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# Listed Local State-Owned Enterprises and Environmental Performance: Evidence from China

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## Abstract

The paper examines the influence of ownership type on environmental performance of Chinese listed enterprises. China's environmental problems are attributed to the collusion between enterprises and economy-oriented local governments, which has allowed many companies to skirt environmental regulations. Especially, local state-owned enterprises (SOEs) tend to have worse environmental performance than private firms, under the wing of local governments, with whom they have a closer political connection. According to the report of the Environmental Protection Agency, currently the unacceptably poor environmental performance of local SOEs has severely hampered the realization of green economy in China. After examining the dataset of 15,996 firm-year observations from 2,688 listed firms, this paper found that, in the presence of central government supervision and personnel intervention, listed local SOEs will be forced to improve their environmental performance in accordance with standards set by the central government, which leads to better environmental performance than that of listed private firms (private firms). The result of two-stage regression also supports the conclusion. This shows increased supervision and personnel intervention from the central government can significantly improve the environmental performance of local SOEs. The research in this paper expects to make a contribution to attaining the goal of green economy in China.

**Keywords:** Listed Local State-Owned Enterprises, Local State-Owned Enterprises, Environmental Performance

**JEL Classification Code:** H32, L32, M14, O13, Q56

## 1. Introduction

Over the past three decades, while the Chinese economy has been growing rapidly, the living environment is being seriously damaged. Due to emissions from polluting industries, currently the air quality of 57.3 percent of Chinese cities exceeds the acceptable standard and 33.3 percent are facing the threat of acid rain. As a result of ongoing pollution, 85 percent of the groundwater can no

longer be used for drinking, and 55.3 percent of the country's area is no longer hospitable for human beings (2019 Report on the State of the Environment in China). Environmental pollution has posed a serious threat to the life and health of people—for example, in 2019, there were over 530 thousand complaint cases resulting from environmental pollution (Ministry of Ecology and Environment of the People's Republic of China).

With regard to the cause of the serious environmental pollution in China, it can be attributed to the collusion between enterprises and local governments, which allows many polluters to skirt environmental laws and regulations (Zhang, 2017). Under the current GDP-centered evaluation system for government official performance, officials at local governments are inclined to sacrifice environmental protection for economic growth (Deng & Xu, 2013; Yang, Chen, & Zhou, 2008; Zhang, 2018; Zhang & Zhong, 2014). Meanwhile, for their own profit, enterprises have the incentive to seek political assistance to reduce their cost on environmental protection (Yao & Cheng, 2014; Zhang & Zhong, 2014). That way, the government-enterprise collusion on environmental protection satisfies both the need

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of government officials for glaring political achievements and that of enterprises for profit maximization (Long & Hu, 2014; Zhang & Zhong, 2014).

Previous research suggests that enterprises politically associated with local governments can easily form a collusive relationship with the governments to obtain preferential policies and thus ease their environmental responsibilities (Nie, 2018). In particular, compared to private businesses, local state-owned enterprises (SOEs), in a natural and closer political connection with their local government (Cheng, Wang, Keung, & Bai, 2017), can not only realize the collusive relationship more easily, but also secure lower environmental spending and lesser penalties in negotiation. Consequently, local SOEs often perform worse environmentally than private ones (Li & Chan, 2016). Under the protection of local government officials, some SOEs show startling environmental performance and have virtually become incorrigible chief polluters (Ministry of Ecological Environment of the People's Republic of China). According to the report of the Environmental Protection Agency, green economy can be basically realized in China by improving the level of environmental performance of local SOEs (Li & Chan, 2016).

Nonetheless, in China, listed firms receive extra supervision and personnel intervention from the central government. Unlike local governments, the central government not only places more emphasis on the balance between economic growth and environmental protection (Nie, 2018), but also demands better environmental performance from local SOEs than private firms—both listed and non-listed ones (the Central Committee of the Communist Party of China). Based on the dataset of 15,996 firm-year observations from 2,688 listed firms, this paper explores the differences between listed local SOEs and listed private firms in terms of environmental performance. The findings indicate that in the presence of central government supervision and personnel intervention, listed local SOEs are forced to improve their environmental performance, therefore surpassing that of listed private firms (private firms). The result of two stage regression also supports the conclusion. Environmental pollution caused by local SOEs has become the biggest obstacle to realizing green development in China. The research in this paper shows that increased central government supervision and personnel intervention for local SOEs can significantly improve their environmental performance. The research aims to contribute to attaining the goal of green development and improving environmental conditions in China.

