

Has Fiscal Decentralization Promoted or Restricted Public Environmental Expenditure ?

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Abstract: Public environmental expenditures are the crucial means to achieve ecological protection and environmental governance, while fiscal decentralization system is the key factor which affects the preferences of expenditures by local government. In order to further identify whether fiscal decentralization has negative incentives for the behavior of public environmental governance by local government, this paper applies provincial panel data of China from 2007 to 2015, to explore the effect of Chinese-styled fiscal decentralization on public environmental expenditures from the two dimensions of income and expenditure decentralization. The research results show that both income and expenditure decentralization have significant negative correlations with public environmental expenditures, which confirms that current fiscal decentralization system has strong incentive distortions and insufficient constraints on the behavior of public environmental governance by local government. Therefore, in order to promote green development and build a beautiful China, improvements should be made in terms of institutional environment, the relationship of financial authority and powers between central and local government, transfer payment systems, the governance models of regional linkage and collaboration, and environmental protection concepts, etc.

Keywords: fiscal decentralization; public environmental expenditure; income decentralization degree; expenditure decentralization degree

1. Literature Review

As is known to us all, not only is the effectiveness of environmental governance restricted by the environmental awareness and behavior of public, but to a large extent, it also depends on the arrangements of government system and financial support for public environmental protection. In order to find the reasons for the persistent existence of environmental pollution and the effective ways to improve the degree of public environmental governance, relevant scholars at home and abroad have gradually shifted their focus to the relevant arrangements of fiscal system and the impact of financial investment on environmental pollution, and explore its internal transmission mechanism and deep-seated reasons from different perspectives. Related research started with the “environmental federalism”, i.e. a theory for research of fiscal decentralization and environmental issues, which was emerged in the 1970s. Its core viewpoint holds that, local government or the most basic level government should undertake specific responsibilities of environmental governance to facilitate the internalization of costs and benefits (Inma and Rubinfeld, 1997). This needs to meet the corresponding conditions of the Tiebout model. Compared with the unified standard regulation of federal government, the decentralization of environment decision is more conducive to the substantial improvement of social welfare (Oates and Portney, 2003). However, the actual situation is quite different from that. Under the background of fiscal decentralization, the financial autonomy which local government enjoys, is much more considerable. Because of regional competition, local government often deregulates enterprises and lowers corresponding environmental standards, in order to attract investment, promote employment, and increase taxes, etc. (Fredriksson et al., 2003). Thus, unhealthy competition is encouraged, and thereby causing a decline in the degree of environmental pollution governance and degradation of environmental quality, i.e. so-called “Race to the Bottom” effect (Kunce and Shogren, 2007).

To sum up, from the above-mentioned articles at home and abroad, it can be seen that existing studies have explored the relationship between fiscal decentralization and environmental pollution

from a variety of perspectives or with different methods. Based on empirical analysis, these studies further clarify its existing transmission mechanism, and then propose targeted improving measures. The environmental quality will gradually deteriorate, although the preference of local government will promote regional economic growth and fiscal income in the short term.

2. Model Specification, Variable Selection and Data Sources

2.1 Model Specification

If it is only analyzed from a theoretical aspect, it is impossible to accurately identify the impact of fiscal decentralization on public environmental expenditures. Therefore, this paper selects provincial panel data in China from 2007 to 2015, to empirically test the effect of fiscal decentralization on public environmental expenditures, and to verify the authenticity of the hypothesis of fiscal decentralization. The panel data model this paper proposed is as follows:

$$PPEE_{it} = \beta_0 + \beta_1 FD_{it} + \lambda Control_{it} + \alpha_i + T_t + \varepsilon_{it} \quad (1)$$

In formula (1), i and t represent the i -th province and the t -th year respectively; $PPEE$ represents response variable, that is, the public environmental expenditures per capital of each local government; FD represents the degree of fiscal decentralization; $Control$ represents the control variable related to the scale of public environmental expenditures of local government; β_1 and λ respectively represent the coefficient matrix of core variable and control variable; α_i represents fixed effects of region; T_t represents fixed effects of time; ε_{it} represents random perturbation.

