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Measurement and Analysis of the Stability of Local Fiscal Revenue

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Abstract**—** *The stability of fiscal revenue, so called the fluctuation of fiscal revenue, refers to the fluctuation degree of local government's actual fiscal revenue deviating from the expected fiscal revenue. As the main way of funds for local governments to perform public service functions, fiscal revenue is an important starting point for local governments to regulate and participate in economic activities. The drastic fluctuation of fiscal revenue will interfere with the government's economic functions, reduce the quantity and quality of public services, and produce inefficient government activities. The economic and social activities carried out by governments at all levels in practice are numerous and complicated, which can be classified according to different purposes and perspectives. However, no matter which classification method is adopted, stable financial revenue is the core guarantee of government economic activities, which is in the position of "leading the development and affecting the whole body". Based on the combination variance method of white (1983), this paper constructs the stability index of local fiscal revenue, and measures the stability of fiscal revenue of all provinces in China, and interprets and analyzes the measurement results through the theoretical method of economics. It is found that there are significant regional differences in the fluctuation of local fiscal revenue in China. By comparing the changes of fiscal revenue fluctuation index in 2000, 2009 and 2018, the fluctuation index of fiscal revenue shows obvious regional differences. The fluctuation degree of the economically developed eastern coastal area is lower than that of the underdeveloped central and Western Region, and the southern region with lower economic activity is significantly lower than that of the north. On the other hand, the external shocks such as "replacing business tax with value-added tax" and financial crisis also have a positive impact on local tax fluctuations. Through the analysis of the experimental results, it is found that good economic foundation, capital accumulation, industrial structure and geographical location have a great impact on financial stability. Therefore, the government should pay attention to the gap between the stability of fiscal revenue in different regions, actively improve the economic foundation of the poor stability of the central and western regions, formulate differentiated economic and financial policies, vigorously develop the secondary and tertiary industries, and improve the stability of fiscal revenue to cope with regional economic risks and improve the administrative efficiency of the government.*

Keywords**— financial revenue stability regional differences.**

I. INTRODUCTION

The stability of fiscal revenue, also known as fiscal revenue fluctuation, refers to the degree to which the actual fiscal revenue of local governments deviates from expected fiscal revenue. Since the reform and opening up, China has established the development goal of focusing on

economic construction, the socialist market economy system has gradually been established and improved, and local governments, as an important carrier serving regional economic development, play an important role in macroeconomic regulation and control of the regional economic operation, economic policy formulation and implementation, and so on. Xi Jinping in the Central Political Bureau of the collective study has pointed out that the current relationship between the government and the market is the core issue of China's economic system reform, the use of dialectics and the two-point theory of scientific approach to the role of the market and the role of government. The "invisible hand" and the "visible hand" should be used to make the market play a decisive role in the allocation of resources and better play the role of the government of the two organic unity. Fiscal revenue plays an important role in regional economic development because it provides an important financial guarantee for local governments to carry out their economic functions. On the one hand, stable fiscal revenue is a necessary prerequisite for stable fiscal expenditures and determines the continuity and consistency of local governments' economic behavior; on the other hand, stable fiscal revenue is an important grasp for local governments to deal with regional debt risks and ensure government solvency. As a result, the stability of fiscal revenue and its impact on the economic behavior of local governments is receiving increasing attention.

Based on White's (1983) combined variance method, this paper constructs local revenue stability indicators and measures the fiscal revenue stability of each province, municipality, and autonomous region in China, and then explains and analyzes the measurement results using theoretical economic methods to provide policy recommendations for the next step of government to improve fiscal revenue stability.

The remaining section is organized as follows: the second part is a literature review section, which focuses on reviewing relevant research results on fiscal revenue stability at home and abroad, identifying flaws in existing research methods in the literature, particularly in research related to the measurement of fiscal revenue stability, and determining the most appropriate measurement method for China's national conditions by comparing. Part III designs a mathematical model for measuring the stability of local revenues based on the conclusions drawn from the literature review in Part II, and derives the corresponding measurement results. The fourth part is an economic analysis based on the measured quantitative results, which seeks to find a reasonable economic theoretical support based on the experimental results. The fifth part is to obtain corresponding conclusions based on mathematical and theoretical calculations, and to give relevant policy recommendations based on the conclusions.

