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A Study of the Impact of Fiscal Decentralization on the Efficiency of Public Health Expenditure

Xiaoman Wu, Tingfei Geng*, Xiaojie Peng*

Business School (School of Quality Management and Standardization), Foshan University, Foshan 528000, China

Corresponding authors: Tingfei Geng, gengtingfly@163.com; Xiaojie Peng, pengxj1@163.com

Abstract: In this present-day global pandemic that has not been completely resolved, health is a major concern among people, and correspondingly, people are demanding higher standards for public health products and services provided by the government. In this paper, we measure the technical efficiency of public health expenditure in each province by using the data envelopment analysis (DEA) model, and examine the impact of decentralization on the efficiency of public health expenditure under the fiscal decentralization system using the panel data from 31 provinces from 2012–2019 in a panel model subject to fixed effects.

Keywords: Fiscal decentralization; Fiscal expenditure efficiency; Public health expenditure

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1. Introduction

The question of whether fiscal decentralization is conducive to more efficient public health expenditure requires further discussion.

With the outbreak of the pandemic, public health issues have garnered widespread attention from all around the world. The efficiency of public health expenditure is directly related to the health environment in which the public lives. The efficiency of public health expenditure in all regions of the country has been a concern as the scale of expenditure increases. In addition, the existence of the "sticky paper effect" in fiscal decentralization has caused an inefficiency in the use of central to local transfer funds [1-6]. Therefore, in the context of China's fiscal decentralization, it is necessary to further investigate the impact of fiscal decentralization on the efficiency of public health expenditure.

2. Theoretical analysis

2.1. Positive impact of fiscal decentralization on the efficiency of public health expenditure

First, the competition in public health services will stimulate the efficiency of public health expenditure in each locality. As proposed by Tiebout [7] in 1956, fiscal decentralization has inspired local governments to design various tax systems and public goods delivery mechanisms based on local realities. Second, the reduction in the size of government improves the efficiency of public health expenditure. Generally speaking, when the size of the relevant sector of public health expenditure is reduced, the operating cost of the sector will also be reduced, thus forcing the health sector to improve its overall expenditure efficiency [8-13]. Third, the reduction of corruption following decentralization will increase the efficiency of public health expenditure. Arikan [14] argues that the higher the degree of fiscal decentralization, the greater the horizontal competition among governments, and the lesser the corruption. Furthermore, the number of

voters is another reflection of the performance of local governments, which can place competitive pressure on local officials.

2.2. Negative impact of fiscal decentralization on the efficiency of public health expenditure

First,the reduction in the size of government public health expenditures reduces the efficiency of public health expenditures. The efficiency of public health expenditure is affected by the fact that each government will voluntarily reduce the tax rate in its region due to the competition for capital and residents, which in turn reduces local tax revenues [15-19]. Second, the efficiency of government health expenditure is reduced by increasing the size of government. According to Oates [20], fiscal decentralization leads to an increase in the size of government in China. The reduction in the size of government cannot be explained by this principle. Third, the increase in corruption reduces the expenditure efficiency. There is no academic consensus on the impact of horizontal competition among governments on corruption under fiscal decentralization.

3. Evaluation of the efficiency of public health expenditure

3.1. Test method for efficiency evaluation

In this study, the data envelopment analysis (DEA) model oriented to the output was used. Since the payoffs to scale of public health outputs are changing as the public health expenditure profile changes, the final model used was the BCC model with variable payoffs to scale and an output-oriented model. If the k^{th} assessment unit is DMUk, and the efficiency score is h_k, then its efficiency assessment input-oriented BCC model is as follows:

$$\begin{gathered} \max h_k = \sum_{r=1}^{s} u_r \ Y_{rk} - u0 \\ \text{s. t.} \sum_{i=1}^{m} v_i \ X_{ik} = 1 \sum_{r=1}^{s} u_r Y_{rj} \sum_{i=1}^{m} v_i \ X_{ij} - u0 \le 0, \\ j = 1, \ldots, n; \ u_r, v_i \ge \varepsilon, \ r = 1, 2, \ldots \\ s, \ i=1, 2, \ldots, m \end{gathered} \tag{1}$$

3.2. Data source

The five output indicators of fixed reported infectious disease incidence rate and population mortality rate of 31 provinces were used as the efficiency decision unit (DUM). Meanwhile, the data used in this article were from China Health Database, China Macroeconomic Database, and relevant health data reports in the EPS data platform from 2012–2019. In this paper, 31 provincial governments across China were selected as the research subjects, and considering the timeliness of the empirical analysis and the availability of data, the data of 8 consecutive years from 2012–2019 were selected for the empirical analysis.

