



Financial Pressure, Efficiency of Tax Collection and Administration and Regional Heterogeneity: A Case Study of Central China

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Abstract

The efficiency of tax collection and management is an important management factor that affects the local financial pressure. This paper uses the data of six provinces in central China from 2018 to 2019, based on the DEA model and Malmquist index to measure the efficiency analysis of tax collection and management in six provinces in central China. The results show that: there is an excess investment in tax collection and management resources in Hubei and Jiangxi, the efficiency of tax collection and administration in the six provinces is generally characterized by a low growth rate of tax collection and administration technology investment, and insufficient technological innovation. In response to different levels of financial pressure with the efficiency of tax collection and management, we should actively establish a scientific and standardized collection and management system, strengthen the analysis and integration of tax data, pay attention to the training of digital tax talents, and promote intelligent tax.

Keywords: *efficiency of tax collection and administration; Financial pressure; DEA model*

1. Introduction

After the tax-sharing system reform in 1994, the central and local financial powers were re-divided, and the change of tax-sharing method reduced the local government's fiscal revenue to a certain extent, but the original expenditure responsibility was not adjusted accordingly. The local finance is facing huge financial pressure, forcing the local government to strive for the increase of fiscal revenue. As the most important form of government organization's fiscal revenue, tax is an important part of local organization's fiscal revenue. However, the legislative power of taxation is vested in the central government, and the tax sharing method cannot be changed at will. Local governments can only supplement local fiscal revenue to maintain the provision of local public services by improving the performance of fiscal expenditure, effectively using debt funds, and improving the efficiency of tax collection and management. Among them, improving the efficiency of tax collection and administration can effectively increase the unnecessary waste of tax revenue, thus relieving the local financial pressure to a certain extent.

Reasons for choosing the central provinces: The previous domestic research on the efficient evaluation of tax collection and administration takes the country as the research unit, including all provinces in China, and is discussed. And is used to divide China into regions such as the northeast, the west, the east, the middle, so on. However, there is little domestic research on the combination of financial pressure in different regions and the corresponding performance of tax collection and management. Based on the discussion of some regions in China, this paper tries to combine financial pressure with tax collection and management and provide suggestions on tax collection and management in selected regions for reference in other regions in China.

The rest of the paper is organized as follows. Section 2 is a literature review of some scholars. In section 3, we set up the measure to calculating the financial pressure of local governments and to evaluating the efficiency of tax collection. Section 4 is a comprehensive analysis of regional heterogeneity. Section 5 is a summarize analysis under different financial pressures. Section 6 provides relevant references and suggestions for the government to

establish and improve relevant policies.

2. Literature Review

Scholars have found that the change of local financial pressure has a positive effect on improving the efficiency of tax collection and management. To ease the local financial pressure, we can take measures to improve the level of tax collection and management, but improving the level of tax collection and management may not effectively ease the financial pressure^[1]. The local government transfers part of the financial pressure by increasing the actual tax burden of enterprises, but the level of local tax collection and management has not been improved^[2], the tax avoidance behavior of enterprises from tax collection and management and that the enhancement of tax collection and management will inhibit the illegal tax avoidance behavior of private enterprises with political status in the region^{[3]-[4]}. There also believes that the weaker the tax collection and administration, the stronger the correlation between financial pressure and the degree of tax avoidance. Scholars believe that the difference in fiscal pressure between regions will further widen the difference in GDP per capita among regions through the "multiplier effect" of tax collection and administration^[5]. There is a positive correlation between the political promotion incentives of officials and the level of tax collection and administration in the region. The change of local government will improve the tax collection and administration of the tax authorities^[6]. The increase in tax sharing will motivate the local government to increase tax efforts, while financial pressure will force the government to strengthen tax collection and management. There is strategic imitation competition between regions in tax effort, while there is strategic substitution between the transmission of financial pressure and local tax effort.

To sum up, scholars believe that there is significant regional heterogeneity in the efficiency of tax collection and administration in China, there is a significant gap in the efficiency level of tax collection and administration in different regions, and there is heterogeneity between the efficiency level of tax collection and administration in different regions and economic development^[7]. This paper holds that there is a gap in economic development and policy implementation between regions, and the tax authorities, as the direct administrative departments, are unified in terms of institutional setup and law enforcement procedures. Therefore, it is of practical significance to analyze the efficiency of tax collection and administration in different regions in combination with the corresponding financial pressure. In this paper, the central region of Shanxi, Henan, Anhui, Hubei, Jiangxi, Hunan, and other six provinces as the research object. Due to the limitation of data availability, the model setting in this paper is slightly insufficient and the

test conclusion is limited. The corresponding results need to be further improved.