II. LITERATURE REVIEW

Fiscal revenue stability is an important research topic in the macroeconomic field that has received attention in both theoretical and practical circles, and several publications have emphasized the significance of fiscal stability research. Ramey (1995) used cross-sectional data for 92 countries from 1960 to 1985 to examine the relationship between fluctuations in fiscal behavior and economic growth and discovered a negative correlation. Badinger (2009), on the other hand, examines the relationship between the volatility of fiscal behavior and the volatility of macroeconomic variables using panel data for 20 countries from 1967 to 2001 and finds a positive correlation between the volatility of fiscal behavior and the volatility of economic output, but not between the volatility of fiscal behavior and the volatility of inflation. Afonso and Furceri (2010) examine the relationship between the size and volatility of fiscal balances and economic growth using cross-sectional data for OECD and EU countries from 1970 to 2004. They find a negative relationship between the size and volatility of indirect taxes and economic growth, as well as a similar negative relationship between the size and volatility of fiscal spending and economic growth. Later, Afonso and Jalles (2012) examine the impact of fiscal stability and financial crises on economic growth using panel data for OECD countries and developing countries from 1970 to 2008, respectively, and find a negative correlation between fiscal spending volatility and economic growth. Fatas and Mihov (2013) examine the relationship between policy stability and economic growth using cross-sectional data for 91 countries from 1960 to 2000. They find that policy stability variables better explain economic growth than

level variables and that policy fluctuation, such as inflation and government spending fluctuations, have a negative relationship with long-run economic growth. In terms of domestic research, Chinese scholars have emphasized the importance of stability studies. For example, Yu Yongding (2000) and Wang Guosong (2004) introduced the concept of financial stability earlier, but their studies focused on the impact of stable fiscal policies on financial markets. Jia Junxue (2012), on the other hand, investigates the significance of tax policy rules in China from 1992 to 2009 and discovers that the policy regularity of tax revenue size changes helps stabilize the inflation rate and output gap, effectively enhancing the stability of economic output, while Fang Hongsheng and Zhang Jun (2010), An Yuan and Wang Jun (2012), Li Ming and Mao Jie (2014), Zhou Bo (2014), and Zhang, J., and Pang, R. (2018) reach similar conclusions. Zeilin Huang and Baohua Zhu (2015) examine the relationship between government revenue and expenditure shocks and economic volatility using a DSGE model and find that the relationship between tax shocks and economic volatility is not significant. Wang, Liyong, and Ji Yao (2019) use a model to identify government spending volatility shocks and tax volatility shocks based on quarterly data for China from 2003 to 2017. They find, first, that fiscal volatility in China has increased significantly since the financial crisis; and, second, that there is a negative relationship between both government spending volatility shocks and total economic output.

Most of the existing literature on the measurement of revenue stability of local revenues uses elasticity indicators or growth indicators to measure the variation of local revenues, and few studies use the variance method (Wilford, 1965; Williams, 1973; Sobel and Holcombe, 1996; Dye and Merriman, 2004; Liu, Jinquan and Liu, 2005; Dong, Jin, 2006; Du, Ting, 2007; Huang, Zeilin and Zhu, Baohua, 2009; Kong, Liu-Liu and Xie, Qiao-Xin, 2009). However, in comparison to tax fluctuations, elasticity and growth indicators show more revenue growth, whereas the variance method shows the degree of revenue fluctuations better. Moreover, the majority of domestic and foreign literature that uses the variance method to measure volatility indicators uses rolling standard deviation measures (Fuzian Fang and Wei Xing, 2017; Xiaolong Wang and Long Yu, 2018; Jing Guo and Guangrong Ma, 2019). Not only is this approach highly divergent and arbitrary in terms of the rolling window period's interval span and interval structure, but the rolling standard deviation indicator can only measure the overall fluctuations of a particular variable, ignoring the intrinsic linkages between various types of output or income within the structure of economic variables. For example, the intrinsic linkage between various categories within the local fiscal structure is neglected, and the fluctuations in fiscal revenues triggered by changes in the local fiscal structure cannot be effectively identified, and the stability of local fiscal revenues cannot be better measured. As a result, White (1983) improved the variance indicator of fiscal fluctuations and proposed the concept of the Portfolio Variance method (Portfolio Variance), which takes into account the residuals of the modified individual categories and their covariances and is capable of accurately measuring the local revenue triggered by the interaction of structural changes in fiscal revenue and economic base fluctuations vola.

Although many scholars at home and abroad have studied the relationship between fiscal revenue stability and economic growth, existing studies on the measurement of fiscal revenue stability are mostly focused on general statistical measurement methods, lacking systematic and standardized mathematical measurement models, and few scholars have measured the fiscal revenue of different provinces in China. As a result, it is necessary to develop scientific and reasonable local revenue indicators to accurately depict the stability of local revenue. Based on White's (1983) "combined variance method," this paper develops a method to measure the fluctuation indicators of local fiscal revenues, then measures the stability indicators of local fiscal revenues in different provinces in China, and makes policy recommendations to increase fiscal revenue stability based on the results of the indicators. The findings are used to make policy recommendations to improve fiscal revenue stability, filling a gap in the existing literature on the empirical study of measuring the stability of local fiscal revenues in China.

