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An empirical study on the influencing factors of tax revenue in Beijing----Based on 2000-2015 data

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Abstract: *Using the factor analysis method, Taking 2000 as the sub point of the analysis, and using the data of Beijing from 2000 to 2015, this paper makes an empirical analysis on the influencing factors of tax income in Beijing. The analysis conclusion is that the increase of per capita net income of rural households in Beijing can better improve the level of tax income in Beijing than the increase of per capita disposable income of urban households;The impact of RMB exchange rate on tax revenue is uncertain.The proportion of GDP of the primary industry in Beijing is negatively correlated with the level of tax revenue, and the proportion of GDP of the secondary and tertiary industries is positively correlated with the level of tax revenue; The efficiency of administrative expenditure in Beijing is high, but the efforts of government tax revenue are weakened to a certain extent.*

Keywords: *Taxes, Influencing factors, Factor regression*

1. Introduction

From 2000 to 2015, Beijing's tax revenue increased by 11.43 times, but the total GDP of Beijing increased by 9.27 times in the same period. The increase of Beijing' s GDP is 1.23 times that of tax revenue.

As we all know, tax revenue is the main component of government revenue, so the quality of tax management, on the one hand, affects the quality and level of people's daily life, on the other hand, it also affects the government's income level and the supply capacity of public goods.Therefore, the research on different factors affecting Beijing tax revenue is conducive to clarify the different factors affecting Beijing tax revenue level and their influence degree, and provide theoretical basis and decision-making reference for Beijing Municipal Government's tax system reform and how to optimize tax management.

2. Literature review

After consulting many articles and research literature on the research of tax influencing factors, it is found that among the research literature of many scholars, some scholars adopt the method of theoretical review, while many mathematicians use the amplification of empirical research, and among many empirical research verification and analysis methods, the multiple linear regression method is the most used and used.Huang Yijie and Zhu Jie (2015) selected the relevant data from 1978 to 2013, added the factors of tax system reform to their analysis framework, and established a breakpoint regression model to empirically analyze the factors affecting China's tax revenue.

In the analysis of the influencing factors of tax revenue by using multiple regression model, some scholars have systematically studied the factors affecting tax revenue by using the method of factor regression analysis and literature review. Chen Shiyuan (2017) believes that multiple taxes in the current tax system have full progressive tax rate effect, which leads to the tax trap problem that the increase of tax burden is greater than the increase of income in the process of collection, payment and reporting.Yang Deqian (2014) applied factor analysis and principal component regression analysis to deeply analyze the linkage effect of various factors and indicators affecting China's tax revenue from the two levels of China's tax revenue scale and tax structure.

To sum up, we can find that the factors affecting tax revenue will change according to different regions, different times and policies.Therefore, regardless of the national analysis of factors affecting tax, the results and conclusions are exactly the same. Therefore, the analysis of tax impact considers different

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regions and different time periods, so as to make the analysis conclusions targeted and operable, which is also the research value of this article.

3. Research design and data selection

(1) Research design

Drawing on the research results of previous scholars and fully considering the measurability and availability of variable factors involved in the factors affecting tax revenue, this paper mainly divides the factors affecting tax revenue into three parts: economic factors, Government factors and macro factors, as well as their per capita income, opening level and industrial structure,There are 6 secondary indicators such as government efficiency, human life currency exchange rate and interest rate level, and 10 tertiary indicators are subdivided. The impact indicators involved are shown in Table 1 below.

Table 1: Influencing factors and indicators of tax revenue

Primary index	Secondary index	Tertiary indicators
economic factors	Per capita income (yuan)	Per capita disposable income of urban residents (x1)
		Per capita disposable income of rural residents (x2)
	Degree of openness	Import and export trade volume / GDP (x3)
	industrial structure	Primary industry / GDP (x4)
		Secondary industry / GDP (x5)
		Tertiary industry / GDP (x6)
Government factors	Government efficiency	Administrative income / financial expenditure (X7)
		Non tax income / fiscal expenditure (x8)
Macro factors	RMB rate	E(X9)
	Interest rate level (%)	F(X10)

The per capita income index is used to measure the economic development level of a region and the tax burden borne by taxpayers in the region.It can be considered that the per capita income level is positively correlated with the tax income level of the country or region.

The openness index mainly considers the openness of the region's foreign trade. Therefore, the openness of the region can be expressed by the share of local import and export trade in GDP.In general, the higher the degree of opening to the outside world and the greater the volume of import and export trade, the more taxes levied by import and export tariffs, indicating that the more tax revenue in the region.

The impact of industrial structure on tax revenue is embodied in the contribution of various industries to tax revenue.Generally speaking, the proportion of agriculture, forestry, animal husbandry and fishery in GDP of the primary industry has a negative correlation with the level of tax revenue, and the respective proportion of the secondary industry and the tertiary industry in GDP has a positive correlation with the level of tax revenue. Of course, sometimes there are differences due to different regions.

The impact of government administrative expenditure on tax revenue is used to measure the efficiency of government expenditure. The positive effect of administrative expenditure on tax revenue means that the government administrative efficiency is high.The larger the proportion of non tax revenue, the easier it is to obtain this part of revenue source, and the degree of government tax effort will be reduced, which will affect the change of tax revenue level.

The changes of macro indicators are mainly reflected in the impact of RMB exchange rate and interest rate on the level of economic development, and then on the level of tax revenue. RMB exchange rate affects the level of tax revenue by acting on import and export factors.The level of interest rate will affect the interest income, and then affect residents' savings, consumption and investment to affect the change of tax income level.