3.3. Analysis of measurement results based on the DEA model

From the analysis results, Hainan and Qinghai are the provinces that are on the frontier surface and are relatively efficient. The public health expenditures in these areas are characterized by high output and reasonable input structure. Provinces with relatively high efficiency are Liaoning and Hunan, whose efficiency values are above 0.7. For these provinces, the way to achieve high efficiency is to maintain the existing level of public health expenditure inputs, further reduce redundant inputs, and effectively manage public health expenditure. Relatively inefficient provinces are remote areas with low-income levels, such as Jiangxi, Guizhou, and Yunnan, with output efficiency values below 0.6.

4. Empirical analysis of fiscal decentralization on the efficiency of public health expenditure

Having obtained these results on the efficiency of public health expenditures, a new model is needed to

study the impact of the role of fiscal decentralization in it.

4.1. Indicator selection

The fiscal decentralization indicator was measured as the ratio of local per capita fiscal budget expenditure to national per capita fiscal budget expenditure and expressed as Fd. From the economic and social perspective, three control variables were set: regional economic development level (Agdp), local general public budget revenue (Arevenue), and population density (Density).

4.2. Data description

The data in this paper were obtained from China Urban and Rural Construction Database, China Finance and Taxation Database, and China Macroeconomic Database in the EPS data platform. Public health expenditure efficiency, as the core explanatory variable, refers to the integrated technical efficiency (EFF) evaluated by the DEA model. Fiscal decentralization, as the key explanatory variable, was quantified using local per capita fiscal budget expenditure divided by national per capita fiscal budget expenditure. The three control variables, which included the economic development level of each region, local general public budget revenue, and population density, were processed. The descriptive statistical characteristics of the variables are shown in **Table 1**.

Table 1. Descriptive statistical characteristics of variables

Variable name	Variable meaning	Quantity	Average value	Standard deviation	Minimum value	Maximum value
EFF	Integrated technical efficiency	248	0.720	0.249	0.159	1
Fd	Degree of fiscal decentralization	248	1.084	0.591	0.562	3.656
Agdp	Gross domestic product per capita	248	10.84	0.422	9.889	12.01
Areveue	Total general budget revenue	248	16.74	0.952	13.37	18.66
Density	Population density	248	7.874	0.404	6.939	8.620

4.3. Econometric model

Based on the basic structure of the model and relevant studies from previous literature, the following baseline regression econometric model was obtained:

$$EFFit = \beta_0 + \beta_1 Fdit + \beta_2 Agdp + it\beta_3 Areveueit + \beta_4 Densityit + \varepsilon it \quad (2)$$

4.4. Analysis of empirical results

Table 2. Results of fixed effects regression

Variables	(1) EFF	(2) EFF	(3) EFF
Fd	-0.4108**	-0.8255***	-0.8938***
	(0.1787)	(0.1656)	(0.1763)
Agdp		0.0251	0.0035
		(0.1561)	(0.1622)

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Variables	(1)	(2)	(3)
	EFF	EFF	EFF
Areveue		0.5985***	0.6266***
		(0.1466)	(0.1555)
Density		-0.1514	-0.1946*
		(0.0987)	(0.1039)
Constant	1.1655***	-7.4800***	-7.4321***
	(0.1943)	(1.2876)	(1.3821)
Observations	248	248	240
R-squared	0.0239	0.2882	0.2954
Number of var8	31	31	30
Province FE	Y	Y	Y

Note: standard errors in parentheses; *** $P < 0.01$, **$P < 0.05$, *$P < 0.1$

From **Table 2**, it can be seen that the antecedent coefficient of fiscal decentralization is negative, indicating that fiscal decentralization has a significant negative impact on the efficiency of public health expenditure. Second, the level of economic development, local general public budget revenue, and the control variable set to population density in model 2 have different effects on the efficiency of local health care expenditure. Third, since the degree of financial autonomy of the Tibetan local government is low, the regression results of model 3 were obtained after excluding the extreme variable of the degree of financial decentralization in Tibet, and there was no obvious change in the significance level of each variable, thus verifying the conclusion of the negative effect of financial decentralization on the efficiency of public health expenditure.

5. Conclusion

On the one hand, the overall level of China's public health expenditure's efficiency has declined since 2014 with certain regional differences, and the decline in its scale is the main reason for the decline in its efficiency. Although there is a certain degree of inefficiency in public health expenditure, the performance varies from province to province, and each province adjusts its scale of investment according to its own situation. On the other hand, control variables were also added to investigate the effect of fiscal decentralization on the efficiency of public health expenditure, which can also be used to examine the effect of other influential factors on the efficiency of public health expenditure in each province. This study concludes that fiscal decentralization is significantly detrimental to the efficiency of local public health expenditure, which is in line with the majority of studies emphasizing on the negative effect of fiscal decentralization on the efficiency of local public goods supply.

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Disclosure statement

The authors declare no conflict of interest.

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