III. MEASURES OF FISCAL REVENUE STABILITY AND RESULTS

1. The measure of fiscal revenue stability

White's (1983) combination variance method is used to build local revenue volatility indicators, and it is an important foundation for empirically testing the stability of local revenue and its economic effects in China. To measure local revenue volatility indicators, the combination variance method is used, which is divided into three steps: the first step is to propose the fiscal revenue classification method; the second step is to measure the unit standard deviation of each type of revenue within the fiscal revenue portfolio, and the third step is to measure the fiscal revenue volatility indicators of the fiscal revenue portfolio.

Classification method of financial revenue

The corresponding classification methods are proposed to provide the necessary data classification criteria for the portfolio variance method based on the elasticity, structure, and intrinsic linkage of each subject within the fiscal revenue portfolio. In academia, there are currently more classification methods for fiscal revenues. Fiscal revenue, for example, can be divided into government public finance revenue and state-owned assets operating revenue based on the method of obtaining revenue; or fiscal revenue can be divided into recurrent revenue and temporary revenue based on the stability of obtaining revenue. Fiscal revenue can also be divided into central and local fiscal revenue based on revenue management authority; or revenue from the state-owned economy, collective economy, and various non-state-owned economies based on economic composition; or revenue from agriculture, industry, transportation, and commercial services based on economic sectors. Officially, China's local government revenues are divided into six categories: tax revenues, social insurance fund revenues, non-tax revenues, loan transfer recovery principal revenues, debt revenues, and transfer revenues. The article follows the Ministry of Finance's classification method for mathematical calculation in data collection to facilitate data collection and statistics.

Measurement of the standard deviation within the portfolio

Measuring the standard deviation of individual fiscal revenue portfolio units: The unit standard deviation of a single category's revenue within the fiscal revenue portfolio can be used to reflect the degree of fluctuation in the category's actual deviation from its expected fitted value. Assuming REV_{it} is the actual revenue of category I in period t, $\widehat{REV_{it}}$ is the expected revenue fit of category I in period t, $\overline{REV_i}$ is the mean of the revenue of category I from period 1 to period m, and m is the number of periods in the sample time span, σ_i,the unit standard deviation of revenue of category I from period 1 to period m can be defined as equation (1):

$$\sigma_i = \sqrt{\frac{\sum_{t=1}^{m}\left[\frac{REV_{it}-\widehat{REV_{it}}}{\overline{REV_i}}\right]^2}{m-1}} \quad (1)$$

In this regard, to measure the expected fitted value $\widehat{REV_{it}}$ of the fiscal revenue of tax category I in period t, assuming that there is no particularly significant change in the tax rate or tax base of each tax category during the sample interval, the Trend Regression method can be used to measure the expected fitted value $\widehat{REV_{it}}$, as shown in equation (2) shows that:

$$ln\, REV_{it} = a + b \cdot t + e_{it} \quad (2)$$

where REV_{it} is the fiscal revenue of category I in period t, t is the time variable indicating the year, a and b are the corresponding regression coefficients, and e_{it} is the random error term of the model. Thus, by using the regression coefficient b, $\widehat{REV_{it}}$ can be estimated. The unit standard deviation σ_i can be estimated by substituting $\widehat{REV_{it}}$ and other relevant data into equation (1) to obtain the difference between the actual and

expected fiscal revenues.

Measures of fiscal revenue volatility indicators

Measuring revenue volatility indicators of the revenue portfolio: Considering that the unit standard deviation σ_i only reflects the revenue volatility of a single category I, to accurately measure the volatility indicators of the revenue portfolio containing multiple categories, it is necessary to consider not only the unit standard deviation σ_i of the fiscal revenue of a single category I but also the covariance σ_{ij} between a single category i and any category j within the revenue portfolio. According to the definition of covariance, $\sigma_{ij} = \rho_{ij} \cdot \sigma_i \cdot \sigma_j \sigma_{ij} = \rho_{ij} \cdot \sigma_i \cdot \sigma_j$, where ρ_{ij} is the correlation coefficient between category i and category j, therefore, given a combination of n fiscal revenue categories, the Revenue Volatility Fluctuation (RV) indicator RV_t of the fiscal revenue portfolio of a region in period t can be defined as in equation (3):

$$RV_t = Revenue\ Volatility_t = \sigma_t^2 = \sum_{i=1}^{n}\sum_{j=1}^{n} REV_i \cdot REV_j \cdot \rho_{ij} \cdot \sigma_i \cdot \sigma_j \quad (3)$$

Where REV_i and REV_j are the revenue levels of fiscal revenue category I and fiscal revenue category j, respectively, and σ_i and σ_j are the unit standard deviations of category I and category j, respectively. A higher value of RV_t means a greater degree of local revenue volatility, i.e., a weaker stability of local revenue.

When elasticity indicators, growth indicators, and variance indicators for local revenue fluctuations are compared, it is discovered that the combined variance method measures local revenue fluctuation indicators scientifically and reasonably by taking into account the intrinsic linkage between each revenue category, and is suitable for application to the study of local revenue stability in China. As a consequence, to measure China's local revenue volatility using the combined variance method, the unit standard deviation of each revenue category and the corresponding Chinese local revenue volatility indicator RV_t must be measured using the revenue structure's prescribed classification method.