3. Research Design

3.1. Local Government Financial Pressure Measurement Method

From the perspective of the impact of financial pressure, the central and local income tax sharing is compared before and after the tax sharing system reform to measure the changes in tax revenue after the impact of the policy changes^[8]. This is different from the commonly used ratio of a fiscal gap to fiscal revenue. Based on the comparison of the above calculation methods, this paper selects the financial gap pressure index to measure the financial pressure of local governments, i.e. financial pressure = (local government fiscal expenditure - local government fiscal revenue) / local government fiscal revenue.

3.2. Local Government Tax Collection Efficiency Analysis Method

When discussing tax effort and financial ability with the DEA model, an index system is established, which takes the number of people employed by tax authorities and tax administration costs as input indicators, and takes local tax revenue, the proportion of local tax revenue in GDP, and tax elasticity as output indicators^[9]. Some scholars believe that, from the perspective of input and output, the most important factor that affects the efficiency of tax output is not only the technical efficiency of tax collection and management but also the change of the tax system under certain domestic economic conditions^[10]. They also find that the relationship between the technical efficiency of tax collection and management and the trend of tax system changes is one-way and the other way, so tax system factors are added to the evaluation index system^[11].

To sum up, the analysis on the efficiency of tax collection and management includes a convenient summary analysis from the management of tax sources, the degree of completion of tax plans, the construction of tax teams, etc., and considers the impact of tax collection and management procedures and tax design on the collection of tax revenue. When analyzing the different performance of tax collection efficiency under the financial pressure of regional heterogeneity, this paper also refers to the DEA model test and selects the corresponding indicators from the output perspective.

3.3. The Efficiency of Tax Collection and Management Index System

Based on the rationality of the selection of

evaluation indicators and the availability of data, this paper finally selects the ratio of GDP of the six provinces in the central region and the added value of the tertiary industry to GDP from 2018 to 2019 as the input and output, the proportion of tax revenue to GDP, the tax risk management income rate and the tax inspection income rate as the output variables, and takes the output as the guidance to establish an index system for evaluating the tax collection and management efficiency of the central region after the combination of national and local taxes (Table 1).

Table 1 Input-output Indicators for Evaluating the Efficiency of Tax Collection and Administration after the Consolidation of State and Local Taxation in the Central Region

Input variable	Regional GDP
	The tertiary industry added value as a proportion of GDP
Output variable	Tax revenue as a proportion of GDP
	Revenue rate from tax risk management
	Tax inspection revenue rate

3.4 DEA Model for Measuring Efficiency of Tax Collection and Administration

DEA is used to evaluate the efficiency of different decision-making units with multiple inputs and multiple outputs. The input-output values of all decision-making units are projected into the efficiency space by using the linear programming idea, and the efficiency envelope surface is obtained, which is a track formed by connecting the most efficient decision-making units. Decision-making units located on the efficiency envelope, the input-output combination has Pareto optimal efficiency, their efficiency value is 1, i.e. the input is the least under the given output or the output is the largest under the given input.

The DEA mathematical model is:

$$\begin{aligned}
 & \text{Min}_{\theta} h_k = \theta - \varepsilon \left(\sum_{i=1}^m S_i^- + \sum_{r=1}^s S_r^+ \right) \\
 & \text{s.t.} \sum_{j=1}^n X_{ij} \partial_j - \theta X_{ik} + S_i^- = 0, i = 1, \dots, m \\
 & \sum_{j=1}^n Y_{rj} \partial_j - S_r^+ = Y_{rk}, r = 1, \dots, s \\
 & \partial_j, S_i^-, S_r^+ \geq 0, j = 1, \dots, n, i = 1, \dots, m, r = 1, \dots, s
 \end{aligned}$$

If the optimal solution of the DEA model is $\theta_0 < 1$, it is said that the j_0 decision-making unit is DEA invalid; if the optimal solution of the DEA model is $\theta_0 = 1$, it is said that the j_0 decision-making unit is weak DEA efficient; if the optimal solution of the C²R model is $\theta_0 = 1, S^- = 0, S^+ = 0$, the j_0 decision unit is said to be DEA efficient.

