

Officials' Turnover, Promotion Incentives and Environmental Quality-Evidence from Provincial Government Leaders in China

Ming ZHOU^{1,2,a}, Li-Ying DENG^{3,b,*}

¹Northwest University, School of Public Management, Xi'an, China

²Northwest University of Political and Law, School of Economics, Xi'an, China

³Northwest University, Xi'an, China

^a1161592016qq.com, ^b40923588@qq.com

*Corresponding author

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Abstract. Environmental problems and causes of China have always been a hot topic in international academic circles. Taking 31 provinces in China (excluding Hong Kong, Macao and Taiwan) from 2006 to 2015 as samples, this paper selects the unique perspective of local government officials' replacement (provincial and municipal party secretary replacement) to make an empirical of the impact of officials' turnover on the environmental quality. We use the software of STATA to empirically tested four hypotheses, the results show that the officials' turnover and exchange of officials has a significant negative impact on regional environmental quality, Officials transferred from the central government have a significant negative impact on local environmental quality, the length of tenure tends to have negative impacts on environmental quality. The officials' turnover in eastern regions does not have a significant impact on environmental quality and environmental incentives do not play an important role in comparison with economic incentives.

Introduction

As a major developing country, China has prominent problems in environmental pollution. It is the primary goal of China to transform the traditional mode of economic growth which is high input, high energy consumption and high pollution, and develop a low-carbon economy marked by low emissions and low energy consumption, so as to achieve sustainable development. According to the *China Environment Bulletin 2016*, among the 338 cities at or above the county level in China, only 84 cities have achieved the environmental air quality standard, accounting for 24.9 percent of all cities in China. According to the *BP Statistical Review of World Energy 2017*, total carbon emissions of China showed a downward trend in 2015 and 2016, but still ranked first in the world. However, the environmental pollution problem is not only environmental and economic problems, is also the issue of the administrative system, especially in China's administrative decentralization system, The central government's environmental policies are basically implemented by local governments, Local governments act as "middlemen" between the central government and businesses [1]. In the past few decades, China has been implementing a one-dimensional incentive mode with GDP as the core, This led to local government officials having trophy tournaments for promotion [2], It is also because officials are overly pursuing economic growth-oriented promotion incentives, so that environmental pollution and energy consumption are becoming more and more serious at the same time of rapid economic development. For the increasingly serious problem of environmental pollution, after 2012, The central government has begun to change the development path which is sacrificing environmental capacity and only for economic growth, and put forward to establish a new indicator system to evaluate the work performance, we should not only pay attention to the growth of the GDP, but also pay attention to other indicators such as per capita disposable income of urban residents, per capita net income of farmers, environmental protection and so on. Government should set up environmental performance appraisal system which is linked

to the current cadre assessment system, at this background, what impact will the replacement and promotion mechanism of local government officials have on environmental quality? A clear answer to this question has important reference value for the effectiveness of the China's environmental policy and new official assessment system.

Theoretical Hypothesis

Existing empirical research results mainly verify that government decentralization will aggravate environmental pollution in various regions[3], And the replacement of officials will significantly affect regional environment[4,5,6], and some studies suggest that regional environment will be affected by the heterogeneity of officials, such as education level and gender of local officials [4,7]