2.2 Variable Selection

2.2.1 Response Variable

This article focuses on the preference and behavior of public environmental governance by local government under the fiscal decentralization system. Generally speaking, the index of the efforts on environmental governance by local government can be indicated by the scale of public environmental expenditures. At the same time, in order to ensure the scale of expenditure in different regions is comparable and avoid its effects by population size, this paper chooses per capita public environmental expenditures ($PPEE$) as response variable.

2.2.2 Core Explanatory Variable

Regarding to the measurement index of fiscal decentralization, scholars and researchers in academic circles still not reach to an agreement. However, basically, the existing research can reflect the degree of regional fiscal decentralization, although different measurement index standards may have different interpretations. The specific formulas are as follows:

The degree of fiscal income (FD_inc) = per capital fiscal income in provincial budgets/per capital fiscal income in national budgets (2)

The degree of fiscal expenditure (FD_exp) = per capital fiscal expenditure in provincial budgets/per capital fiscal expenditure in national budgets (3)

2.2.3 Control Variable

Since there are many factors which may affect public environmental expenditures, it is necessary to introduce a certain number of control variables in order to obtain more robust results. The details are as follows: (1) Per Capital GDP ($PGDP$) and its quadratic term ($PGDP^2$). GDP usually reflects the overall level of regional economic development. Limited to the difference in the regional population size, here per capital GDP is used to represent the economic development level of each province. Since whether there exists a non-linear relationship between the level of regional economic development and public environmental expenditures is far from certain, the quadratic term of per capital GDP is included as a control variable in that model. (2) Financial Self-Sufficiency Ratio ($SSSR$). The degree of financial self-sufficiency can reflect the influence of central fiscal transfer payments on regional fiscal income, and indirectly affect the amount of

investment in environmental protection by local government. (3) Urbanization Rate (URBANRATE). As the current rapid progress of urbanization is dominated by relevant policy and affected by performance evaluation system, local government is more inclined to invest resources in the areas where economic performance can be achieved in short term. (4) Openness (OPENESS). The degree of openness can reflect the full utilization of labor, technology, foreign capital and other element resources in international trade between local government and other countries or regions, which is conducive to the transformation and upgrading of regional economic growth. However, it will inevitably affect the changes of local fiscal expenditure structure, which includes capital investment for environmental governance. Therefore, this article introduces it as a control variable. The specific measurement formula is, Openness = total import and export of each local government / GDP of each region. (5) Industrial Structure (INDS). To some extent, the changes in industrial structure will affect the degree of environmental pollution, and then, it will affect the investment of local government in public environmental governance. This article uses the proportion of secondary industry in GDP as measurement index. (6) Degree of Local Government Competition (GOVCOMP). In the strategy of yardstick competition, local government usually competes to attract direct foreign investment to promote regional economic growth. (7) Degree of Local Environmental Pollution (ENVPOLL).

2.3 Data Sources

The object of this article is the effect of the fiscal decentralization system on the behavior of public environmental governance by various local governments in China. Before 2007, data on public environmental expenditures were not listed separately in the yearbook. After 2007, the Ministry of Finance carried out corresponding reforms to the classification of government income and expenditure. It was the first time that public environmental expenditures were set up separately in the fiscal expenditure classification. For this reason, the period of test selected in this article is 2007-2015, and the scope of test covers 30 provinces in China (Tibet, Hong Kong, Macau, and Taiwan are not included). The above index data mainly comes from the 2008-2016 China Statistical Yearbook, the website of National Bureau of Statistics of China, CEIC Database and other resources. In addition, related data such as PGDP, PGDP2, FDI, etc. have all been adjusted from relevant price index based on that in 2007. The descriptive statistics of the variables are shown in Table 1.

