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Study on China's Appropriate Tax Burden and Tax Reduction Space for the Construction of Innovative Economy

Yanfeng Jiang*

School of Accounting, Guangdong University of Finance, Guangzhou, China
jiangyanfeng2011@126.com
**Corresponding author*

Abstract: *From the theoretical analysis to the optimal macro tax burden in the framework of endogenous economic growth, this paper discussed the importance of study the problem of optimal macro tax burden for sustained economic growth. According to the 1994-2016 data of our country from the provinces, cities, autonomous regions, we analyzed the relationship between macro tax burden, fiscal expenditure and total factor productivity using the panel threshold model. The result is that the control interval for sustained economic growth of China's optimal macro tax burden is 14.22%-18.76%.In the optimum range of macro tax burden, Inhibitory effect of macro tax burden on the total factor productivity is minimum. Finally, according to the empirical analysis results, at present our tax burden is too high, put forward policy recommendations to reduce the tax burden and optimize the structure of fiscal expenditure.*

Keywords: *Innovative Economy, Optimum Macro Tax Burden, Tax Reduction Space, Growth Rate of Total Factor Productivity, The Panel Threshold Regression*

1. Introduction

Since tax-sharing reform in 1994, China's fiscal annual revenue shows rapid growth. The proportion of fiscal revenue to GDP has gradually increased from 10.3% in 1995 to 21.46% in 2016(Among them, the proportion of tax revenue to GDP has risen from 9.9% to 17.53%), corresponding, the ratio of fiscal expenditure to GDP has also increased from 11.2% to 25.26%. Annual average growth rate of tax revenue exceeds 15%, much higher than GDP growth rate during the same period. The extraordinary increase of tax revenue makes the tax burden rate of our country increase gradually. It indicates that the government's ability to provide public goods has increased, but may also destroy private sector economic decisions, so that reducing resource allocation efficiency. Reasonable tax levels for a certain period of time, Both to ensure that the government to perform their functions of financial needs, and need to adapt to the stage of development and goals of the economy. Moderate macro tax burden will change depending on different target. As the continuous improvement of our country's social and economic development level, the government-led investment-driven economic growth model makes economic growth inefficient, not adapting to the economic reality of our country. During The Twelfth Five-Year Plan, China clearly proposed to speed up the transformation of economic development, implement Innovative economic development strategy. The essential of implementing strategy is improve growth rate of TFP. So, it's necessary to make a rough estimate of the appropriate level of China's tax burden rate for the present and future periods, to adapt to government goals to maximize investment-driven economic growth to maximize innovation-driven total factor productivity.

Determine optimum macro tax burden needs to consider fiscal expenditure. If macro tax burden is high, the level of government-provided public services is also high, and economic efficiency will be higher. In contrast, if macro tax burden is low, the level of government provision of public services is also low, and economic efficiency will not be high. The tax of developed countries is generally higher than China, but government provides high quality public products, these countries have higher levels of economic efficiency and innovation. Therefore, the optimum macro tax burden will change with the level of fiscal expenditure required by the national strategy and changes in the direction of expenditure. For this reason, we can put forward the hypothesis that the macro tax burden has a nonlinear dynamic impact on economic efficiency: generally speaking, when macro tax burden is low, and The level of fiscal expenditure is relatively low, and the social demand for public goods is large, the negative effect

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of macro tax burden on economic efficiency is less than the positive effect of fiscal expenditure on it. Increasing taxation at this time will help promote economic efficiency. Instead, when macro tax burden is high, the corresponding financial expenditure level is also high, At this time, the provision of social public goods has become more abundant. The negative effect of macro tax burden on economic efficiency is greater than the positive effect of fiscal expenditure on it. Taxes for government investment and public spending will hinder economic efficiency, right now. Thus, we can draw a conclusion that macro tax burden will affect the dynamic changes in economic efficiency with different levels of fiscal expenditure. According to this hypothesis this text uses the panel threshold model of fiscal expenditure as a threshold variable to test.

2. Literature Review

Macro tax burden refers to the overall tax burden of a country, the level of macro tax burden indicates the degree of concentration of government in the allocation of national economic aggregates, and shows the strengths and weaknesses of the government's socio-economic functions and financial functions. So the core issue of all tax policies is establishing a reasonable level of macro-tax burden. The research on the reasonable standards and level of macroeconomic taxation can be divided into the following perspectives: (1)From the rate of surplus value point of view, Liu Rongcang 、Zhao Zhigen (1999) thought Our government's financial resources are mainly composed of two parts: tax revenue and charging revenue, and mainly from surplus value. For the sake of social simple reproduction and expanding reproduction, the total amount of taxes and fees for a given period of time cannot equal or exceed the amount of surplus product created by workers during the same period. Yang Bing (1998) measured the data, concluded the total value of surplus products is maintained at between 31% and 33% of GDP in China from 1987 to 1996, it is the upper limit of China's macro tax burden.(2)From the perspective of social public expenditure and social welfare, Alesina and others(2004) believe that the criteria for judging the level of macro-tax burdens depend on whether or not to improve national welfare. If tax revenue does not bring corresponding public services and social security, people will difficult to enjoy more welfare, that's mean corresponding increase in national tax burden. Li Junsheng believed(1994) Ideal tax scale efficiency level refers to such a state that the total tax revenue and total expenditure under ideal conditions are basically equal in a fiscal year. Ye ZhenPeng and Zhang Xin (1995) considered the scale of public finance is in the best quantity state is while the government increases the benefits provided by the unit public service, the negative interest generated by the tax corresponding to the service of the unit is equal. According to the principle of determining income based on expenditure, the proportion of social public demand in GDP can reasonably reflect the tax burden. Zhao Zhigeng (2001) obtained the optimal scale of China's future fiscal expenditure by determining the proportion of various fiscal expenditures in 1994-98 and the elasticity of various expenditure items on economic growth, and then forecast China's Fiscal Expenditure as a Share of GDP during 2001-2010.They considered that the reasonable range of current tax burden in China is 19%-22%.Based on the data on the share of social public demand in GDP from 1987 to 1999, Li Chen concludes that it is reasonable for China's tax burden to reach 20%-25% at this stage.(3) From the perspective of economic growth, Scully(1996) utilized New Zealand data for 1927-1994,calculated the optimal tax rate that maximizes New Zealand's economic growth rate is 19.7% of tax revenue in GDP, at the same time he also forecast the best tax rates in other countries. The United States' 1929-1989 optimal tax scale was 21.5% of GDP, and it was 18.5%, 18.9%, 20.1%, 16.6%, and 25.2% in Denmark, Finland, Italy, Sweden and the United Kingdom from 1987 to 1988. The average tax rate for sample countries is 20.1%. Yue Shuming (2003) pointed out that a theoretical criterion for judging the reasonable level of macroeconomic tax burden is the synchronization of the growth of tax revenue and economic growth. Ma Shuanyou (2001)estimated that China's optimal macro tax burden ranged from 14% to 23%.Liu Puzhao (2004) He estimates that the level of macro tax burden to maximize China's economic growth should be between 19.5% and 21.08%.•