In this way, the research method used in this paper is more accurate and in-depth Malmquist index. The traditional CCR model and BCC model of the DEA method are generally applicable to the horizontal efficiency comparison at the same time point, but it is difficult to find its dynamic development trend for panel data. The Malmquist index can better analyze the relative dynamic changes of production efficiency in different regions. It can use the distance function to calculate the input-output changes during the period from t to t+1. It can perform dynamic efficiency assessment and factor decomposition on the entire decision-making system. The Malmquist index can be expressed as:

$$TFP = \frac{D^{t+1}(x_{t+1}, y_{t+1})}{D^t(x_t, y_t)} \times \left[\frac{D^t(x_{t+1}, y_{t+1})}{D^{t+1}(x_{t+1}, y_{t+1})} \times \frac{D^t(x_t, y_t)}{D^{t+1}(x_t, y_t)} \right]^{1/2}$$

4. Local Government Tax Collection Efficiency Analysis of Regional Heterogeneity

The data in this paper are derived from the China Tax Yearbook (2018 -2019) and the unit final accounting documents published by the tax bureaus of individual provinces. Table 2 shows the tax collection efficiency index of the six provinces in central China from 2018 to 2019 and its influencing factors. As can be seen from Table 2, the change in scale efficiency has played a significant role in promoting the efficiency of tax collection and administration in Hunan and Anhui, and the growth rate is above 10%. However, the scale efficiency of Shanxi and Henan are in the state of optimization or relative optimization, which indicates that the scale and output of their collection and management resources are in the state of relative optimization after the combination of national tax and local tax. The scale efficiency in Hubei and Jiangxi has regressed, and the scale efficiency in Jiangxi has regressed to the highest degree, which indicates that there are various degrees of excess investment in collection and management resources in Hubei and Jiangxi. The change in scale technology indicates that the scale technology growth in all five provinces except Shanxi is low, indicating that the scale technology investment in most provinces and cities in the central region has slowed down. More shows that the scale of technology investment is insufficient and there is a large room for improvement in the future. However, the scale and technology in Shanxi increased by more than 5%,

indicating that the investment in collection and management technology in Shanxi has a positive effect on its collection and management efficiency. The change in pure technical efficiency shows that the application level of collection and management technology in Shanxi, Henan, and Jiangxi is in a state of improvement or unchanged. The application level of collection and management technology in Anhui and Hunan is increasing rapidly, while the application level of collection and management technology in Hubei is decreasing. Pure technology shows that the potential benchmark technology of tax collection and administration in Shanxi and Henan has improved or remained unchanged. The average annual growth rate in Hunan and Anhui is above 4.5%, while the technological retrogression in Jiangxi ranks first among the six provinces in the central region, followed by Hubei. On the whole, Jiangxi should pay more attention to the resources input, technology input, and technology innovation in collection and management.

After comparing the tax collection and administration work of the six provinces in the tax yearbook, it is found that there are differences in the internal control of the tax department between the provinces. As for the details of internal control, Anhui Province needs to further control and implement the responsibility system, and Jiangxi Province's information evaluation work is more prominent. In terms of performance management, the tax departments of the six provinces have all applied digital personnel management and conducted a follow-up investigation on the performance management evaluation. In personnel, digital means are combined to ease the pressure on the grassroots level from point to surface. In terms of risk management, the tax departments of the six provinces apply big data technology to conduct data docking and service information sharing. Hubei province has done a good job in linking other departments to conduct a joint analysis of tax data. Shanxi province's chain management using the whole process before, during, and after the event is worth learning from other provinces.