Table 1 The descriptive statistics of the variables

samples	Mean	Mid-Range	Maximum	Minimum	Mean Squared Error (MSE)	Sample Size
PPEE	0.0301	0.0283	0.0673	0.0085	0.0109	270
FD_inc	0.5806	0.4112	2.8694	0.1875	0.4804	270
FD_exp	0.9956	0.8528	3.1272	0.5154	0.4636	270
PGDP	2.4026	1.9315	6.7933	0.7666	1.2509	270
PGDP ²	7.3313	3.7307	46.1490	0.5877	8.5588	270
SSSR	0.5205	0.4547	0.9509	0.1483	0.1988	270
URBANRATE	0.5295	0.5040	0.8960	0.2824	0.1366	270
OPENESS	0.3022	0.1471	1.6668	0.0152	0.3382	270
INDS	0.4775	0.4956	0.6150	0.1974	0.0791	270
GOVCOMP	0.1088	0.0679	0.8509	0.0015	0.1353	270
ENVPOLL	0.0333	0.0297	0.1222	0.0083	0.0162	270

3. Analysis of Empirical Results and Robustness Test

3.1 Analysis of Benchmark Model Results

This article mainly uses Eviews7.2 Software to estimate the regression results. In the estimation process, this article firstly uses Hausman testing the applicable category of the model. The results show that all the models in Table 2 are suitable for constructing fixed effects model instead of

random effects model. This article is an empirical investigation from the two dimensions of fiscal income and expenditure decentralization. Among them, Model 2 and Model 5 are the regression results which remove insignificant control variables, and Model 3 and Model 6 are the regression results which add all the control variables. The specific regression results are shown in Table 2.

Table 2 Basic Regression Results of fiscal Decentralization and Public Environmental Expenditures

samples	PPEE			PPEE		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	0.0408*** (18.6199)	0.0870*** (9.3940)	0.0896*** (8.5753)	0.0476*** (17.5185)	0.0880*** (9.7644)	0.08766*** (8.6726)
FD_inc	-0.0183*** (-4.9284)	-0.0194*** (-3.2815)	-0.0174*** (-2.7439)			
FD_exp				-0.0176*** (-6.4938)	-0.0180*** (-4.9509)	-0.0180*** (-4.6511)
PGDP		-0.0306*** (-6.1633)	-0.0238*** (-3.0806)		-0.0243*** (-4.9509)	-0.0188*** (-2.6581)
PGDP2		0.0034*** (4.9858)	0.0028*** (3.1032)		0.0029*** (5.0765)	0.0025*** (3.3771)
SSSR		-0.0225* (-1.7673)	-0.0250* (-1.9330)		-0.0386*** (-3.2496)	-0.0402*** (-3.3721)
URBANRATE			-0.0213 (-1.1450)			-0.0168 (-0.9474)
OPENESS		-0.0255*** (-4.1921)	-0.0251*** (-4.1195)		-0.0214*** (-3.5994)	-0.0210*** (-3.5316)
INDS		0.0419*** (3.2283)	0.0322** (2.0587)		0.0419*** (3.5650)	0.0377** (2.4795)
GOVCOMP		0.0197* (1.6775)	0.0221* (1.8496)		0.01758* (1.6571)	0.0212* (1.9337)
ENVPOLL			0.0433 (0.4824)			0.09837 (1.1119)
N(observations)	270	270	270	270	270	270
Cross-Sectional Data	30	30	30	30	30	30
Adjusted R2	0.6874	0.7511	0.7506	0.7073	0.7644	0.7645

Note: Robust standard errors in parentheses.***:significant at 1%; **:significant at 5%; *:significant at < 5%

According to the regression results in Table 2, no matter it is fiscal income decentralization or expenditure decentralization, the significance of two core variables is not affected by the control variables, and both of them are significantly negative. The coefficients do not show obvious change, and it is significantly established at the 1% level. This shows that the higher the degree of fiscal decentralization is, the harder the increase in public environmental expenditures will be. On the contrary, it will reduce the expenditures to a certain extent. It further validates the rationality of the above-mentioned theoretical effect analysis. Next, this article will observe the estimated results of the influence of respective control variables on public environmental expenditures.