The Influence of the Officials' Turnover on Regional Environmental Quality

Compared with mature market economy countries in the west, In the government-led economic development mode, China's local government officials play a more important role in economic development, so although environmental indicators have been built into the cadre promotion examination, economic indicators are still plays the important role of cadres promotion, After the replacement of local government officials, New officials may be encouraged by economic growth to relax environmental controls and reduce environmental investment, and they will objectively need a adjustment period, so the environmental quality will down in the area they manage. On the one hand, because when Chinese government evaluates officials, they will compare it with the performance of former officials. So for the sake of political promotion, new officials need to set up different or even more outstanding achievements during their tenure [8]. As a result, new officials may lower environmental barriers to attract investment, introduce polluting projects, relax environmental regulations in their districts and cover up polluting activities, even interfere with enforcement by environmental authorities; On the other hand, with the implementation of the decentralization strategy, the provincial and sub-provincial governments have gained more economic power. Local governments hold favorable policies such as land, credit, natural resources and pollution discharge rights, and they have the right to distribute important resources, various administrative approval rights and administrative control discretion. The tournaments for promotion require local officials to deliver credible performance signals to superiors. Therefore, officials will actively seek short-term performance projects as a signal carrier to superior. New officials may reduce local investment in environmental governance to invest limited resources in short-term profitable projects. In addition, local officials need some time to adapt to new positions and new working environment after replacement. Even if new officials have the demand to implement new policies, they need some time to successfully promote the policies before they can produce results [8,9], which may lead to insufficient environmental supervision in their early days. Therefore, when local government officials are replaced, regional environmental quality may deteriorate due to the reduction of environmental investment or the reduction of environmental supervision. Therefore, the first empirical hypothesis is proposed: *Hypothesis 1: the replacement of officials is not conducive to the improvement of regional environmental quality.*

The Influence of the Officials' Exchanges on Regional Environmental Quality

Officials' turnover refers to the replacement of the administration officials, this change may have three different forms, That is, officials were promoted from local to provincial secretary, Officials were transferred from other places to become provincial secretary or Officials were transferred from the central government to become provincial secretary. The exchange of officials refers to latter two. There are some literature studies on the impact of the cadre exchange system on economic growth, make use of the data of provincial secretary, they found that officials' exchanges generally had a positive impact on economic growth, Therefore, to some extent, it can be explained that the environmental performance incentive effect is not as good as the economic performance incentive effect for the exchange of officials.

In addition, Huang divided the central government's governance over local officials into "explicit governance" and "invisible governance" in 2002, "explicit governance" is achieved through a system of measurable economic development indicators, "invisible governance" is achieved through some means which are Local officials also serve on the political bureau of the CPC central committee, the central government directly appoints local officials, term control for local officials and exchange of officials[10]. The central government appoints officials are the most effective way to guide, supervise and control the actions of local governments, different types of official exchanges can have different effects on environmental quality, officials which sent by the central government did not know about the local situation, and they usually are good at a specific area in central government, but lack of experience in managing overall social and economic affairs in a region, they don't have too much experiences in comparison to the officials which promoted from local or transferred from other provinces, so they need more time to adaptation and familiarity, so there must a cost during that period, and environmental costs are one of them. When the officials transferred from the central government are familiar with the situation, they usually will pay attention to economic development rather than environmental protection. Moreover, officials transferred from the central government usually have a short tenure, and they may have to be transferred again before they start to focus on environmental governance, which requires a relatively long cycle. Therefore, the second and third empirical hypotheses are proposed: *Hypothesis 2: officials' exchange is not conducive to the improvement of regional environmental quality. Hypothesis 3: officials from the central government have a significant negative impact on regional environmental quality.*

The Influence of the Officials' Turnover on Regional Environmental Quality of Different Region

Before the establishment of the new China in 1949, China implemented a planned economy. The development of various regions in China is relatively balanced, but it's inefficient. After the reform and opening up, China began to implement the market economy, Under the system of "some people become rich first and then bring along the poorer", the development of different regions extremely unbalanced, therefore, under situation of the disequilibrium development of different areas in the eastern, central and western regions, different area will show the different effects on environmental quality after replacement of officials. The eastern region is developed area of economic development, with the rapid economic growth, environmental problems are also serious, the provinces and cities in the eastern region also recognized the importance of environmental protection earlier, the provinces which include environmental protection index in cadre assessment in the new policy document at the earliest are also in eastern area, such as Guangdong, Beijing, Jiangsu and so on. Guangdong province issued relevant documents in 1997, it can be seen that various provinces and cities in the eastern region attach more importance to environmental protection. Therefore, the replacement of officials in the eastern region may focus on environmental governance because of the importance of environmental protection in these provinces. While the central and western regions are still in the stage which focus on develop economy, so officials seldom attach importance to environmental governance in central and western area. Therefore, the fourth empirical hypothesis is proposed: *Hypothesis 4: the turnover of officials in eastern regions has a significant positive impact on environmental quality.*

Methods

Data

This article selects the provincial panel data from 2006 to 2015, the discharge of smoke and dust, pollution control investment data are from *China's Environment Statistical Yearbook*, the change information of local government officials are from *People's Daily Online* and *Baidu Baike*, these information are all sorted by hand, other data are from *China Statistical Yearbook*.