Based on different angles of investigation, the answer to the issue of the level of macro tax burden and whether it is appropriate or not is not necessarily the same, especially for China. Macro tax burden subordinate to and serve the Chinese national strategy. The party's report on the 18th National Congress clearly put forward that Implementing innovation-driven development strategy is a new historical task put forward by China's economic and social development in the new era. It provides an objective basis for the scientific planning of moderate macro tax burdens in China in the near to medium term. Implement innovation-driven development strategy, we should improve TFP, Investigate whether the use of income corresponding to the level of macro-tax burdens achieves macroeconomic efficiency depends mainly on whether government spending promotes the growth of total factor

ISSN 2706-6827 Vol. 4, Issue 4: 55-70, DOI: 10.25236/IJFS.2022.040411

productivity. Few studies on macro-tax burdens in terms of innovation and economic efficiency in existing literature, while most of literature is based on the study of single taxes. Such as Widmalm (2001), Lee and Gordon (2005), Arnold (2008), Myles (2009) studied the impact of personal income tax, corporate income tax, property tax, commodity tax on economic efficiency, respectively. And they found that the impact of these taxes on the economic efficiency of countries is not consistent. Liu Rongcang 、Ma Shuanyou (2002)analyzed the relationship between the effective tax rate of taxation on labor, capital income, and consumer spending in China and TFP, found taxing on capital in our country reduces investment rate and total factor productivity, but does not affect human capital supply. Labor taxation reduces investment rates, and stimulates the supply of human capital and has no impact on technological progress. Taxes on consumer spending increased investment rate and TFP, does not affect human capital supply. Li Shaorong、Geng Ying (2005) believed that the increase in the share of income tax, resource tax, and behavioral taxes will increase the overall efficiency of the economy, while The increase in the share of property tax and specific-purpose taxes would reduce the overall efficiency of the economy. This shows that different tax types in China have different and different effects on economic efficiency.

So, overall, the impact of macro tax burden on economic efficiency is uncertain, nonlinear. On the judgment of the optimal macro-tax level in China, From the initial purely theoretical research to international comparative analysis and later empirical research, these studies have achieved some results. However, the macro tax burdens of these methods are all average over a period of time, they are mean in mathematics and cannot reflect the dynamic characteristics of the optimal macro tax burden at different stages of economic development. The determination of the reasonable level of macro-tax burden may be affected by many factors other than fiscal expenditure. In the long run, the level of macro tax burden should not be a freezing point but a dynamic of constant adjustment and change. Base on this theoretical consideration, we believe that the optimal macro tax burden may not be the only one. There may be a nonlinear relationship between the macro taxation dynamic efficiency differences, and it is closely linked with the government's fiscal expenditure. Therefore, using a threshold panel is more appropriate. In addition, the previous literature generally based on the estimated error to obtain the optimal macro tax interval, we use the threshold effect to determine the optimal interval, which can reduce the subjective arbitrariness of the regulatory interval determination. To this end, we choose fiscal expenditure as a threshold variable, base on the panel data since the reform of the 1994 tax sharing system in all provinces (cities, autonomous regions) in China, use a threshold regression model, By controlling the indirect effects between the level of macro tax burden and TFP, study on the relationship between macro-tax burden and TFP in different threshold regions, to determine the optimum control target range of macro tax burden under China's innovation-driven strategy.

3. Model Setting and Estimation Method

3.1 Econometric Model and Choice of Variables

The econometric model adopted in this paper is a threshold regression model for panel data, threshold variable is fiscal expenditure. Due to the economic factors such as the economic resources endowment in our country, there are difficult to observe the non-time-varying geopolitical differences, In the model we set the fixed effect of individuals with non-temporal heterogeneity. The econometric model originally set forth in this paper is:

$$TFP_{it} = \alpha_{it} + \beta TAX_{it} I(EXP) + \gamma EXP_{it} + \theta X_{it} + \varepsilon_{it} \quad (1)$$

Among them, threshold variable is fiscal expenditure EXP, $I(\cdot)$is an indicative function.It depends on the value of the threshold variable EXP. EXP_{it} and X_{it} are all control variable vectors.

In order to study the causal relationship between macro-tax burden and total factor productivity, first we should control the indirect effects between them. The control variables commonly used in the past to study total factor productivity include: Material Capital, Human Capital, Marketization Level, Openness, and Fiscal Expenditure. In addition, the effects of different government expenditure items vary in size and direction. This article subdivides the structure of fiscal expenditures, inspects government's fiscal expenditure on public capital services, scientific education investment, and consumer spending have different effects on economic efficiency.