(1) The coefficients of the two control variables, that is per capital GDP (PGDP) and its quadratic term (PGDP2), reflecting the level of regional economic development, have passed the test at the significance level of 1% (such as Model 2, 3, 4 and 5). As far as the relationship is concerned, there is a significant negative correlation between PGDP and PPEE, and a significant positive correlation between PGDP2 and PPEE. It can be seen that there is a “U-shaped” relationship between the level of regional economic development and public environmental expenditures. It further shows that the regional per capital public environmental expenditures have not increased with the improvement of the economic development, but the turning point and the

increasing trend will appear only after the level of economic development has reached to a certain stage.

(2) The effect of financial self-sufficiency ratio (SSSR) on per capital public environmental expenditures (PPEE) is slightly different in the two dimensions of fiscal income decentralization and expenditure decentralization. They have passed the test at the significance level of 10% and 1%. And, both of the coefficients are negative, which indicates that there is a significant negative correlation between them.

(3) The coefficients of urbanization rate (URBANRATE) have not passed the test at the significance level of 10% in the two dimensions of fiscal income decentralization and expenditure decentralization, and it does not have a significant relationship with per capital public environmental expenditures (PPEE). However, all of the coefficients are negative, which can also reflect that in the process of vigorously promoting urbanization, local government is affected by the reform of tax-division system, and there is an obvious inequality between the central and local governments in terms of financial authority and powers.

(4) The coefficients of openness (OPENESS) is significant negative, and it is not benefit for the increase in public environmental expenditures. The reason may be that, in the course of trade, local government and other countries or regions will make the change of allocation to regional public resources inevitably. Thus, the result is that local government pays less attention to environmental governance.

3.2 Robustness Test

In order to further verify the robustness of the test results, the following tests are carried out by transforming explanatory variable and response variable, and by dividing the eastern and central-western groups by geographic location. The specific test results are shown in Table 3 and Table 4.

Table 3 Robustness test results based on explanatory variable and response variable transformation

Samples	PPEE		PEEE Ratio	
	model 1	model 2	model3	model4
Constant	0.0909*** (8.2296)	0.0770*** (5.9456)	0.2330*** (10.2466)	0.2285*** (10.2644)
FD_inc	-0.0035*** (-3.9923)		-0.0210*** (-2.5216)	
FD_exp		-0.0012** (-2.2385)		-0.0273*** (-3.1999)
PGDP	-0.0186** (-2.4445)	-0.0098 (-1.2348)	-0.0462*** (-2.7521)	-0.0409*** (-2.9116)
PGDP2	0.0017** (2.0298)	0.0007 (0.9801)	0.0047** (2.4101)	0.0047*** (2.9116)
SSSR	-0.0313** (-2.3392)	-0.0384*** (-3.1090)	-0.0843*** (-2.7153)	-0.1040*** (-3.9581)
URBANRATE	-0.0283 (-1.3813)	-0.0190 (-0.9657)	-0.1102*** (-2.7153)	-0.0980** (-0.9474)
OPENESS	-0.0259*** (-4.0551)	-0.0259*** (-4.2070)	-0.0526*** (-3.9616)	-0.0466*** (-3.5548)
INDS	0.0260* (1.6601)	0.0255* (1.6712)	0.0675** (1.9853)	0.0783** (2.3379)
GOVCOMP	0.0153* (1.1942)	0.0164 (1.4296)	0.0456* (1.7551)	0.0483** (2.0027)
ENVPOLL	0.0199 (0.2198)	0.0581 (0.6323)	0.0855 (0.4378)	0.1792 (0.9194)
Constant Term	270	270	270	270
Cross-Sectional Data	30	30	30	30
Adjusted R2	0.7435	0.7479	0.7501	0.7583

Note: Robust standard errors in parentheses.***:significant at1%;**:significant at 5%;*:significant at< 5%