Shanxi Province uses the information platform to create a good business environment for the province; Henan Province has set up an evaluation mechanism for tax supervision and tax source management; Hubei Province to conduct electronic management of archives and monitoring and evaluation of the transaction process; Hunan Province is using electronic information comparison and tax source management for key layout; Jiangxi Province has streamlined the cancellation procedures, and Anhui Province has focused on the standardization of tax administration and the construction of post responsibility system. In terms of tax supervision, Shanxi Province has deepened the "interaction between bank and tax", Henan has implemented the "one-window acceptance" of real estate transaction registration, and established a "big operation and maintenance" mechanism during the levy period. The tax department of Hubei Province provides parallel services together with other departments; Hunan Province has established a regular monitoring and evaluation mechanism for the quality and effectiveness of collection and management, and regularly evaluates the supervision work; Jiangxi Province has established "internet plus Supervision" to build a joint system by using Internet technology. Anhui Province carries out risk management by the working principle of "Zhakou Management". In the implementation of tax reduction and fee reduction work, the tax department of Shanxi Province actively linked with other departments to provide full coverage in publicity, counseling, and implementation; Henan Province uses the data of tax reduction and fee reduction to construct an accounting analysis system; Hubei Province has made great efforts to solve the problems in the whole process; Hunan Province embeds a monitoring model in the third phase of the golden tax system to make a horizontal and vertical comparative analysis of the data; the implementation of the policy in Jiangxi Province is based on grid counseling, and the implementation of the work of household insurance is guaranteed. Anhui Province has promoted the organizational system in terms of improving the working mechanism and providing classified and graded insurance services.

In the actual work of tax collection and management,

Table 2 Malmquist Index of Tax Administration Efficiency of Six Provinces in Central China from 2018 to 2019 and Its Decomposition

province	Changes in scale efficiency (SEC)	Scale Technology Change (STC)	Changes in pure technical efficiency (PEC)	Pure Technology Change (PTC)	Changes in Malmquist Index (MI)
Shanxi(Province)	1.000	1.064	1.000	1.000	1.064
Henan(Province)	1.000	0.927	1.000	1.000	0.927
Hubei(Province)	0.930	0.783	0.981	0.948	0.729
Hunan(Province)	1.399	0.993	1.325	1.056	1.388
Jiangxi(Province)	0.793	0.868	1.000	0.793	0.688
Anhui(Province)	1.315	0.904	1.256	1.047	1.188
mean value	1.052	0.919	1.085	0.970	0.967

5. Analysis of the Difference of Tax Collection Efficiency of Local Governments under Different Financial Pressures

Analysis of Figure 1 shows that the data of fiscal pressure show that the fiscal pressure faced by each province is also different. According to the calculation formula of fiscal pressure, the ratio of a fiscal gap to fiscal revenue, which is greater than 1, indicates that the fiscal gap is large, the local fiscal gap is more than double the fiscal revenue, and less than 1 indicates that the ratio of a fiscal gap to fiscal revenue is less than 100% [12]. According to Figure 1, the financial pressure in Shanxi is less than 1, and the financial pressure increased in 2019. The financial pressure in Hunan is the biggest, close to 1.8, indicating that the gap between Hunan's financial gap and its existing financial revenue

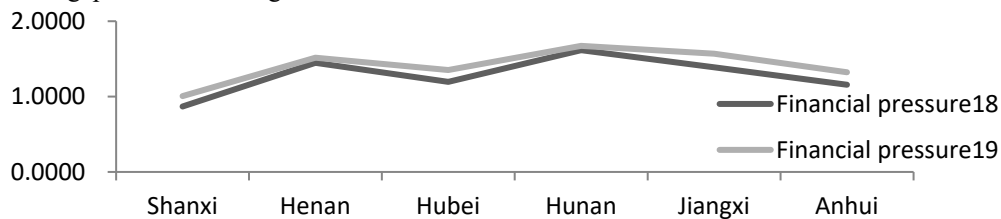


Figure 1 Fiscal pressure of six provinces in 2018 and 2019

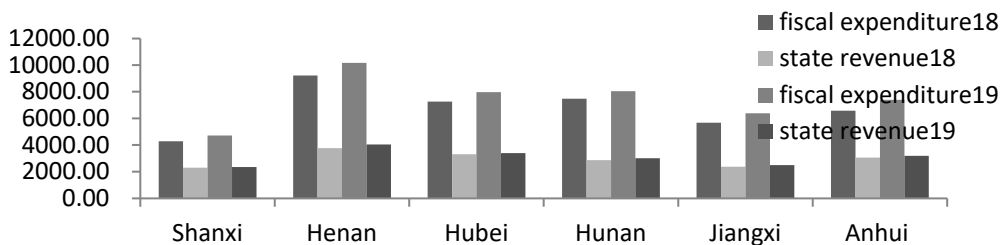


Figure 2 Financial Gap of Six Provinces in 2018 and 2019 (Billion Yuan)