The definition of variables is shown in the following table 1:

ISSN 2706-6827 Vol. 4, Issue 4: 55-70, DOI: 10.25236/IJFS.2022.040411

Table 1: Description of variables

Control variable	variable name	Variable description
Growth rate of TFP	TFP_{it}	Measure economic efficiency
Macro tax burden	TAX_{it}	Measure the impact of macro tax burden on economic Efficiency
The proportion of fiscal expenditure to GDP	EXP_{it}	Measuring the impact of government intervention on economic efficiency
Public capital service expenditure as a share of GDP	BE_{it}	Measuring the impact of public capital service expenditure on economic efficiency
Science, education, culture and health expenditure as a percentage of GDP	TE_{it}	Measure the influence of the proportion of science, education, culture, and public health expenditure on economic efficiency
The proportion of consumer spending in GDP	CE_{it}	Measuring the effect of consumption proportion on economic efficiency
The actual material capital stock	K_{it}	Measuring the effect of physical capital stock on economic efficiency
Human capital level	H_{it}	Measuring the effect of human capital level on economic efficiency
The proportion of state-owned industrial value in total industrial output value	$MARKET_{it}$	Measuring the effect of marketization on economic efficiency
The proportion of exports in GDP	OPENNES	Measuring the impact of market openness on economic efficiency

3.2 Index Calculations and Variable Statistics Description

Total factor productivity growth rate(TFP_{it}): This paper calculates total factor productivity based on Solow residual value method.Use perpetual inventory method to calculate the actual capital stock,and draw references from Zhang Jun (2004) et al. and Shan Haojie (2008),Calculate actual capital stock based on 1978,and determine depreciation rate as 10%. Figure out labor force data based on the number of employees in the three industries. Calculate the annual growth rate of total factor productivity using the ring method.

Macro tax burden (TAX_{it}): An Tifu (2002) specifically classified the macro tax burden into three categories in light of the reality in China: Small-caliber macro tax burden、Medium-caliber macro tax burden and Large-caliber macro tax burden. Among them, the small-caliber macro tax burden refers to the proportion of tax revenue; the medium-caliber macro tax burden is the proportion of the budgeted revenue, including tax revenue; the large-caliber macro tax burden refers to the proportion of government revenue that includes both internal and external fiscal revenues and non-system revenues. We use the proportion of total fiscal revenue in GDP here, that is the rate of medium-caliber macro tax burden, we use it as a measure of inter-provincial tax burden in China. Since the tax-sharing reform, China's financial and financial power is concentrated in the central government, business power shifts downward, local government funding sources are limited, tax revenue does not match with its authority, so that non-tax revenue becomes an important means for local governments to make up for the lack of financial resources. Therefore, it is limited to use small-caliber macro tax burden to measuring macro tax burden, while Large-caliber macro tax burden, including government extra-budgetary income and extra-system income, are difficult to measure statistically. Therefore, for the sake of digital accuracy and to facilitate the study of the problem, we adopts the medium-caliber macro tax burden is more appropriate.

Fiscal expenditure variables: According to the different functions of the fiscal expenditure function, this paper analyzes the structure of fiscal expenditure as public capital service, scientific education investment, and consumer expenditure. Among them, public capital service expenditure items include general public service expenditures, geological exploration expenditures, national material reserve expenditures, business services and other business expenditures, agricultural and forestry water affairs expenditures, and transportation and transportation expenses. Scientific education investment include expenditure on local financial education and expenditure on science and technology and cultural and health expenditure. And Consumption expenditures mainly cover administrative expenses and some other subsidies. At the same time, in order to correspond with the tax burden, the proportion of fiscal expenditure here refers to the proportion of fiscal expenditure to GDP.

ISSN 2706-6827 Vol. 4, Issue 4: 55-70, DOI: 10.25236/IJFS.2022.040411

Besides, we use the perpetual inventory method to calculate the actual capital stock(K_{it}).Represent the stock of human capital level(H_{it}) with the ratio of university and technical secondary school population per 10000 people. Measure the level of marketization($MARKET_{it}$) by taking the proportion of the total value of state-owned industry in total industrial output value. And the degree of openness($OPENNESS_{it}$)is measured by the ratio of exports to GDP.

Due to data availability and model accuracy requirements, the time span of our data adoption is from 1994 to 2012 2016.that's because tax-sharing reform began in 1994.According to the panel data of 30 provinces, autonomous regions and municipalities in mainland China except Tibet, Comprehensive tax burden and fiscal expenditure, using threshold panel method to measure and calculate, better for the determination of moderate tax burden for the economic efficiency of various regions and the choice of tax reform schemes. The data used in the article are mainly derived from such authoritative organizations as the China Economic Network and the Statistical Yearbook of China, the Statistical Data Collection of 60 Years in New China, and the relevant Statistical Yearbook.

The statistical characteristics of variables are shown in the following table 2:

Table 2: Variables and their statistical characteristics

variable	Observation	Average value	Standard deviation	Min	Max
Growth rate of TFP	690	6.11	3.20	2.13	9.75
Macro tax burden (%)	690	15.35	5.88	8.13	23.53
Public capital service expenditure (%)	690	7.82	4.77	4.46	12.67
Science, education, culture and health expenditure (%)	690	5.71	4.52	2.78	10.98
Consumer transfer payments (%)	690	5.87	2.56	3.64	7.13
Actual capital stock (Unit: trillion)	690	0.3878	0.4577	0.01195	3.4895
Human capital (%)	690	3.27	2.53	1.75	6.65
Marketization	690	0.5312	0.2094	0.1093	0.9011
Openness	690	0.1910	0.1993	0.01502	0.9394

3.3 Estimation Method

3.3.1 Estimation of Threshold Value

Basic equations for nonlinear panel threshold models:

$$y_{it} = \alpha_i + \beta_1 x_{it} I(q_{it} \le \eta) + \beta_2 x_{it} I(q_{it} > \eta) + \varepsilon_{it} \quad (2)$$

$I(\cdot)$is an indicative function ,q_{it} is threshold variable ,according to the comparison of q_{it} and threshold η, the observations can be divided into two different "districts", and assign different regression slope β_1 and β_2 to every "districts".