Model 1 and Model 2 in Table 3 have transformed the explanatory variables, that is, using the degree of fiscal income decentralization (fiscal income decentralization = income in the budget of each province / income in the central budget) and fiscal expenditure decentralization (fiscal expenditure decentralization = expenditure in the budget of each province / expenditure in the central budget) as two measurement indexes to replace the original index and perform regression estimation again. The estimation results show that both of fiscal income and expenditure decentralization have a significant negative correlation with per capital public environmental expenditures. Compared with benchmark result of regression estimation, the estimation results here basically maintain their stabilities. However, in the dimension of fiscal expenditure decentralization, several have not passed the test at the significance level of 10%, which have no significant impact on per capital public environmental expenditures. And, the remaining control variables basically remain stable. Model 3 and Model 4 have changed response variables, response variables, that is, replacing them by the proportion of public environmental expenditures in the supply of basic public services. The re-regression estimation results show that both of the two core explanatory variables, fiscal income and expenditure decentralization, have negative impacts on the proportion of public environmental expenditures, which is consistent with the aforementioned benchmark regression results.

4. Basic Conclusions and Policy Recommendations

4.1 Basic Conclusions

This article constructs a panel model based on the sample data of 30 provinces in China from 2007 to 2015, and empirically tests the impact of the fiscal decentralization system on local public environmental expenditures from the two dimensions of income decentralization and expenditure decentralization. Also, the benchmark regression results are tested for their robustness. The results of this research show that both fiscal income and expenditure decentralization have a significant negative correlation with public environmental expenditures.

4.2 Policy Recommendations

(1) Optimizing the Institutional Environment.

Under the background where local government officials take GDP as the evaluation standard for promotion, many local government officials, in pursuit of rapid regional economic development, put more investment in the field of performance projects which can drive GDP growth in the short-term, while ignoring the resource allocation in environmental protection. It will further cause the unfavorable situation of ecological environment deterioration. Not only does it reduce the well-being index of the general public with its future generations, but also it requires more explicit and implicit costs because of the difficulty of environmental governance. For this purpose, it is necessary to speed up the improvement of the institutional environment and promulgate corresponding laws and regulations. At the same time, it is necessary to promptly optimize the assessment criteria for the promotion of officials, especially by adding regional environmental index into assessment, to regulate the behavior of officials and correct their preferences in fiscal expenditure.

(2) Rationally Allocating the Financial Authority and Powers.

Since the reform of tax-division system in 1994, the financial authority and powers (expenditure responsibilities) of the local government have been in a severe mismatch, which has seriously affected the optimal allocation for the supply of basic public services, including public environmental governance. Especially in the underdeveloped provinces in the central-western regions, local government requires more support from central fiscal transfer payments, due to their weak financial extraction capacity, to barely maintain the normal operation of administrative agencies at all levels and the investment of infrastructure and other areas. It is difficult for them to put more investment in the welfare public service supply which includes public environmental governance. Therefore, it is necessary to appropriately expand the financial authority of local government to maintain a relative balance between the financial authority and powers of the local government. Based on the current background of comprehensively promoting the “VAT reform (replacing business tax with value-added tax)”, it is necessary to adjust the structure and proportions of tax-division between the central and local governments to make up for the gap in local fiscal income and expenditure.

(3) Continually Improving the Fiscal System of Transfer Payments

It is necessary to appropriately reduce the proportion of special transfer payments and increase the proportion of general transfer payments to ensure that local government has discretionary power in the usage of funds. At the same time, it is necessary to appropriately increase the investment in special transfer payments for environmental protection governance, strengthen fund supervision with highlights to improve the efficiency of using the funds. In addition, the spillover of public environmental governance and the urgency of environmental pollution issues should be considered. It is difficult to achieve effective governance only by local government’s undertaking of the main supply responsibilities. It is necessary for central government to coordinate local government to distinguish the main supply responsibilities, and jointly implement environmental pollution.

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