It should be noted that, considering that the revenue data of different revenue categories used in this paper are in "tens of billions of yuan", then, according to the calculation process of equations (1)-(3), the final unit of the revenue fluctuation indicator will be "tens of billions of yuan squared ". The unit of "tens of billions of yuan" is used to present the measurement results more clearly, and different units do not affect the change of relative fiscal revenue fluctuations (White, 1983; Yan, 2012; He, Yang, and Wang, Wei, 2017), therefore, there is no need to worry about the choice of units, and it is feasible to choose the unit of "tens of billions of yuan" for fiscal revenue data.

2. results of the measure of fiscal revenue stability

Using White's (1983) combined variance method and sample data from 30 Chinese provinces (except Tibet) from 2000 to 2018, we can calculate the fiscal revenue volatility indicator RV for each province in China. Table 1-1 displays the results of measuring the fiscal revenue volatility indicator RV for 30 Chinese provinces from 2000 to 2018, revealing significant geographical differences

Table 1-1 Fiscal revenue volatility indicators for Chinese provinces: 2000-2018.

Unit: tens of billions of dollars squared

RV	2000	2003	2006	2009	2012	2015	2018
Xinjiang	1.14	3.02	9.73	31.83	87.92	160.81	219.46
Ningxia	0.42	0.88	3.6	13.47	47.4	102.36	106.81
Qinghai	0.61	1.19	3.7	13.47	51.63	82.37	160.02
Gansu	0.39	0.77	3.82	13.03	42.95	51.49	128.60

Shaanxi	0.38	0.63	3.71	20.44	80.61	128.56	133.14
Yunnan	1.1	2.14	6.89	31.44	145.28	54.23	78.01
Guizhou	0.46	0.9	1.64	7.72	41.06	51.85	56.65
Sichuan	0.8	1.18	2.53	6.85	25.65	30.62	42.07
Chongqing	0.87	2.72	7.84	20.4	42.93	86.5	142.08
Hainan	2.06	6.62	26.34	99.57	318.6	608.16	708.39
Guangxi	0.71	2.98	9.08	28.2	75.4	125.99	222.29
Guangdong	0.71	1.01	2.95	12.98	58.99	114.42	179.55
Hunan	0.61	1.05	3.39	11.6	42.71	80.15	115.32
Hubei	0.42	0.81	2.29	11	60.11	142.06	185.40
Henan	0.9	2.13	8.24	25.8	75.72	151.51	193.02
Shandong	0.52	0.99	3.24	11.98	40.79	88.05	148.92
Jiangxi	0.66	1.02	2.69	9.38	46.63	121.81	189.67
Fujian	0.52	1.14	3.1	10.57	45.85	93.94	169.44
Anhui	1.33	2.9	8.05	24.49	66.45	139.31	234.07
Zhejiang	0.51	0.98	2.11	8.44	32.73	61.51	73.98
Jiangsu	0.15	0.24	0.62	3.41	19.72	41.91	67.45
Shanghai	0.33	0.77	2.6	11.11	66.57	157.47	217.94
Heilongjiang	0.78	1.35	4.47	17.47	75.29	133.86	196.42
Jilin	0.34	0.6	1.72	7.06	38.17	117.54	151.33
Liaoning	0.71	1.02	2.21	9.53	40.07	51.27	74.09
Inner Mongolia	0.44	0.86	3.04	12.33	62.27	87.69	172.92
Shanxi	0.24	0.45	1.02	2.75	10.94	25.66	37.42
Hebei	0.03	0.07	0.2	0.9	3.93	7.81	7.86
Tianjin	0.05	0.1	0.33	1.37	7.24	11.35	15.58
Beijing	0.32	0.62	1.69	5.88	34.28	58.13	97.73

Tables 1-2 present the rankings of RV measures of fiscal revenue volatility indicators for 30 Chinese provinces in 2000, 2009, and 2018. On the one hand, comparing the degree of change in the ranking of fiscal revenue volatility indicators in different provinces between 2009 and 2000, while accounting for the shock of the 2008 financial crisis, can reflect the impact of shocks such as the financial crisis on the stability of local fiscal revenue. On the other hand, considering the pilot reform of "camp conversion" by region and industry from 2012 to 2016, comparing the degree of change in the ranking of fiscal revenue fluctuation indicators in 2018 and 2009 in different provinces can reflect the impact of "camp conversion" as a representative of the impact of tax structure change on the stability of local fiscal revenue.