When doing specific regression estimates, first we need to eliminate individual effects α_i, and make $y_{it}^* = y_{it} - \frac{1}{T}\sum_{t=1}^{t} y_{it}$, replace the corresponding variable (1) after the other variables are treated the same, then here is:

$$y_{it}^* = \beta_1 x_{it}^* I(q_{it} \le \eta) + \beta_2 x_{it}^* I(q_{it} > \eta) + \varepsilon_{it}^* \quad (3)$$

$y_{it}^* = \beta_1 x_{it}^* I(q_{it} \le \eta) + \beta_2 x_{it}^* I(q_{it} > \eta) + \varepsilon_{it}^*$ is the matrix form of (2),and the residual sum of squares (RSS) is:

$$S_1(\eta) = \hat{e}^*(\eta)'\hat{e}^*(\eta) = Y^*(I - X^*(\eta)'(X^*(\eta)'X^*(\eta))^{-1}X^*(\eta)')Y^*$$

The threshold optimal estimate η needs to be such that $S_1(\eta)$ is minimum, which is $\hat{\eta} = \arg\min_{\eta} S_1(\eta)$

3.3.2 Hypothesis Testing of Thresholds

The hypothesis testing of the threshold can be divided into two steps. First, it is tested whether the threshold effect is significant, and secondly, whether the estimated threshold value is equal to the true value.

The original hypothesis of the first test is $H_0: \beta_1 = \beta_2$,and the alternative hypothesis is $H_1: \beta_1 \neq$

ISSN 2706-6827 Vol. 4, Issue 4: 55-70, DOI: 10.25236/IJFS.2022.040411

β_2. Test statistic is $F_1 = \frac{S_0 - S_1(\hat{\eta})}{\hat{\sigma}^2}$, Where S_0 is the RSS under the original assumption, and the thresholds are not yet determined. Because traditional test statistics do not meet the standard distribution, Hansen (1999) suggested using Bootstrap to find the critical value of the approximate distribution. If the P small enough, the null hypothesis is rejected, indicating that there is a significant threshold effect. Second, check whether the threshold value is equal to the true value, the original hypothesis is $H_0: \eta = \hat{\eta}$.The corresponding likelihood ratio statistic in this case is: $LR_1(\eta) = \frac{S_1 - S_1(\hat{\eta})}{\hat{\sigma}^2}$

3.3.3 Multi-Threshold Panel Model

The basic threshold model assumes that there is only one threshold, but from the measurement point of view, multiple thresholds may appear in the estimation result. In the following, the dual threshold model is used as an example to illustrate, and the multi-threshold model is based on this extension. The dual threshold model can be set to:

$$y_{it} = \alpha_i + \beta_1 x_{it} I(q_{it} \le \eta_1) + \beta_2 x_{it} I(\eta_1 < q_{it} \le \eta_2) + \beta_3 x_{it} I(q_{it} > \eta_2) + \varepsilon_{it} \quad (4)$$

$\eta_1 < \eta_2$ in formula(4), the double-threshold model is a second threshold that is estimated when a single threshold is fixed. Its search process is similar to the single-threshold model. From this we get the RSS after the second threshold is $S_2^{\eta}(\eta_2)$

$$S_2^{\eta}(\eta_2) = \begin{cases} \{S(\hat{\eta}_1, \eta_2), \hat{\eta}_1 < \hat{\eta}_2 \\ \{S(\eta_1, \hat{\eta}_2), \hat{\eta}_1 < \hat{\eta}_2 \end{cases} \quad (5)$$

The second threshold estimate obtained should minimize equation (5), which is $\hat{\eta}_2^{\eta} = \arg\min_{\eta_2} S_2(\hat{\eta}_2^{\eta})$.

For determine the number of thresholds, Hansen passes construction test statistics

$F_2 = \frac{S_1(\gamma) - S_2^{\gamma}(\hat{\gamma}_2^{\gamma})}{\hat{\sigma}^2}$, by identifying whether there is a significant difference in the squared residual sum of the two thresholds. Take the following steps to do: First use Hansen's Bootstrap method to obtain the asymptotic distribution, then calculate P. If it is significant, it means that the second threshold is significant, then the third threshold can be searched, and the analogy will continue until the obtained threshold is not significant.

3.4 Threshold Effect test

Firstly, use the Stata statistical analysis software package to estimate the threshold of the model (1), and the threshold effect of the model was tested for significance; the results are shown in Table 3.

Table 3: Threshold effect test of the model

hypothetical test	LR	Bootstrap threshold (200 times,%)		
		10	5	1
H_0^1:No threshold H_1^1:one threshold	35.338	22.558	25.990	30.552
H_0^2:one threshold H_1^2:two thresholds	24.881	18.508	20.628	29.157
H_0^3:one threshold H_1^3:two threshold	2.294	16.720	18.990	24.637

We can learn from table 3 that LR_1=35.338, bootstrap thresholds greater than 10%, 5%, and 1% confidence levels respectively 22.558, 25.990, and 30.552. It shows that threshold effect is significant, then reject the original hypothesis. That is, the assumption that there is a threshold is established. Similarly, it can be seen that the assumption of two thresholds is also valid. Since LR_2 = 2.294, much less than 10% of the bootstrapped critical value of 16.720, the original hypothesis cannot be rejected, so there are no three thresholds in the model. Therefore, there are two thresholds for model (1). According to Stata analysis software, two threshold estimates are obtained as η_1= 0.1422, η_2= 0.1876. Its 95% asymptotic confidence intervals are [0.1487, 0.1491] and [0.1875, 0.1877], respectively. Therefore, the following dual threshold model can be constructed:

$$TFP_{it} = \alpha_{it} + \beta_1 TAX_{it} I(EXP \le \eta_1) + \beta_2 TAX_{it} I(\eta_1 \le EXP \le \eta_2) + \beta_3 TAX_{it} I(EXP \ge \eta_2) + \gamma_1 BE_{it} + \gamma_2 TE_{it} + \gamma_3 CE_{it} + \theta_1 K_{it} + \theta_2 H_{it} + \theta_3 MARKET_{it} + \theta_4 OPENNESS_{it} + \varepsilon_{it} \quad (6)$$

ISSN 2706-6827 Vol. 4, Issue 4: 55-70, DOI: 10.25236/IJFS.2022.040411

4. Parameter Estimation and Robustness Test

4.1 Estimate the Parameters of the Estimation Model (2), Results are Shown in Table 4.

Table 4: Dual Threshold Factor Estimation

coefficient	estimated value	Standard deviation	t value
β_1	0.004189***	0.01307	2.8808
β_2	-0.001645*	0.001911	-1.8906
β_3	-0.008312**	0.004227	-2.2498
γ_1	0.005041***	0.001531	6.5269
γ_2	0.001606***	0.0003409	3.4041
γ_3	-0.001962**	0.0006487	-2.04891
θ_1	0.04607***	0.003591	12.7144
θ_2	0.001490**	0.0005671	2.2647
θ_3	0.007265***	0.001179	5.6549
θ_4	0.006771***	0.001547	3.6809

Note: *, **, and *** are significant at the 10%, 5%, and 1% confidence levels, respectively.