The FE Model

To test the above hypothesis, the following model is constructed in this paper:

$$Y_{ci,t} = \alpha_i + \beta_1 Ot_{i,t} + \lambda_1 X_{i,t} + \lambda_2 Y_{i,t} + Year_i + Provi_n_i + \varepsilon_{i,t}. \quad (1)$$

$Y_{ci,t}$ represents environmental quality in area i , year t . Chinese scholars usually choose the discharge of the "Three Wastes" to measure the level of environmental pollution in an area, however, considering the availability of pollution data of prefecture-level cities and the overflow of pollution, The smoke and dust index has a weaker spatial spillover than other pollution indexes, so we choose the discharge of smoke and dust as a regional pollution index. $Ot_{i,t}$ represents replacement of officials in area i , year t . We use Chun-Fang Cao's method to definite "replacement of provincial secretary", when replacement is happened before June 30, we sign the current year as 1; when replacement is happened after June 30, we sign the next year as 1, other year as 0[11], When the replacement happened twice in one year, for example, Jing-Ping Xi elected Shanghai municipal secretary in first half year of 2007, Zheng-Sheng Yu elected Shanghai municipal secretary in the latter half of the year of 2007, we consider the latter information as basis for making judgment, it means that we sign 2007 as 0, sign 2008 as 1.

X represents control variable, it mainly include local economic development level, foreign direct investment (FDI), pollution control investment, regional industrial structure. We use average GDP to measure the level of economic development in each region. For whether FDI has a negative impact on the regional environment, there are two perspectives. On the one hand, FDI is seen as having a "pollution halo" effect. Because multinational companies have advanced management experience and environmental technologies, so they can contribute to urban environmental governance. On the other hand, FDI is regarded as the "pollution paradise". to maintain their comparative advantage, local governments are competing to attract foreign direct investment by reducing environmental regulations, competition between regions leads FDI to converged upon the areas which is weak on environmental controls [12]. So we increased FDI variable. In theory, when pollution control investment is more in an area, this area's environmental quality will be better. So we use local pollution control investment to measure government subsidies and loans for environmental protection. We use ratio of output value of tertiary industry to value of secondary industry to measure regional industrial structure, because we usually think that the discharge of the "Three Wastes" is more serious in regions with higher levels of industry in developing countries, environmental regulation is more difficult and costly, environmental governance is more difficult.

Y represents leaders' personal characteristics such as age, educational level, tenure and gender.

In the second hypothesis, we need to divide replacement of officials into groups. If the new provincial secretary has worked in the local area before (promotion or transfer of the provincial governor to provincial secretary), This group will be assigned to the "local transfer" group, it means that only "local officials become provincial secretary" can defined as the replacement of officials in this group; If the new provincial secretary is transferred from the central government to the local area, the group will be assigned to the "central transfer" group, it means that only "central officials become provincial secretary" can defined as the replacement of officials in this group; if new provincial secretary is not from central government or local government, the group will be assigned to the "nonlocal transfer" group, it means that only "officials which not from local or central government become provincial secretary" can defined as the replacement of officials in this group. "Exchange of officials" group include "central transfer" group and "nonlocal transfer" group.