Table 1-2 Ranking of fiscal revenue volatility indicators for Chinese provinces: 2000-2018

Unit: tens of billions of dollars squared

RV	2000	2000 Ranking	2009	2009 Ranking	2018	2018 Ranking
Hainan	2.06	1	99.57	1	708.39	1
Anhui	1.33	2	24.49	6	234.07	2
Guangxi	0.71	11	28.20	4	222.29	3

Xinjiang	1.14	3	31.83	2	219.46	4
Shanghai	0.33	25	11.11	17	217.94	5
Heilongjiang	0.78	8	17.47	9	196.42	6
Henan	0.90	5	25.80	5	193.02	7
Jiangxi	0.66	12	9.38	21	189.67	8
Hubei	0.42	21	11.00	18	185.40	9
Guangdong	0.71	10	12.98	13	179.55	10
Inner Mongolia	0.44	19	12.33	14	172.92	11
Fujian	0.52	15	10.57	19	169.44	12
Qinghai	0.61	14	13.47	11	160.02	13
Jilin	0.34	24	7.06	24	151.33	14
Shandong	0.52	16	11.98	15	148.92	15
Chongqing	0.87	6	20.40	8	142.08	16
Shaanxi	0.38	23	20.44	7	133.14	17
Gansu	0.39	22	13.03	12	128.60	18
Hunan	0.61	13	11.60	16	115.32	19
Ningxia	0.42	20	13.47	10	106.81	20
Beijing	0.32	26	5.88	26	97.73	21
Yunnan	1.10	4	31.44	3	78.01	22
Liaoning	0.71	9	9.53	20	74.09	23
Zhejiang	0.51	17	8.44	22	73.98	24
Jiangsu	0.15	28	3.41	27	67.45	25
Guizhou	0.46	18	7.72	23	56.65	26
Sichuan	0.80	7	6.85	25	42.07	27
Shanxi	0.24	27	2.75	28	37.42	28
Tianjin	0.05	29	1.37	29	15.58	29
Hebei	0.03	30	0.90	30	7.86	30

As shown in Table 1-2, the top ten provinces of local fiscal revenue fluctuation indicators in 2000 were Hainan, Anhui, Xinjiang, Yunnan, Henan, Chongqing, Sichuan, Heilongjiang, Liaoning, and Guangdong in that order; the top ten provinces of local fiscal revenue fluctuation indicators in 2009 were Hainan, Xinjiang, Yunnan, Guangxi, Henan ， Xinjiang, Yunnan, Guangxi, Henan, Anhui, Shaanxi, Chongqing, Heilongjiang, and Ningxia in order; the top 10 provinces of local fiscal revenue fluctuation indicators in 2018 were Hainan, Anhui, Guangxi, Xinjiang, Shanghai, Heilongjiang, Henan, Jiangxi, Hubei, and Guangdong in order. It can be found that Hainan, Guangxi, Xinjiang, Anhui, Heilongjiang, Henan, Ningxia, and other local fiscal revenue fluctuation indicators have been in the top 10 for a long time, with Hainan being the highest. The rest of the fluctuation indicators are mostly concentrated in the central and western provinces, with Xinjiang, Guangxi, and other remote provinces fluctuating more. Hebei, Tianjin, Jiangsu, and other coastal provinces and municipalities directly under the Central Government fluctuate relatively little and are frequently at the bottom of the list.

Comparing the changes in the ranking of fiscal revenue volatility indicators of different provinces in 2009 and 2000, we can see that the impact of the financial crisis has significantly increased the ranking of fiscal revenue volatility indicators of Shaanxi and Ningxia, from 23rd and 20th to 7th and 10th.The ranking of fiscal revenue volatility indicators in Guangxi, Gansu and Inner Mongolia also increased to some extent, which means that

the financial crisis shock raised the fiscal revenue volatility in Shaanxi, Ningxia, Guangxi, Gansu and Inner Mongolia, thus reducing the stability of their fiscal revenues. On the contrary, the ranking of fiscal revenue volatility indicators in Sichuan and Liaoning show significant decreases, from 7th and 9th to 25th and 20th, respectively, and the ranking of fiscal revenue volatility indicators in Jiangxi also decreases to some extent, which implies that the financial crisis shock reduces the fiscal revenue volatility of Sichuan, Liaoning and Jiangxi, thus improving the stability of their fiscal revenues.

Considering the "camp reform" pilot reform by region and industry from 2012 to 2016, and comparing the changes in the ranking of fiscal revenue volatility indicators of different provinces in 2018 and 2009, we can see that the impact of the "camp reform" on Shanghai and Jiangxi's fiscal revenue volatility indicators is significant. Fiscal revenue volatility indicators have risen significantly in rank, from 17th and 21st to 7th and 8th, respectively. The ranking of fiscal revenue volatility indicators in Hubei, Fujian, and Jilin also increased to some extent, indicating that the structural change in fiscal revenue represented by the "camp reform" has increased fiscal revenue volatility in Shanghai, Jiangxi, Hubei, Fujian, and Jilin, reducing fiscal revenue stability. On the contrary, the ranking of fiscal revenue volatility indicators in Yunnan and Chongqing falls significantly, from third and eighth place to 22nd and 16th place, respectively, and the ranking of fiscal revenue volatility indicators in Ningxia and Shaanxi falls to a lesser extent, indicating that the structural change in fiscal revenue represented by the "camp reform" reduces fiscal revenue volatility in Yunnan, Chongqing, Ningxia, and Shaanxi. Thus increasing the stability of its fiscal revenues