4.2 Impact Analysis

4.2.1 Tax Impact Analysis β_1、β_2、β_3

From the significance test of t values in Table 4, we found that test statistic of β_1、β_2、β_3、γ_1、γ_2、γ_3、θ_1、θ_2、θ_3、θ_4 is statistically significant. When the financial expenditures, marketization level, degree of openness, material capital stock, and human capital are relatively stable, there is a significant non-linear relationship between the level of macro taxation and total factor productivity growth. The dynamic impact of macro tax burden on total factor productivity can be divided into three different economic zone systems: When the macro tax burden is lower than 14.22%, that is, in the first economic zone system, at this time, the macro-tax burden was lower than the level that hindered economic efficiency. The response factor of TFP to macro-tax burden was 0.004189, that is, every 1% increase in macro tax burden and TFP increase by 0.004189%.The changes in macro tax burden and total factor productivity are in the same direction, indicating that the reduction of macro tax burden in this economic zone system is not conducive to the improvement of total factor productivity. When the macro-tax burden is between 14.22% and 18.76%, that is, when it is located in the second economic zone system, the response factor of TFP to macro-tax burden is -0.001645.That is to say, if the macro tax burden is reduced by 1% and the TFP is increased by 0.001655%, the macro tax burden will have a weaker effect on total factor productivity. When the macro-tax burden is higher than 18.76%, that is, in the third economic zone system, the response factor of the growth rate of TFP to macro-tax burden is -0.008312.Comparing with the second economic zone system, changes in macro-tax burden have significantly increased the inhibitory effect on total factor productivity. It shows that when the level of macro-tax burden is higher than 18.76%, the reduction in the level of macro-tax burden has a significant effect on the promotion of total factor productivity. In other words, when the tax burden is lighter than 14.22%, raising the tax rate will increase economic efficiency. When the tax burden is heavier than 18.76%, excessive tax burdens will undermine the enthusiasm of the market's main innovation and severely inhibit economic efficiency. In a nutshell, the optimal target control range for macro tax burden levels in China should be [14.22%, 18.76%].At present, China’s macro tax burden has exceeded the optimal macro tax burden. If the macro tax burden continues to grow, it will surely have a severe inhibitory effect on economic efficiency. Therefore, China’s macro tax burden should be appropriately reduced. According to China's 2016 actual tax burden of 21.46%, China's macro tax burden will need to be reduced by at least 2.70% in the future.

Appendix Table 5 shows the distribution of macro-tax burdens in various provinces, autonomous regions, and municipalities in China from 1994 to 2016.It tell us that there are significant inter-provincial differences in China's macro tax burden. Before 1998, When the macro tax burden is generally less than the first threshold of 14.22%,The macro tax burden in the western regions of Ningxia, Guizhou, Gansu, Qinghai and Yunnan has exceeded the first threshold of 14.22%.After 2010, the macro tax burden of these provinces (autonomous regions, municipalities directly under the Central Government) generally exceeded 30%.Compared with the level of economic development, the tax burden in the western region is generally high. The macro tax burdens in in the central region like

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Hubei, Hebei, Shandong, Jiangxi and Hunan are generally low. Prior to 2006, most were within the first threshold, and after 2006, most were within the second. And lower level of taxation is not conducive to the government's financial functions. The eastern region has a high level of economic development and abundant sources of taxation, and its tax burden should be the highest. However in the eastern part of Jiangsu, Guangdong, Fujian, Zhejiang, and Tianjin, the macroeconomic tax burden is lower. When the national level of tax burdens in general increased in 2010, these provinces are still mostly within the first threshold. The higher levels of economic development in the eastern region and the lower level of macro-tax burdens are asymmetric.

4.2.2 Analysis of the Impact of Fiscal Expenditure

The empirical results show that the effect of different fiscal expenditure items varies in size and direction. Public capital expenditure has the greatest positive impact on TFP, followed by spending on science, education, culture, and education. And consumer spending has a negative effect on it. The effect of public capital expenditures on productivity is positive, indicating that when the macro tax burden is constant, increasing the proportion of public expenditure in fiscal spending will help promote productivity growth. When the macro-tax burden is between 14.22% and 18.76%, the absolute value of the impact coefficient of public capital expenditure is greater than the absolute value of the macro-tax impact coefficient. On average, taxation for public capital expenditures helps increase productivity. In recent years, the proportion of public investment in China has gradually declined. Therefore, government fiscal expenditure should increase the proportion of public expenditure; The coefficient of spending on science, education, culture, and health is significantly positive, indicating that when the macro tax burden is not changing, the proportion of investment in science and education in raising fiscal expenditure will also help increase productivity growth. When the macro tax burden is between 14.22% and 18.76%, the positive impact coefficient of expenditure on science, education, culture, and education is equivalent to the negative impact coefficient of macroeconomic tax burden, indicating that the taxation expenditure on science, education, culture, and culture has no significant effect on productivity. In the economic development, the level of science, education, culture and health has always played a central role. In recent years, China’s spending on science, education, culture, and health has not significantly increased, and the basic needs of education, medical care, and pensions are far from being met. It seriously constrains the improvement of the level of technological innovation and consumer demand, therefore, the proportion of spending on science, education, culture, and health should be appropriately increased in the future. The impact coefficient of consumer spending is negative, indicating that taxation for consumer spending will hinder productivity growth when the macro tax burden is unchanged. In general, the lack of supervision over administrative expenditures can easily lead to improper use and cannot really benefit demanders. The dramatic increase in administrative fees has reduced the expenditure on public goods or quasi-public goods. In the future, expenditure on administrative expenses should be reduced, and the use of consumer spending should be improved.