Estimation Results and Discussion

Table1, Descriptive statistics and definitions of the variables used in this study

Variable	Definition	Mean	Max	Min	S.D
Y	The discharge of smoke and dust	3.197	5.192	-2.303	1.211
Officials' turnover	Whether the officials' turnover is happened(0=not happened; 1=happened)	0.235	1	0	0.425
Average GDP	Average annual GDP during the provincial secretary's tenure	29729.110	83124.930	6231.963	16831.920
FDI	The ratio of total industrial output value of foreign-invested enterprises to total industrial output value of the region [%]	84.567	1638.579	3.826	157.641
Investment	local pollution control investment(in logs)	4.790	7.256	-1.609	1.203
Structure	ratio of output value of tertiary industry to value of secondary industry[%]	0.958	4.046	0.499	0.517
Age	The age of provincial secretary	60.042	70	47	4.214
Education	The education level of provincial secretary(1= Master degree or above; 0= Bachelor or bellow)	0.668	1	0	0.472
Gender	The gender of provincial secretary(1=male; 0=female)	0.984	1	0	0.126
Tenure	The tenure of provincial secretary(1=more than one term; 0=one term or less)	0.548	1	0	0.228

In this part, we use the software of STATA to empirically tested four hypotheses, before the regress, we use The Hausman Test and get a P-value which is 0.0000, so we choose FE model. The estimation results of the empirical study are reported in Tables 1, 2, 3.

Basic Estimation Results

In model(1) in Table2, the coefficient of "officials' turnover" are significantly positive, indicating that after the replacement of officials, the discharge of smoke and dust will increase. And the coefficient of "officials' turnover" is 0.047, it means that the discharge of smoke and dust increased by 4.7% after the replacement of officials, it also prove the hypothesis 1 succeed.

In model(2) in Table2, the coefficient of "exchange of officials" are significantly positive, indicating that after the exchange of officials, the discharge of smoke and dust will increase. And the coefficient of "officials' turnover" is 0.048, it means that the discharge of smoke and dust increased by 4.8% after the exchange of officials It also prove the hypothesis 2 succeed. Model(3), model(4) and model(5) in Table 2 reflect different impact of officials' turnover on environmental quality in different groups. The coefficients of "officials' turnover" in model(4) and model(5) are statistically insignificant, suggesting that influences of officials' turnover on environmental quality may not be significant. In model(3) in Table2, the coefficient of "officials' turnover" are significantly positive, indicating that when new official is from central government, the discharge of smoke and dust will increase in this area. It also proves the hypothesis 3 succeeds. We also can see that in model(3) the coefficient of "officials' turnover" is 0.082, higher than the coefficient in model(2) which is 0.048, it means that the Officials which from central government are more relaxed about environmental governance.

Moreover, it is also interesting to investigate the estimation results for the other explanatory variables. In all five models in Table 2, the coefficient of FDI are significantly negative, indicating that foreign direct investment is more; the discharge of smoke and dust is less. So it means that advanced management experience and environmental technologies of multinational companies can contribute to urban environmental governance. And In all five models in Table 2, the coefficient of "pollution control investment" are significantly positive, it shows that the current investment in

pollution abatement may not be used in the real need for environmental governance, so the improvement of environmental quality may not only increase the pollution control investment but should pay attention to the improvement of institutional environment.

Table 2, The influence of the officials' turnover on regional environmental quality

	Hypothesis 1	Hypothesis 2	Hypothesis 3		
	(1)	(2)	central transfer (3)	local transfer (4)	nonlocal transfer (5)
Ot	0.047** (2.09)	0.048** (2.05)	0.082* (1.85)	0.026 (0.75)	0.011 (0.28)
Average GDP	-0.000 (1.03)	-0.000 (1.05)	-0.000 (1.10)	-0.000 (1.04)	-0.000 (1.03)
FDI	-0.000*** (4.79)	-0.000*** (4.52)	-0.000*** (4.53)	-0.000*** (4.56)	-0.000*** (4.55)
Investment	0.177*** (3.33)	0.176*** (3.31)	0.175*** (3.27)	0.178*** (3.29)	0.177*** (3.29)
Structure	-0.286 (0.93)	-0.284 (0.92)	-0.278 (0.91)	-0.278 (0.90)	-0.278 (0.91)
Age	0.003 (0.72)	0.004 (0.74)	0.003 (0.70)	0.002 (0.49)	0.003 (0.52)
Education	-0.027 (0.43)	-0.023 (0.36)	-0.022 (0.35)	-0.026 (0.40)	-0.023 (0.36)
Gender	-0.130* (2.00)	-0.124* (1.89)	-0.109* (1.88)	-0.138** (2.12)	-0.136** (2.17)
Tenure	0.196*** (3.63)	0.190*** (3.57)	0.186*** (3.47)	0.191*** (3.56)	0.189*** (3.58)
_cons	2.751*** (6.13)	2.736*** (6.03)	2.743*** (6.45)	2.826*** (6.35)	2.810*** (6.10)
Year & Provin	control	control	control	control	control
R ²	0.62	0.62	0.62	0.61	0.61
Observation	310	310	310	310	310