By comparing changes in the ranking of fiscal revenue volatility indicators in China between 2000, 2009, and 2018, the typical fact of local fiscal revenue volatility in China is confirmed on the one hand, namely, the indicators of fiscal revenue volatility show significant geographical differences. The degree of volatility is higher in economically developed eastern coastal regions than in less developed central and western regions, and it is significantly higher in economically active southern regions than in northern regions, with the overall degree of volatility decreasing from east to west and south to north. On the other hand, by comparing the degree of fluctuation before and after external shocks, the "camp reform" and external shocks such as the financial crisis have the same positive impact on the fluctuation of local fiscal revenue.

IV. ANALYSIS OF MEASUREMENT RESULTS

Due to large disparities in the economic base, history and culture, natural endowment, and so on between different regions in China, particularly the rapid economic development of the eastern region at the beginning of reform and opening up, China has a large problem of unbalanced regional economic development, which has led to large differences in the basic situation of fiscal revenue in each region. Therefore, this chapter attempts to explain the regional differences in the fluctuations of local fiscal revenues in China through economic analysis and the underlying mechanisms of the impact of external shocks, such as the "camp reform" and the financial crisis, on the fluctuations of local fiscal revenues in different regions.

The role of factors of production in determining regional economic development is revealed by Neoclassical economic theory, with material capital, human capital, and the level of technology as measured by total factor productivity (TFP) determining the level of economic development of a region. According to Shu, Yuan, and Xu, Xianxiang (2002), China's economic growth model is primarily of the AK type, i.e., China's economic growth is primarily based on physical capital accumulation. Southern and eastern regions have a stronger economic base and more capital accumulation, which makes their fiscal revenues more stable and resilient to external shocks, whereas northern and western regions have less capital accumulation, owing to the recent decline in economic activity, causing the stability of local fiscal revenues to decline gradually from south to north and east to west.

The difference in economic structure also contributes to regional differences in fiscal revenue stability. Since the establishment of the Shenzhen Special Zone in 1979 to the identification of 14 coastal open cities in 1984 and the opening up of economic open zones in the eastern regions of the Yangtze River Delta, Pearl River Delta, Southeast Fujian, and the Bohai Rim in 1985, China's reform and opening up has not progressed neatly in the development

process. As a result, there are clear differences between regions in terms of industrial structure, level of nationalization, and level of marketization. Among these, the proportion of primary, secondary, and tertiary industries in GDP, as an important indicator for measuring the industrial structure of regional economies, can better reflect the significant differences in economic structure across China's regions.

Table 2 Industrial structure distribution of provincial governments

Ranking	Region	GDP（Billion）	Percentage of primary industry	Percentage of secondary industry	Percentage of tertiary industry
1	Guangdong	107671.07	4.04%	40.44%	55.51%
2	Jiangsu	99631.52	4.31%	44.43%	51.25%
3	Shandong	71067.50	7.20%	39.84%	52.96%
4	Zhejiang	62352.00	3.36%	42.61%	54.03%
5	Henan	54259.20	8.54%	43.51%	47.95%
6	Sichuan	46615.82	10.31%	37.25%	52.44%
7	Hubei	45828.31	8.31%	41.67%	50.01%
8	Fujian	42395.00	6.12%	48.55%	45.33%
9	Hunan	39752.12	9.17%	37.60%	53.23%
10	Shanghai	38155.32	0.27%	26.99%	72.74%
11	Anhui	37114.00	7.86%	41.44%	50.82%
12	Beijing	35371.30	0.32%	16.16%	83.52%
13	Hebei	35104.50	10.02%	38.73%	51.24%
14	Shaanxi	25793.17	7.72%	46.45%	45.83%
15	Liaoning	24909.50	8.74%	38.26%	52.99%
16	Jiangxi	24757.50	8.31%	44.19%	47.50%
17	Chongqing	23605.77	6.57%	40.23%	53.20%
18	Yunnan	23223.75	13.08%	34.28%	52.64%
19	Guangxi	21237.14	15.95%	33.33%	50.72%
20	Inner Mongolia	17212.50	10.82%	29.62%	49.56%
21	Shanxi	17026.68	4.84%	43.77%	51.38%
22	Guizhou	16769.34	13.60%	36.13%	50.27%
23	Tianjin	14104.28	1.31%	35.23%	63.45%
24	Heilongjiang	13612.70	23.38%	26.56%	50.06%
25	Xinjiang	13597.11	13.10%	35.27%	51.63%
26	Jilin	11726.80	10.98%	35.26%	53.76%
27	Gansu	8718.30	12.05%	32.83%	55.12%
28	Hainan	5308.94	20.35%	20.70%	58.95%
29	Ningxia	3748.48	7.47%	42.28%	50.26%
30	Qinghai	2965.95	10.18%	39.10%	50.72%

Data source: National Bureau of Statistics

According to data published by the National Bureau of Statistics and provincial and municipal statistical bureaus, provinces with poor fiscal stability, such as Hainan, Guangxi, Xinjiang, and Anhui, have a relatively

high share of primary industry and a relatively low share of secondary and tertiary industry, indicating that the economic structure represented by the industrial structure is an important factor in determining fiscal revenue stability.