The remainder of this paper is organized as follows: the second section provides information on previous research and established hypotheses, the third section explains the model and data involved, the fourth offers empirical results, and the fifth section states the conclusion.

## **2. Literature Review and Hypothesis Development**

### **2.1. Fiscal Decentralization, Official Promotion and Environmental Pollution**

It is believed that the problem of environmental pollution in China is mainly caused by the behaviors of local governments under the influence of fiscal decentralization and the evaluation system for government official performance (Cai, Du, & Wang, 2008; Que, Zhang, Liu, & Yang, 2018). Since 1994, owing to the tax incentive brought by fiscal decentralization and official promotion based on chief indicator of economic growth, local governments in China have been obsessed with promoting economic growth, which directly leads to the rapid economic growth in China (Cai et al., 2008; Zhou, 2007). Nonetheless, while local governments seek economic growth and tax revenues, other social goals such as environmental protection are put on the backburner (Cai, Chen, & Gong, 2016). Under the current fiscal and evaluation system, environmental protection and governance have been sacrificed for local economic achievements (Song, Du, & Tan, 2018).

Certainly, the behavior of local governments is influenced by central government policies. For a developing country like China, despite the importance of environmental protection, economic growth remains the primary goal (Kuo, Yeh, & Yu, 2012). At present, in order to ensure a rising standard of living, China needs to maintain a comparatively high rate of economic growth over a long period (Zhang & Wen, 2008). Thus, it becomes unavoidable that the central government has to set GDP growth as a main indicator for evaluating official performance.

### **2.2. Local SOEs and Environmental Performance**

Previous research suggests that it is the pressure from stakeholders that determines the level of corporate environmental performance (Sade-Abreu, 2009), while the government is believed as the most important stakeholder, who put huge pressure on enterprises through policymaking (Delmas, 2002; Delmas & Toffel, 2004; Steurer, 2010). What is more distinctive in China's case is that due to its special institutional background, other factors such as external public pressure and media attention have little influence on the environmental behaviors of enterprises, and environmental polices play an overwhelming role in regulating corporate environmental behaviors, forcing enterprises to act upon the policies (Yao & Yang, 2017). Therefore, for their own benefit, enterprises are motivated to seek political assistance so as to escape the circumvent legal constraints and evade environmental responsibilities (Yao & Cheng, 2014; Zhang

& Zhong, 2014). Besides, in view of the existing evaluation system, officials at local governments have the incentive to sacrifice the environment for economic development (Deng & Xu, 2013; Yang et al., 2008; Zhang, 2018; Zhang & Zhong, 2014). In this situation, the government-enterprise collusion on environmental protection satisfies both the need of government officials for glaring political achievements and that of enterprises for profit maximization (Long & Hu, 2014; Zhang & Zhong, 2014).

As discovered by previous studies, enterprises that have a political connection with their local government can easily build a collusion relationship with them, which allows them to obtain preferential environmental policies under the wing of local governments and diminish their environmental responsibilities (Nie, 2018). In particular, compared with private enterprises, the managers of local SOEs have a political role because they are appointed by local governments, which predetermines the natural political connection between local SOEs and their governments (Cheng et al., 2017). Based on the survey data from the China Center for Economic Research (CCER) and the National Bureau of Statistics (NBS), the research conducted by Li and Chan (2016) shows that by virtue of their natural and closer political connection with local governments, local SOEs are not only able to build business-government collusion more easily, but also can secure lower environmental expenses and penalties in negotiation. Therefore, in general, local SOEs perform worse than private businesses environmentally.

However, meanwhile, publicly listed firms in China receive extra supervision and personnel intervention from the central government. Hence the next section will explore the differences between listed local SOEs and listed private firms in terms of environmental performance.

### 2.3. The Differences between Listed Local SOEs and Listed Private Firms in Terms of Environmental Performance

In general, local SOEs are supervised by local governments, their directors and senior executives are also appointed by local governments. Therefore, they only need to meet the requirements on environmental performance set by the local government. However, listed companies in China receive extra supervision from China Securities Regulatory Commission (a public institution directly under the State Council), who can also intervene in the appointment and removal of directors and senior executives at listed firms (CSRC may criticize and punish directors and senior executives of listed firms, or decide that they are not suitable for their position. According to the Stock Listing Rules, those who have received the aforementioned punishment shall not be candidates for directors and senior executives

within a certain period of time). Therefore, local SOEs need to reach the level of environmental performance set by the central government as well.