The significance levels of 1%, 5% and 10% are noted by***, ** and *, respectively

The variables under the category "personal characteristics" have quite different estimated coefficients, suggesting that their influences on environmental quality vary remarkably. Specifically, the coefficients of the variable Gender turn out to be negative and significant in five models, indicating that when official is male, the discharge of smoke and dust is less. By contrast, the length of tenure tends to have negative impacts on environmental quality, because the coefficients of the variable Tenure turn out to be positive and significant in five models, it means that when the length of tenure more than one term, the discharge of smoke and dust will increase. So with the extension of the term, the situation that "Collusion between government and enterprise" will become more serious, the environmental quality will become worse.

Table 3 reflects the results of the impact of the officials' turnover on environmental quality in different areas. The coefficients of "officials' turnover" in all models in Table 3 are statistically insignificant, the areas of unbalanced development will not affect new officials, the influences of officials' turnover on environmental quality in eastern may not be significant. And we think it has reasons. The first reason is, it's going to make a big difference on impact of officials' turnover on environmental quality when new official from different source. Therefore, while considering the role of regional environmental quality, we neglect to consider the influence of official sources; this may shows the result that insignificant. The second reason is, although the eastern region economic development is fast, and it may attach greater importance to the environment, environmental quality has remained relatively stable in eastern region. That's exactly why the quality of the environment

hasn't changed much after replacement of officials. Thus, the turnover of officials in the eastern region does not have a significant impact on environmental quality.

Table 3, The influence of the officials' turnover on environmental quality in different region

	Hypothesis 4		
	The eastern region (1)	The central region (2)	The western region (3)
Ot	0.057 (1.63)	0.009 (0.28)	0.051 (1.10)
Average GDP	-0.000 (1.03)	-0.000 (1.05)	-0.000 (1.06)
FDI	-0.000*** (4.70)	-0.000*** (4.51)	-0.000*** (4.56)
Investment	0.178*** (3.33)	0.178*** (3.29)	0.176*** (3.27)
Structure	-0.275 (0.89)	-0.277 (0.90)	-0.287 (0.94)
Age	0.003 (0.59)	0.002 (0.51)	0.003 (0.62)
Education	-0.023 (0.36)	-0.024 (0.37)	-0.026 (0.40)
Gender	-0.123* (1.95)	-0.135** (2.11)	-0.139** (2.16)
Tenure	0.196*** (3.60)	0.188*** (3.53)	0.191*** (3.58)
_cons	2.773*** (6.19)	2.816*** (6.35)	2.801*** (6.25)
Year & Provin	control	control	control
R ²	0.62	0.61	0.62
Observation	310	310	310

The significance levels of 1%, 5% and 10% are noted by***, ** and *, respectively

Sensitivity Analysis

To check the robustness of the estimation results, we change the definition of the environmental quality. In former literatures, there are many measures of environmental quality, including discharge of waste water, waste gas, solid waste, smoke and dust, PM2.5 emissions and other indicators, we used discharge of industrial solid waste as an alternative variable of environmental quality to examine the robustness of the impact of official turnover on environmental quality, the regression results are shown in the Table 4. It can be seen from the Table 4 that the results are basically consistent with those of Table 2, it shows that the negative effect of official turnover on environmental quality is not affected by the selection of environmental quality measurement.