Geographic location is also an important factor in determining fiscal revenue stability. Zhao, Ai-Feng (2014) discovered that the natural environment, transportation conditions, climatic conditions, and geopolitical conditions caused by geography are all important factors that affect the fiscal status of different regions of China in a study on the differentiation of fiscal revenues in different regions of China. China's topography is stepped from west to east, with highlands in the west and lowlands in the east. The western part is mountainous with complex topography, with sparse vegetation, mostly grassland Gobi, and a harsh natural environment, particularly in the northwestern provinces of Qinghai, Xinjiang, and Inner Mongolia. The eastern coastal region is characterized by plains and hills, as well as good transportation and a humid climate, making it suitable for human production activities. Furthermore, the eastern coast is located on the Pacific Ocean's west coast, and there are many good ports along the coast to facilitate communication with the outside world, making it suitable for trade activities that will drive the economic development of the entire eastern region. The central and western regions are far from the Asia-Pacific region's economic center, with more inconvenient traffic, higher transportation costs for businesses, and a weaker investment environment. Furthermore, the western border region is located in Asia and Europe's hinterland, with many ethnic groups, and the surrounding security situation is also far from the eastern coastal region. Ethnic and political conflicts have a greater impact on the region's economic development and fiscal revenue stability.

V. CONCLUSIONS AND POLICY RECOMMENDATIONS

This paper first clarifies the definition of fiscal revenue volatility, then builds an indicator of local revenue stability based on White's (1983) combined variance method, and finally presents the results of measuring local revenue stability in China based on the institutional background of local fiscal structure and typical facts of local fiscal volatility in China to provide mathematical support for the subsequent study of the impact of fiscal revenue stability on the economic role of fiscal revenue stability.

The results of the combined variance method measure show that there are significant geographical differences in the fluctuation of local fiscal revenues in China. By comparing the changes in the ranking of fiscal revenue volatility indicators in China in 2000, 2009 and 2018, it confirms the typical fact of local fiscal revenue volatility in China, on the one hand, that fiscal revenue volatility indicators show significant geographical differences. The degree of volatility is lower in the economically developed eastern coastal regions than in the economically less developed central and western regions, and it is significantly lower in the economically active southern regions than in the northern regions, with the overall degree of volatility decreasing from east to west and south to north. However, when the degree of fluctuation before and after external shocks is compared, the "camp reform" and external shocks such as the financial crisis have the same positive impact on the fluctuation of local fiscal revenue.

We can conclude from the economic analysis of the experimental results that regional differences in fiscal revenue stability are primarily caused by factors of production, economic structure, and geographical location. On the one hand, a solid economic foundation, capital accumulation, and an efficient industrial structure all contribute to fiscal stability. The comparison of the industrial structure ratio and fiscal revenue stability among 30 provinces, autonomous regions, and municipalities directly under the central government reveals that fiscal revenue stability is relatively better in regions with higher economic volume and more secondary and tertiary industries, while fiscal revenue stability is relatively worse in provinces with higher primary industries, such as Hainan and Guangxi. Geographic location and other objective natural conditions, on the other hand, are important factors limiting economic development and fiscal revenue stability. The central and western regions have a large gap with the eastern coastal regions in terms of natural environment, transportation conditions,

ecological environment, and geopolitical conditions, which directly leads to a large gap in the region's economic development level and the stability of fiscal revenue.

Fiscal revenue is an important grip for local governments' regulation and participation in economic activities because it is the primary source of funding for them to perform public service functions. Fiscal revenue fluctuations can disrupt the government's ability to perform economic functions, reduce the quantity and quality of public services, and result in inefficient government activities. The economic and social activities carried out by governments at all levels in practice are diverse and can be classified for different purposes and from different perspectives, but regardless of the classification method, stable fiscal revenue is the core guarantee of the government's economic activities, which is in the position of "affecting the whole body by one hair". According to empirical tests and theoretical analysis, the government should pay attention to the disparity in fiscal revenue stability across regions, actively improve the economic foundation of the less stable central and western regions, formulate differentiated economic and fiscal policies, vigorously develop secondary and tertiary industries, and improve fiscal revenue stability to deal with regional economic risks and improve government administrative efficiency.