4.2.3 Analysis of Other Control Variables

The empirical results show that human capital, material capital, marketization, and openness have positive and significant effects on productivity. For every 1 trillion increase in material capital, productivity growth can increase by 0.04607.Raising the stock of material capital can significantly increase the productivity growth rate, indicating that the characteristics of China’s capital-enhancing technology progress are more prominent. With a 1% increase in the proportion of undergraduates in the employed population, productivity growth will increase by 0.001490%. It shows that increasing the educational level of the population will promote productivity growth; For every 1% increase in marketization, productivity will increase by 0.007265%. It shows that the higher the degree of nationalization is, the more it is not conducive to technological progress. It may be that state-owned enterprises rely more on their monopoly status and economies of scale, and their technological research engines are lower. Should reduce the market access of private capital and increase the level of marketization; For every 1% increase in openness, productivity will increase by 0.006771%.It shows that the deepening of the degree of openness is conducive to the improvement of technical efficiency. The internal logic may be that opening up to the outside world can introduce advanced foreign technologies while at the same time international competition will prompt domestic enterprises to raise the level of technological innovation.

4.3 Robustness test

Since TFP often has a certain degree of correlation in terms of changes in time, there is a lagging

ISSN 2706-6827 Vol. 4, Issue 4: 55-70, DOI: 10.25236/IJFS.2022.040411

effect on total factor productivity in adjacent periods. If the static model is used for analysis, there may be serious model setting problems, which greatly reduces the credibility of the analysis results. Therefore, in order to test robustness, this paper establishes the following dynamic panel threshold model(DPTM):

$$TFP_{it} = \alpha_{it} + \lambda TFP_{it-1} + \beta_1 TAX_{it} I(EXP \le \eta_1) + \beta_2 TAX_{it} I(\eta_1 \le EXP \le \eta_2) + \beta_3 TAX_{it} I(EXP \ge \eta_2) + \gamma_1 BE_{it} + \gamma_2 TE_{it} + \gamma_3 CE_{it} + \theta_1 K_{it} + \theta_2 H_{it} + \theta_3 MARKET_{it} + \theta_4 OPENNESS_{it} + \varepsilon_{it} \quad (7)$$

This dynamic panel threshold model is a promotion of the Hansen (1999) panel threshold mold (PTM).This article uses a dynamic model to capture and test the effects of TFP between adjacent phases. From the model setting point of view, the model has the characteristics of a dynamic model because the lag of the interpreted variables in the model is also used as an explanatory variable. In the dynamic panel model, the dependent variable's lagged term as the explanatory variable may cause the correlation between the explanatory variable and the random error term and the endogeneity of the explanatory variable. On the other hand, it may cause the error term to have a moving average process. Therefore, for the dynamic panel threshold model set in this paper, if the Hansen (1999) static panel threshold model estimation method is used to estimate the estimated amount has a large bias. This paper uses the GMM estimation method proposed by Arellano and Bond (1991), and uses the lagged terms of the first-order difference of the dependent variable as the instrumental variables to estimate the above equations. The threshold value search method still uses Bootstrap proposed by Hansen (1999) to find the critical value of the approximate distribution. Then, the P value of the Likely hood Ratio (LR) test is obtained. If the P value is small enough, it indicates that there is a significant threshold effect, otherwise there is not. The estimated results are shown in Table 6 below:

Table 6: Robustness test - GMM estimation

coefficient	estimated value	standard deviation	t value
λ	0.2031***	0.04257	3.1255
β_1	0.003354**	0.001412	2.4489
β_2	-0.001307**	0.002038	-2.1627
β_3	-0.006623***	0.004754	-2.9128
γ_1	0.004031***	0.001681	5.5488
γ_2	0.001282***	0.0003744	2.8931
γ_3	-0.001568**	0.0007138	-1.7416
θ_1	0.03684***	0.003946	10.8074
θ_2	0.001191**	0.0006235	1.9248
θ_3	0.005810***	0.001296	4.8069
θ_4	0.005415***	0.001696	3.1282
Threshold 1:15.36%	Threshold 2:20.28%	AR(1)P value: 0.0262	
AR(2)P value:0.2217	Sargan test P value:0.3805	Wald test P value:0.0000	

Note: *, **, and *** are significant at the 10%, 5%, and 1% confidence levels, respectively.

From the estimation results of the model, there are still two threshold effects in the model, and the thresholds for robustness tests are 15.36% and 20.28%, respectively, which is slightly larger than the previous results. AR (1) and AR(2) are correlation tests for differential residual sequences in GMM sequences. The results show that there is only a first-order autocorrelation in the differential residual sequence of the model, but there is no second-order autocorrelation. It shows consistency in GMM estimates. Sargan over-recognition constraint test results show that the selection of instrumental variables in this paper is reasonable. The combined significance Wald test shows that the model is overall significant. As the degree of freedom decreases, the estimation coefficient of the robustness test and the coefficient estimation accuracy of the model decrease. However, most of the coefficients passed the significance test and met the theoretical expectations. The previous TFP has a significant positive effect on total factor productivity in this period, indicating that TFP has significant inertial characteristics. Compared with the common threshold panel, the coefficient of the explanatory variable in the empirical result is smaller but the influence direction has not changed. The robustness test did not affect the basic estimation results and further validated our hypothesis: When fiscal expenditures are low, macro-tax burdens have a positive effect on total factor productivity; when fiscal expenditures are high, macro-tax burdens have an inhibitory effect on total factor productivity.

