this paper makes the following

robustness tests respectively.[1]

First, the existing literature holds that since the change of official tenure and Five-Year Plan are exogenous, the possibility of endogenous problems brought by reverse causation is less likely, and the missing variables may be the main cause of endogeneity. Therefore, this paper uses fixed effect model and controls the industry and annual effect, and finds that the coefficient of official tenure is (*Ptenure*) still not significant while that of Five-Year Plan tenure (*Indtenure*) is significantly positive, which indicates that the Five-Year Plan is still the main driving force of environmental governance of enterprises.

Second, replacing tenure of secretary of provincial Party Committee with tenure of governor of a province, the result has not changed substantially, which indicates that the coefficient of tenure of governor of a province is not significant while that of tenure of secretary of provincial Party Committee is significant positive. This indicates the results are robust.

Third, in the main test, this paper uses the year minus year of appointment to measure the tenure of secretary of provincial Party Committee. Many secretaries of provincial Party Committee may be appointed in the successive tenure, and the tenure of provincial officials in China is for 5 years. Therefore, the tenure of secretary of provincial Party Committee in this paper is evaluated at 5, and in the further empirical regression, the results of Five-Year Plan is significantly positive. This indicates that the Five-Year Plan has a significantly positive effect on environmental investment, and the results are robust.

Fourth, using the standardized environmental investment based on the final total assets as the dependent variable, the results of the main test are still robust.

Fifth, in the situation that the problem of selective disclosure exists in the environmental subsidies and pollution cost charges, if the missing values were replaced with 0, the results would have errors. Therefore, this paper uses the means to replace the loss value and excludes the missing data for the further empirical regression. The results are still robust.

5. Research Conclusions and Policy Implications

This paper focuses on the role of official tenure and Five-Year Plan target on environmental governance. The results show the environmental investment has a remarkable Five-Year Plan cycle while the official tenure has not the remarkable periodic trend. The mechanism also shows the environmental subsidies and pollution costs have the significant five-year periodic trend, and when the official tenure assessment is before the Five-Year Plan target assessment, it has the stronger effect

[1] Limited to the length, the detailed results are not reported in the article. The author can provide the results if the reader needs it.

on environmental governance of enterprises. The further test also shows that with the "environmental performance" being incorporated into the local government performance evaluation of officials, environmental investment has the significant periodic law of official tenure. However, the periodic trend of Five-Year Plan is not significant, which shows a "substitutional relation". The main significance of policy revelation in this paper is as follows.

First, government should continually strengthen the environmental assessment, and improve the enthusiasm of government officials in environmental governance. The conclusion shows that the Five-Year Plan target assessment has a more significant effect on environmental governance before the specific environmental performance appraisal on official tenure, and with the "environmental performance" being incorporated into the assessment system of official tenure, its effect on environmental governance has become increasingly prominent. Therefore, government should continually strengthen the environmental performance assessment, and strive to improve the enthusiasm of environmental governance in official tenure, and encourage officials to balance the relationship between economic development and environmental governance.

Second, the government should coordinate the relationship between Five-Year Plan target assessment and official tenure assessment. This study shows that for the two important assessment system of environmental performance, local officials need to meet the requirement of Five-Year Plan target assessment in the early periods that Five-Year Plan target assessment is more explicit. However, when environmental performance was incorporated into the official tenure, official tenure assessment began to have significant effect on environmental governance, and the mismatch between Five-Year Plan target assessment and official tenure assessment would weaken the enthusiasm of environmental governance. On the contrary, if the two assessment systems can be matched in time, it would be helpful to further enhance the effect of these two assessments on environmental governance. Therefore, government should coordinate the relationship between Five-Year Plan target assessment and official tenure assessment, which exploits the advantages of these two assessments, and promotes the sustainable development of Chinese economy.

Third, the government should further improve the environmental governance system with government as the center. This study shows pollution cost charges and environmental subsidies are two important mechanisms of environmental governance, and the two mechanisms are influenced by the motivation of environmental governance by government officials. Therefore, a sound system of the pollution cost charges and environmental subsidies would be conducive to weaken the periodic trend of official tenure or Five-Year Plan in the environmental governance, which helps to achieve the goal of environmental governance in China.

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