REFERENCES

[1] Afonso A, Furceri D. Government size, composition, volatility and economic growth[J]. European Journal of Political Economy, 2010, 26(4):517-532.

[2] Afonso A, Jalles J T. Fiscal volatility, financial crises and growth[J]. Applied economics letters, 2012, 19(16-18):p.1821-1826.

[3] Badinger, H. Fiscal rules, discretionary fiscal policy and macroeconomic stability: an empirical assessment for OECD countries[J]. Applied Economics, 2009, 41(7):829-847.

[4] Dye R F, Merriman D F. State Revenue Stability: Alternative Conceptualizations[C]. National Tax Association, 2004.

[5] Fatas A, Mihov I. Policy Volatility, Institutions and Economic Growth[J].Review of Economics and Statistics, 2013, 95(2):362-376.

[6] Ramey G, Ramey V A. Cross-Country Evidence on the Link between Volatility and Growth[J]. American Economic Review, 1995, 85(5):1138-1151.

[7] Sobel R S, Holcombe R G. Measuring the Growth and Variability of Tax Bases Over the Business Cycle[J]. National Tax Journal, 1996, 49(4):535-552.

[8] Wilford W T. State tax stability criteria and the revenue-income elasticity coefficient reconsidered[J]. National Tax Journal, 1965, 18:304-312.

[9] Williams W V. The Stability, Growth and Stabilizing Influence of State Taxes[J]. National Tax Journal, 1973, 26(2):267-274.

[10] White F C. Trade-Off in Growth and Stability in State Taxes[J]. National Tax Journal, 1983, 36(1):103-114.

[11] An Yuan, David Wang. Did fiscal behavior fluctuations affect industrial structure upgrading? --An examination based on the technological complexity of industries[J]. Management World.,2012(09):19-35+187.

[12] Dong Jin. Measurement of macroeconomic volatility cycles[J]. Economic Research,2006(07):41-48.

[13] Du Ting. Typical facts of China's economic cycle fluctuations[J]. World Economy,2007(04):3-12.

[14] Fang Fuzian, Xing Wei. Economic fluctuations, financial development and the transformation of industrial enterprises' technological progress patterns[J]. Economic Research,2017,52(12):76-90.

[15] Fang Hongsheng,Zhang Jun. Expansionary Biased Fiscal Behavior of Local Governments in China: Observations and Explanations[J]. Economics (Quarterly), 2009,8(03):1065-1082.

[16] Guo Jing,Ma Guangrong. Macroeconomic stability and state-owned economy investment: mechanism of action and empirical test[J]. Management World.,2019,35(09):49-64+199.

[17] Huang Zeilin, Zhu Baohua. Real economic cycles and tax policy effects in China[J]. Economic Research,2015,50(03):4-17+114.

[18] Huang Zeilin, Zhu Baohua. An empirical study on the facts of China's economic cycle characteristics[J]. World Economy,2009(07):27-40.

[19] Jia Junxue. Regularity, policy dynamics and stabilizing effects of changes in the size of tax revenues in China[J]. Economic Research.,2012,47(11):103-117.

[20] Kong, Liu-Liu, Xie, Qiao-Xin. An empirical study on the effect of tax division on the stability of local revenue[J].

Taxation and Economy,2010(05):98-103.

[21] Li M, Mao J, Yang C-Y. Vertical Competition, Tax Power Allocation and the Change of Fiscal Revenue Share in China[J]. Management World.,2014(05):52-66.

[22] Liu JQ, Liu ZG. Analysis of the dynamic pattern and causes of real output volatility in China's economic cycle fluctuations [J].Economic Research.,2005(03):26-35.

[23] Shu, Yuan, Xu, Xianxiang. Setting up an economic growth model for China:1952-1998[J]. Economic Research,2002(11):3-11+63-92.

[24] Wang Guosong. Fiscal stability and financial vulnerability:A theoretical and empirical study in China[J]. Management World.,2004(07):53-60+68.

[25] Wang LY,Ji Yao. Fiscal Policy Volatility and Fiscal Rules:An Analysis Based on an Open-Conditional DSGE Model[J]. Economic Research.,2019,54(06):121-135.

[26] Xiaolong Wang,Yu Long. Uncertainty of fiscal transfers and the real tax burden of enterprises[J]. China Industrial Economy,2018(09):155-173.

[27] Yu, Y. D.. A theoretical framework for the study of fiscal stability [J]. World Economy,2000(06):3-12.

[28] Zhang Jie,Pang Ruizhi,Deng Zhongqi. Measuring the Effectiveness of Automatic Fiscal Stabilizers:Evidence from China[J]. World Economy,2018,41(05):27-52.

[29] Zhou Bo. A study on the output stabilization effect of fiscal policy based on a provincial panel in China[J]. Management World,2014(07):52-66.

[30] Zhao Aifeng. Study on Regional Fiscal Revenue Differences in China [D]. Southwest University of Finance and Economics,2014.