ISSN 2706-6827 Vol. 4, Issue 4: 55-70, DOI: 10.25236/IJFS.2022.040411

5. Conclusions and Policy Recommendations

Faced with the requirements of the times for transforming the mode of economic development and improving the efficiency of economic growth, From the perspective of economic efficiency, we have conducted in-depth studies on whether China's macro tax burden is reasonable at present. What is the regulatory scope of macro-tax burdens that are conducive to productivity? It is a practical issue that needs to be answered at the macro level of reforming the economic development mode and carrying out tax reform. This article studies the moderate macro-tax intervals that maximize total factor productivity by constructing panel threshold models, and draws the following conclusions:

(1) There is a significant non-linear relationship between macro-tax burden and TFP. The economy is a dynamic in reality, non-equilibrium process. At present, the level of the optimal threshold for macro tax burden in China is between 14.22% and 18.76%,When it is lower than the threshold of 14.22%, the increase in macro tax burden will help raise the productivity level. Between the thresholds, the negative effect of macro tax burden on productivity is weaker. When the macro tax burden was higher than 18.76%, the macro tax burden had a significant increase in the inhibitory effect on TFP. The current macro tax burden in China is higher than the optimal range, and the high and rapidly rising macro tax burden has caused serious obstacles to China's economic efficiency. So, in the future, when fiscal stimulus plans are implemented to raise the level of macro-tax burdens, they should be carefully selected.

(2) There are significant differences in regional macro tax burdens. There are significant inter-provincial differences in China's macro tax burden. Higher tax burdens in the western region are not compatible with relatively low levels of regional development; The macro tax burden in the central region is generally low, and the lower level of tax burden is not conducive to the government's financial functions; The eastern region has a high level of economic development and abundant tax sources, but its tax burden is relatively low. In recent years, the provincial economy of different levels of development has entered a period of high taxation at the same time, which has hindered the development of the local economy to varying degrees. In terms of regional distribution, compared with the eastern and central regions, there are more high-tax provinces in the western region. The current tax burden not only results in loss of efficiency, but also widens regional disparities.

(3) The amount and structure of fiscal expenditures affect economic efficiency, which in turn affects the optimal level of macro taxation. This article shows that the ultimate effect of the tax burden on economic efficiency depends on its use. Correctly evaluate the effect of tax policy must be combined with the determination of fiscal expenditure, different effects of expenditures and the use of funds determine the complete effect of taxation policies. The effects of different fiscal expenditure items on long-term growth vary in size and direction. Public capital expenditure has the greatest positive impact on TFP. Science, education, culture and public health expenditures are the next highest, and consumer spending has a negative impact on TFP. The optimal tax interval will change with the structure of fiscal expenditure, If we optimize the structure of fiscal expenditure, we can achieve the same policy effect with less expenditure. Correspondingly, fewer taxes can be collected to reduce the level of macro taxation. Combine the research results of this article with the experience of other countries, in order to achieve the goal of macro-tax adjustment of innovative economy, We believe that in the future China's tax reform should consider the following aspects:

First, implement structural tax cuts and reduce macro tax burdens. The results show that the high and rapidly rising macro tax burden has caused serious obstacles to China's economic efficiency. The optimal control range for macro tax burden in China is [14.22%, 18.76%].In 2016, China's actual macro-tax burden has reached 21.46%, and structural tax cuts are needed. Reduce the level of tax burden on innovation investment and human capital and reduce the burden on innovative companies. To dispose of outdated tax incentives, gradually form a preferential taxation policy system that encourages independent innovation, promotes the transformation of scientific and technological achievements, and saves energy and environmental protection. At the same time, with the guidance of the scientific concept of development, reform the performance appraisal mechanism for local governments and change government functions. Clear up and rectify excessive administrative charges and funds and cancel unreasonable charges. In line with effective tax reforms, taxation is levied in accordance with law to ensure that the levy of the levy is raised, and the reduction will be reduced, and the proportion of fiscal revenue to GDP will gradually reach the optimal level of regulation. Correct taxation to distort economic efficiency and promote coordinated development of economy and taxation.

Second, balance regional tax burdens. There are obvious differences in macro tax burdens between regions. When formulating tax policies, the actual economic environment in each region should be

ISSN 2706-6827 Vol. 4, Issue 4: 55-70, DOI: 10.25236/IJFS.2022.040411

considered. However, the current uniform tax system design and highly concentrated tax power in the country have made it impossible for local governments to adjust their tax burden according to their economic development status. Therefore, it is necessary to give the local government a certain amount of tax administration power and establish a local tax system that meets the characteristics of the region. It is beneficial to the local government to adjust the tax burden according to the economic development of the region in time to reduce the efficiency loss. Due to the high tax burden in the western region, the preferential tax treatment for the western region should not be cancelled in the short term. It can increase transfer payments to economically backward regions such as the western region. Pay attention to the trade-off between universal taxation and fair taxation. Let tax collection and economic development go to a virtuous circle.

Third, we must strengthen fiscal expenditure management and optimize the structure of fiscal expenditure. The construction of an innovative economy needs to determine the quantity and structure of reasonable fiscal expenditures. Fiscal expenditure should be conducive to innovation and improve economic efficiency. It is necessary to shift from investment-driven fiscal expenditure to innovation-driven fiscal spending. In the fiscal resource allocation function, the roles of “offside”, “misplacement”, and “disapproval” will be properly implemented, and the structure of fiscal expenditures will be optimized. After clarifying the public expenditure responsibilities of the central government and local governments, increase public investment in health care, education, science and technology, and pensions, and expand the supply of public goods and quasi-public goods, especially public expenditure on capital and spending on science, education, culture, and culture.