(2) Data selection

The sample data in this paper is the indicator variable data affecting tax revenue in Beijing from 2000 to 2015. At the same time, the secondary indicators are quantified by three-level indicators. The two tertiary indicators of per capita disposable income (x1) of urban households and per capita net income (x2) of rural households in Beijing represent the per capita income level of Beijing;Beijing's opening to the outside world is expressed by Beijing's import and export trade volume / GDP

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(x3);The industrial structure of Beijing is measured by three tertiary indicators: primary industry / GDP (x4), secondary industry / GDP (x5) and tertiary industry / GDP (x6);The efficiency of Beijing municipal government is measured by two three-level indicators: administrative expenditure / fiscal expenditure (X7) and non tax revenue / fiscal expenditure (x8);The macro factors are measured by two three-level indicators: RMB exchange rate e (x9) and interest rate level R (X10).

The data used in this paper are mainly from the statistical yearbook of Beijing from 2000 to 2015. The data of RMB exchange rate and interest rate are from the National Bureau of statistics and the financial information network.

4. Empirical analysis

(1) Detection of influencing factors of tax revenue in Beijing from 2000 to 2015

1) Kmo and bartleet test results

Table 2: Kmo and Bartlett test

Kmo sampling suitability quantity.		.637
Bartlett sphericity test	Approximate chi square	199.879
	freedom	45
	Significance	0.000

From the kmo and bartleet tests, the kmo value is 0.637, greater than 0.5, and the approximate chi square value of bartleet's sphericity test is 199.879, SIG < 0.01, indicating that the selected variables are highly correlated, so it is appropriate to use factor analysis for research.

2) Variance decomposition analysis

Table 3: Interpretation of total variance (principal component analysis)

component	Initial eigenvalue			Extract the sum of squares of the loads			Sum of squares of rotating loads		
	total	Percentage variance	Cumulative %	total	Percentage variance	Cumulative %	total	Percentage variance	Cumulative %
1	6.132	61.317	61.317	6.132	61.317	61.317	5.230	52.300	52.300
2	1.772	17.721	79.037	1.772	17.721	79.037	2.566	25.664	77.964
3	0.977	9.774	88.812	0.977	9.774	88.812	1.085	10.847	88.812
4	0.539	5.395	94.207						
5	0.308	3.077	97.283						
6	0.151	1.514	98.797						
7	0.072	0.724	99.521						
8	0.039	0.388	99.909						
9	0.007	0.074	99.982						
10	0.002	0.018	100.000						

3) Principal component score analysis

Table 4: Component score coefficient matrix

Factor score coefficient	Principal component factor selected after orthogonal rotation		
	Factor F1	Factor F2	Factor F3
X_1	0.229	-0.165	0.097
X_2	0.213	-0.134	0.126
X_3	-0.171	0.408	0.212
X_4	-0.132	-0.124	0.214
X_5	-0.179	-0.020	0.099
X_6	-0.037	-0.059	0.895
X_7	-0.014	0.356	-0.150
X_8	0.187	-0.022	-0.111
X_9	-0.173	0.047	-0.145
X_{10}	-0.059	0.388	-0.097

According to the principal component score coefficient matrix in Table 4, the principal component factor score expression is as follows:

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$$\begin{cases} F1 = 0.229X1 + 0.213X2 + \ldots\ldots - 0.059X10 \\ F2 = -0.165X1 - 0.134X2 + \ldots\ldots + 0.388X10 \\ F3 = 0.097X1 = 0.126X2 + \ldots\ldots - 0.097X10 \end{cases}$$

Finally, the scores of each factor are calculated. Taking factors F1, F2 and F3 as explanatory variables and tax revenue y from 2000 to 2015 as explanatory variables, the factor regression model is as follows: $Y_1 = C + \beta_1 F_1 + \beta_2 F_2 + \beta_3 F_3 + u_i$

5. Conclusion and Suggestions

From the level of per capita income and openness, the level of tax revenue in Beijing is positively correlated with the per capita disposable income of urban households, the per capita net income of rural households and the proportion of import and export trade in GDP, and the positive effect of import and export trade on tax revenue is the highest during this period.

From the perspective of industrial structure, the increase of the proportion of the primary industry in GDP in Beijing will have a negative impact on the increase of tax revenue, that is, a negative effect, and the increase of the proportion of the secondary and tertiary industries in GDP will have a positive impact on the increase of tax revenue, that is, a positive effect.This shows that in terms of industrial structure, increasing the proportion of secondary and tertiary industries in GDP will have a great positive effect on the increase of tax revenue.From the current situation, Beijing's tax revenue mainly comes from the contribution of the tertiary industry.

From the perspective of government expenditure structure, the increase of government administrative expenditure will promote tax collection and management and increase tax revenue, but the increase of non tax revenue reduces the improvement of the government's efforts to tax revenue, resulting in the decrease of tax revenue.

From the perspective of macro factors, the RMB exchange rate has a negative effect on tax revenue, and the interest rate level has a positive effect on tax revenue.On the whole, the impact of RMB exchange rate on taxation is mainly reflected in China's relaxation of the control of RMB exchange rate and the implementation of a managed floating exchange rate system. The change of RMB exchange rate generation mechanism will undoubtedly have an important impact on the volume of import and export trade.At the same time, the increase of interest rate level will increase savings and increase residents' interest income, so as to drive the increase of tax revenue.

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