Table 4, An alternative variable of environmental quality: discharge of industrial solid waste

	Hypothesis 1	Hypothesis 2	Hypothesis 3		
	(1)	(2)	central transfer (3)	local transfer (4)	nonlocal transfer (5)
Ot	2.460** (2.41)	3.812*** (3.16)	5.518*** (3.26)	-0.524 (0.29)	1.641 (0.86)
Average GDP	-0.001 (1.37)	-0.001 (1.39)	-0.001 (1.40)	-0.001 (1.35)	-0.001 (1.35)
FDI	-0.144* (1.84)	-0.143* (1.83)	-0.140* (1.75)	-0.146* (1.81)	-0.146* (1.84)
Investment	0.025* (1.74)	0.025* (1.74)	0.024* (1.69)	0.024* (1.68)	0.025* (1.69)
Structure	-6.926 (0.81)	-7.017 (0.82)	-6.635 (0.75)	-6.350 (0.72)	-6.577 (0.76)
Age	0.053 (0.16)	0.093 (0.28)	0.062 (0.18)	0.004 (0.01)	0.024 (0.08)
Education	0.542 (0.28)	0.773 (0.40)	0.820 (0.42)	0.806 (0.40)	0.745 (0.38)
Gender	-3.925* (1.14)	-4.577* (1.30)	-5.431* (1.56)	-3.785* (1.07)	-3.573* (1.04)
Tenure	2.836* (1.22)	2.585* (1.17)	2.320* (1.03)	2.353* (0.98)	2.520* (1.14)
_cons	75.954*** (3.83)	72.728*** (3.77)	73.925*** (3.65)	78.972*** (4.03)	77.958*** (4.02)
Year & Provin	control	control	control	control	control
R ²	0.62	0.62	0.62	0.61	0.61
Observation	310	310	310	310	310

The significance levels of 1%, 5% and 10% are noted by***, ** and *, respectively

Summary

This paper's results show that the officials' turnover and exchange of officials has a significant negative impact on regional environmental quality, Officials transferred from the central government have a significant negative impact on local environmental quality, The officials' turnover in eastern regions does not have a significant impact on environmental quality, the length of tenure tends to have negative impacts on environmental quality. And it also shows that in Chinese current administrative system and personnel system, local officials have a big external incentive to develop regional economies, and the effect of this incentive will increase increases during the officials' turnover time. Overall, during the replacement period, there was a negative impact on the state of the environment, and as the term increases, the negative effects are turning for the worse.

Therefore, Chinese government should change the current system of promotion, exchange and replacement of officials as soon as possible, truly highlight the environmental factors in the official promotion and selection system, and put it in place.

At the central government level, although environmental protection index have been included in the cadre assessment mechanism now, but the weight of environmental protection still not big. The system for evaluating officials' performance remains unscientific and imperfect. The government still needs to make sure the practical implementation of this policy, and make the assessment mechanism's "baton" and "inhibiting magic phrase" role work.

The central government should consider both guidance and regulation on environmental protection when sending officials down. China's environmental crisis is usually attributed to the failure of local environmental governance, but it is also attributed to the failure of central environmental policies cannot be effectively implemented at the local level. According to general

experience, Officials from the central government can better reflect the policy will of the central government, which will significantly improve the quality of urban environment, but the empirical analysis results in this paper are the opposite conclusion. We think this is motivated by political promotion, because in the officialdom environment of "not advance but retreat", promotion incentives affect the governance of local officials, When officials have stronger political ties, they will get higher promotion opportunities at the expense of high resource consumption and environmental pollution, and the officials from central government has a deeper background, they are more likely to favor economic incentives over environmental ones. Therefore, the central government should place special emphasis on environmental requirements when sending officials.

The government can increasing restrictions on highly polluting enterprises and give environmental industries and enterprises some environmental incentives, limit the polluting enterprises which are high energy consumption and high emissions, give certain tax subsidies and preferential treatment to the environmental industry or enterprises which are good in environmental protection.

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