Unlike economy-oriented local governments, the central government (the Central Committee of the Communist Party of China) not only places more emphasis on the balance between economic growth and environmental protection, but also demands better environmental performance from local SOEs than private firms. Under the supervision and personnel intervention of the central government, listed local SOEs will have to improve their environmental performance according to the requirements of the central government and thus perform better than private firms (both listed and non-listed ones).

Hence, we can formulate the following hypothesis:

**Hypothesis:** *Listed local SOEs have better environmental performance than listed private enterprises.*

## 3. Research Methods and Materials

### 3.1. Measuring Environmental Performance and Ownership type

Based on the methods of previous research (Jiang & Fu, 2019; Khan, Gang, Fareed, & Yasmeeen, 2020; Zhang, Liu, Ge, Hao, & Hao, 2020), corporate environmental performance is measured in this paper with CEP\_score from Hexun.com, on a scale of 0-30. The data of ownership type is from the CSMAR database, which determines the ownership structure according to the nature of the actual controller of an enterprise.

### 3.2. Regression models

The following regression model is constructed to test the hypothesis:

$$\begin{aligned} CEP_{score_{i,t}} = & \alpha_0 + \alpha_1 LLSOE_{Dummy_{i,t}} + \alpha_2 GROWTH_{i,t} \\ & + \alpha_3 LEV_{i,t} + \alpha_4 LNAGE_{i,t} + \alpha_5 LNSIZE_{i,t} \\ & + \alpha_6 OWNER_{i,t} + \alpha_7 ROA_{i,t} + Industry Dummies \\ & + Year Dummies + \varepsilon_{i,t} \end{aligned}$$

The table 1 illustrates definitions for variables of the model.

According to previous research, GROWTH (Zhang et al., 2020), LEV (Nguyen, 2020), LNAGE (Khan et al., 2020), LNSIZE (Li & Chan, 2016; Nguyen, Nguyen, & Nguyen, 2020), OWNER (Khan et al., 2020; Zhang et al., 2020), ROA (Nguyen, Nguyen, Nguyen, Le, & Nguyen, 2020; Russo & Fouts, 1997) will influence the environmental behavior of enterprises.

**Table1:** Variable Definitions

Variable	Definition
CEP_score	Corporate environmental performance, measured as the scores of environmental responsibilities.
LLSOE_Dummy	Ownership style. listed local state-owned firm = 1, listed private firm = 0.
GROWTH	Growth ability, measured as the growth rate of sales.
LEV	Leverage ratio, which is obtained by dividing total liabilities by total assets.
LNAGE	The natural logarithm of firm age.
LNSIZE	The natural logarithm of total assets.
OWNER	Percentage of shares owned by the largest shareholder.
ROA	Return of assets.
Industry Dummies	Industry dummy variables.
Year Dummies	Year dummy variables.
$\varepsilon$	Error term.

**Table 2:** Descriptive statistics

Variable	N	Mean	SD	Min	Median	Max
CEP_score	15,996	1.904	5.186	0	0	30
CEP_score (LLSOE_Dummy =1)	5,097	3.100	6.424	0	0	30
CEP_score (LLSOE_Dummy =0)	10,899	1.344	4.381	0	0	30
LLSOE_Dummy	15,996	0.318	0.465	0	0	1
GROWTH	15,996	0.242	0.643	-0.630	0.126	4.792
LEV	15,996	0.430	0.218	0.047	0.418	0.974
LNAGE	15,996	2.766	0.366	1.609	2.833	3.401
LNSIZE	15,996	21.922	1.200	19.132	21.804	25.220
OWNER	15,996	34.480	14.834	8.990	32.260	75.000
ROA	15,996	0.038	0.054	-0.191	0.036	0.199

### 3.3. Samples

All data is sourced from the annual reports of A-share listed companies released every December, with CEP\_score data from Hexun.com and the rest from the CSMAR database.

The data is filtered by following conditions:

- (1) Delete missing values;
- (2) Delete the data of financial enterprises.