6. Conclusions and Recommendations

First, develop a scientific collection and management system, improve the efficiency of collection and management technology. Considering the actual development of the local economy, the taxation task should be formulated to avoid one-size-fits-all taxation. Under the background of the introduction of the new budget law, the local government's budget combines with the objective tax plan to make the tax revenue and the economy grow simultaneously. And take measures to further improve the quality and efficiency of tax collection and administration, and closely monitor the tax sources of key taxes. Based on the analysis of the efficiency of tax collection and management in the six provinces in the central region, Hubei and Jiangxi provinces should improve the efficiency of the input of tax collection and management

is very large, and Hunan Province is more dependent on central transfer payments.

Combined with Figure 2, the fiscal expenditure of each province has increased, and the growth of fiscal revenue has not changed much. Leading to a further widening of the fiscal gap. Through the analysis of Figure 2, we know that the six provinces in the central region are facing different financial pressures and financial gaps. Using the financial gap pressure coefficient to measure the impact factors is necessary to screen and remove the impact, so the six provinces are not visually comparable. This paper compares the tax collection and administration efforts made by the six provinces in the face of different economic conditions and different financial gaps.

resources, and establish a scientific tax collection and management system to effectively improve the overall efficiency of tax collection and management.

Second, standardize tax collection and management and improve the level of technology application. It is necessary to clarify the right boundary of the tax authorities and strengthen the standardization and consistency of tax collection and administration [13]. Based on the analysis of collection and management efficiency of six provinces in central China, the level of collection and management technology application in Hubei Province has decreased. It is necessary to enhance the technical popularization rate of the departments and further emphasize the standardization of tax collection and management. In the process of performing official duties, the tax authorities will give preference to administrative practices rather than written laws due to the principle of preferential application.

Although administrative practices have experience and reference value for novice tax collectors, when applied to the ever-changing economic background and the ever-changing background of tax collection and management methods, the traditional practices are no longer applicable and may even hinder the positive effect of tax collection on other factors.

Third, strengthen the analysis and integration of tax data. Based on the analysis of the collection efficiency of the six provinces in the central region, the technological retrogression of Jiangxi Province and Hubei Province is obvious, and when the three provinces of Hubei, Hunan, and Anhui are facing a relatively consistent financial gap (Figure 2), the tax collection efficiency of Hubei Province has a technological retrogression, with obvious comparison. Therefore, Hubei Province should continue to invest in improving the data integration and technology collection of tax authorities. On the whole, on the one hand, the tax department uses the powerful data operation function of the data-based tax management platform to conduct overall analysis, based on the analysis results, allocates the tax management task flow for the relevant tax management responsibilities of each department, and implements the final data-based tax management work. If we can analyze the tax situation and economic changes in some areas, we can better control and forecast the tax trend; the forecast of tax work, so that the local national tax administration can make a forecast of the next tax scale.

Fourth, increase the training of digital tax talents and promote smart tax. In terms of upgrading scale and technology, manpower is an important part. The key to developing the digital economy is to train digital talents. Through the construction of a diversified digital tax talent training system, grasp the opportunity of digital tax transformation. On the government side, the relevant authorities should strengthen the resources supply for digital finance and taxation personnel training based on the latest development trend of the digital economy^[14]. At the same time, the government departments in charge of education, finance, and taxation should strengthen the dialogue. Under the new scientific and technological revolution, our country should stick to the new requirements of digital tax administration to optimize the value-added tax system and enrich the modern tax administration system and practice.

With the content of tax-related data becoming complex and diverse, tax authorities need to use big data thinking to integrate and summarize tax big data, to improve the level of tax risk management in China. Under the background of big data technology, the tax collection and management model will move towards intelligence and efficiency and will be more fair and accurate.

7. Limitation

In this paper, the DEA method is selected to analyze the input and output of tax collection and management. The innovation lies in the discussion combined with the financial pressure faced by the research provinces, and the discussion combined with "financial pressure" and "tax collection and management". However, the lack of data in this paper is not convincing, which makes the analysis only on the six provinces in the central region from 2018 to 2019.

Acknowledgment

This paper is supported by the scientific research and innovation projects Funds for Heilongjiang universities (No. YJSCX2021-713HSD).

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