Through data filtering, finally the dataset of 15,996 firm-year observations from 2,688 listed firms between 2010 and 2017 were obtained (The data range was chosen because so far Hexun.com only provided detailed evaluation on the environmental performance of listed firms between 2010 and 2017).

To mitigate the influence of outliers, we winsorize all of the continuous variables at the 1% and 99% levels.

## 4. Results

### 4.1. Descriptive statistics

Table 2 presents the descriptive statistics of variables. The 15,996 samples studied in this paper include 5,097 samples of listed local SOEs, whose average score of environmental performance is 3.100, and 10,899 listed private enterprises, whose average score of environmental performance is 1.344. In general, listed local SOEs score higher in environmental performance than listed private firms do (The results of t-test are: CEP-score (LLSOE-Dummy=1)- CEP-score (LLSOE-Dummy=0) =1.755,  $t=17.678$ ).

### 4.2. Univariate Analysis

Table 3 displays the results of the univariate correlation analysis of main variables in the model. In this paper there is a significant positive relationship between the CEP\_

score and LLSOE\_Dummy. However, the results based on univariates are not sufficiently meaningful. Therefore, multivariate regression analysis is employed to further test the relationship between CEP\_score and LLSOE\_Dummy.

### 4.3. Multivariate Regression Analysis

Multivariate OLS regression results on this model are listed in Table 4. As shown in the Column 1 of Table 4, the coefficient of LLSOE\_Dummy is 0.634 and it is statistically

significant at the 1% level ( $t=6.594$ ). In order to control the influence of problems such as heteroscedasticity on the results, the cluster robust standard error (firm-level) is used for OLS regression. The Column 2 of Table 4 shows that the coefficient of LLSOE\_Dummy remains statistically significant at the 1% level ( $t=3.347$ ). The result suggests that under the pressure of extra supervision and personnel intervention from the central government, listed local SOEs can have better environmental performance than listed private firms (private firms).

**Table 3:** Univariate correlations among key variables

Variable	CEP_score	LLSOE_Dummy	GROWTH	LEV	LNAGE	LNSIZE	OWNER	ROA
CEP_score	1.000							
LLSOE_Dummy	0.156***	1.000						
GROWTH	0.021***	-0.110***	1.000					
LEV	0.092***	0.301***	-0.005	1.000				
LNAGE	-0.033***	0.232***	-0.101***	0.224***	1.000			
LNSIZE	0.242***	0.319***	0.077***	0.446***	0.175***	1.000		
OWNER	0.065***	0.187***	0.007	0.022***	-0.097***	0.192***	1.000	
ROA	0.068***	-0.150***	0.298***	-0.420***	-0.130***	-0.032***	0.121***	1.000

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

**Table 4:** Regression Results

Variable	CEP_score			
	Coeff.	t-statistics	Coeff.	t-statistics
LLSOE_Dummy	0.634***	6.594	0.634***	3.347
GROWTH	-0.224***	-3.709	-0.224***	-4.419
LEV	-0.852***	-3.734	-0.852***	-2.670
LNAGE	0.242**	2.043	0.242	1.081
LNSIZE	1.338***	34.032	1.338***	18.250
OWNER	-0.009***	-3.629	-0.009*	-1.943
ROA	3.752***	4.703	3.752***	3.615
Constant	-25.908***	-28.756	-25.908***	-15.302
Year dummy	YES			
Industry dummy	YES			
Cluster by firm	NO		YES	
R-squared	0.1586			
F-test	100.35***		23.59***	
N	15,996			

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

#### 4.4. Endogeneity

Two-stage regression is used in this paper to exclude the interference of the endogeneity problem.

LagLLSOE1 and LagLLSOE2 serve as the instrumental variables for LLSOE\_Dummy. If Enterprise *i* is a listed local SOE in year(*t*-1), LagLLSOE1 equals 1; if Enterprise *i* is a listed private firm year(*t*-1), LagLLSOE1 equals 0; if Enterprise *i* is a listed local SOE in year(*t*-2), then LagLLSOE2 equals 1; if Enterprise *i* is a listed private firm in year(*t*-2), LagLLSOE2 equals 0. The approach of lagged variables is widely applied in fields such as accounting and political economy (Gerber, 1998; Kang & Sivaramakrishnan, 1995).

In the two-stage regression, the MLE approach shows higher efficiency than OLS (Larcker & Rusticus, 2010; Staiger & Stock, 1997). Thus, in the two-stage regression model, the first stage involves a Probit regression model, and the second, an MLE-based linear regression model. Readers may use the new command “eregress” developed by STATA in 2017 to compute the model directly.

As the ownership style of the vast majority of listed companies in China remains unchanged every year, there should be a positive correlation between LagLLSOE1 & LagLLSOE2 and LLSOE\_Dummy. However, obviously there will be no direct correlation between corporate ownership style in year(*t*-1) & year(*t*-2) and corporate environmental performance in the year(*t*).

As revealed in the Column 1 in Table 5, there is a positive correlation between the instrumental variables LagLLSOE1

& LagLLSOE2 and the variable LLSOE\_Dummy. The Column 2 of Table 5 shows that the fitting value of the variable LLSOE\_Dummy(Pre-LLSOE\_Dummy) has a positive correlation with CEP\_score. Moreover, the result of Sargan-test supports the validity of the selected instrumental variables (P-value > 0.1).

To sum up, after eliminating the interference of the endogeneity problem, the conclusion can still be obtained that there is a significant positive correlation between LLSOE\_Dummy and CEP\_score.

#### 5. Conclusions

China's environmental problems are attributed to the collusion between enterprises and economy-oriented local governments, which has allowed many companies to skirt environmental regulations. In a natural and closer political connection with their local government, local SOEs can not only realize the collusive relationship more easily, but also secure lower environmental spending and lesser penalties in negotiation. While the central government demands better environmental performance from local SOEs than private firms, as local SOEs are not supervised and intervened by the central government, the environmental performance of local SOEs is often worse than that of private firms. At present, the unacceptably poor environmental performance of local SOEs has severely hampered the realization of green economy in China.

**Table 5:** Endogeneity: Two-stage regression.

Variable	LLSOE_Dummy		CEP_score	
	Coeff.	z-statistics	Coeff.	t-statistics
LagLLSOE1	4.266***	17.199		
LagLLSOE2	0.579**	2.334		
Pre-LLSOE_Dummy			0.599***	5.819
GROWTH	-0.063	-1.371	-0.213***	-3.368
LEV	0.149	0.674	-1.217***	-4.975
LNAGE	0.331**	2.257	0.146	1.105
LNSIZE	0.124***	3.319	1.384***	32.913
OWNER	0.007***	2.710	-0.009***	-3.119
ROA	-0.268	-0.352	3.270***	3.863
Constant	-6.152***	-6.863	-26.419***	-27.264
Year dummy	YES			
Industry dummy	YES			
Wald chi2	2838.88***			
Sargan test	Chi=0.1032 (P value=0.7479)			
N	14,382			

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

As in China, listed firms are supervised and intervened by the central government, this paper explores the differences between listed local SOEs and listed private firms in terms of environmental performance. In light of the empirical study based on the dataset of 15,996 firm-year observations from 2,688 listed firms, this paper found that in the presence of central government supervision and personnel intervention, listed local SOEs will be forced to improve their environmental performance in accordance with standards set by the central government, which leads to better environmental performance than that of listed private firms (private firms). The conclusion remains valid after excluding the interference of the problems of heteroscedasticity and endogeneity, indicating that increased supervision and personnel intervention from the central government can be an effective way to improve the environmental performance of local SOEs.

Meanwhile, this paper certainly has its limitations. Since only the evaluation on the environmental performance of listed firms is available from Hexun.com, this paper merely touches upon the differences between the environmental performance of listed local SOEs and listed private firms, rather than include the comparison between listed SOEs and private firms (both listed and non-listed ones), which is indeed regretful. Nonetheless, as stated in previous research (Yao & Yang, 2017), the special institutional environment in China has predetermined that the environmental performance of Chinese enterprises mainly depends on the pressure from the government. Compared to non-listed private enterprises, listed ones are not only supervised by economy-oriented local governments, but also receive supervision and personnel intervention from the central government focusing more on the balance between economic development and environmental protection. For this reason, there is no reason to believe that the environmental performance of listed private firms could be worse than non-listed ones. Therefore, our research is still reliable. The research in this paper expects to provide some guidance for the decision-making of the central government and make a contribution to attaining the goal of green economy.

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