References

[1] Alesina, A., Di Tella, R., Macculloch, R. Inequality and Happiness: Are Europeans and Americans Different? .Journal of Public Economics, 2004, (8).
[2] Arnold J., Do Tax Structure Affect Aggregate Economic Growth? Empirical Evidence from a Panel of OECD Countries. OECD Economics Department Working Papers, No.643, 2008.
[3] Chu Mingqin. Industry development, factor input and China's supply-side reform. Seeking Truth, 2016(06):33-39.
[4] Hansen., Threshold Effects in Non -dynamic Panels: Estimation, Testing and Inference . Journal of Econometrics, 1999, (2).
[5] Fan Qingquan, Zhou Xianhua, Zhang Tongbin. Externality of dynamic environmental taxes, accumulative paths of pollution, and long-term economic growth-Concurrently on the selection of time points for environmental taxes. Economic Research, 2016, 51(08):116-128 .
[6] Jia Kang, Su Jingchun. On Supply-side Reform. Management World, 2016(03):1-24.
[7] Liu LY, Ma Z Y. On taxation and economic growth: An analysis of the effects of taxation on labor, capital, and consumption in China. Chinese Social Sciences, 2002(1):67-76.
[8] Lee Y., R.H. Gordon, Tax structure and economic growth. Journal of Public Economics, 89, 2005, pp. 1027-1043.
[9] Li Weian, Li Haobo, Li Huicong. Innovation incentive or tax shield? - Research on tax incentives for high-tech enterprises. Science Research Management, 2016, 37(11):61-70.
[10] Li Hongxia. Green Technology Innovation and Environmental Tax Policy of Private Enterprises. Tax Research, 2014(03):12-15.
[11] LIU Yu, XIAO Hongwei, L ü Shukang. Economic Impact of Carbon Tax on China under Multiple Tax Return Models: Based on Dynamic CGE Model. Financial and Economic Research, 2015, 41(01):35-48.
[12] Liu Puzhao. Relationship between Macro Tax Burden and Economic Growth, Economic Science Press, 2004
[13] Li Shaorong, Yu Ying. China's tax structure, economic growth, and income distribution. Economic Research, 2005, Issue 5.
[14] Ma Yuyou. Macroeconomic Tax Burden, Investment and Economic Growth: Estimation of China's Optimal Tax Rate, World Economy, 2001(9)
[15] Mao Chenglian, Ji Li. Study on the effect of tax rate on the evasion of taxation by foreign-invested companies. World Economy, 2014, 37(06): 73-89.
[16] Myles G.D., Economic Growth and the Role of Taxation. OECD Economics Department Working Papers, No.713-715, 2009.
[17] Single Hero. Re-evaluation of China's capital stock K: 1952-2006 . Quantitative Economics and Technology Economics Research, 2008(10):17-31.

ISSN 2706-6827 Vol. 4, Issue 4: 55-70, DOI: 10.25236/IJFS.2022.040411

[18] Scully, G.W., Tax rate, Tax Revenues and Economics Growth, Policy Report No.98 National Center for Policy Analysis, Dallas.
[19] Widmalm F., Tax Structure and Growth: Are Some Taxes Better than Others?. Public Choice, 107, 2001, pp.199-219.
[20] Yang Zhenbing, Zhang Cheng. Has the efficiency of foreign-funded enterprises increased after the merger of the two taxes? Evidence from China's manufacturing industry. Finance and Trade Economy, 2015(09):19-32.
[21] Yue Shumin. Theoretical Analysis of China's Tax System Optimization, Renmin University of China Press, 2003.
[22] Ye Zhenpeng, Zhang Xin. Dual Structure Finance, Economic Science Press, 1995.
[23] Zhang Jun, Wu Guiying, Zhang Jipeng. Inter-provincial material capital stock estimation in China: 1952-2000. Economic Research, 2004(10):35-44.
[24] Zhao Zhigeng, Xia Jiechang. Quantitative Analysis and Policy Orientation of Macro Tax Burden in China, Quantitative Economic and Technical Economics, No.4, 2001

Appendix:

Table 5: Regional division of thresholds by provinces in China, 1994-2012

Year	Provinces (municipalities, autonomous regions) less than the threshold of 14.89%	Provinces (municipalities, autonomous regions) with a threshold of 14.89% and 19.37%	Provinces (municipalities, autonomous regions) with a threshold value greater than 19.37%
1994	Shanghai, Beijing, Ningxia, Inner Mongolia, Henan, Xinjiang, Sichuan, Jiangsu, Hubei, Guangdong, Chongqing, Shaanxi, Liaoning, Hainan, Heilongjiang, Shanxi, Hebei, Anhui, Shandong, Guizhou, Jilin, Gansu, Guangxi, Jiangxi, Hunan, Fujian, Zhejiang, Tianjin	Qinghai	Yunnan
1995	Shanghai, Shanghai, Beijing, Ningxia, Inner Mongolia, Henan, Xinjiang, Sichuan, Jiangsu, Hubei, Guangdong, Chongqing, Shaanxi, Liaoning, Hainan, Heilongjiang, Shanxi, Hebei, Anhui, Shandong, Guizhou, Jilin, Gansu, Guangxi, Jiangxi, Hunan, Fujian, Zhejiang, Tianjin	Qinghai, Yunnan	
1996	Shanghai, Beijing, Ningxia, Inner Mongolia, Henan, Xinjiang, Sichuan, Jiangsu, Hubei, Guangdong, Chongqing, Shaanxi, Liaoning, Hainan, Heilongjiang, Shanxi, Hebei, Anhui, Shandong, Guizhou, Jilin, Gansu, Guangxi, Jiangxi, Hunan, Fujian, Zhejiang, Tianjin	Qinghai, Yunnan	
1997	Shanghai, Beijing, Inner Mongolia, Henan, Xinjiang, Sichuan, Jiangsu, Hubei, Guangdong, Chongqing, Shaanxi, Liaoning, Hainan, Heilongjiang, Shanxi, Hebei, Anhui, Shandong, Guizhou, Jilin, Gansu, Guangxi, Jiangxi, Hunan, Fujian, Zhejiang, Tianjin	Ningxia, Qinghai, Yunnan	
1998	Shanghai, Beijing, Inner Mongolia, Henan, Xinjiang, Sichuan, Jiangsu, Hubei, Guangdong, Chongqing, Shaanxi, Liaoning, Hainan, Heilongjiang, Shanxi, Hebei, Anhui, Shandong, Jilin, Guangxi, Jiangxi, Hunan, Fujian, Zhejiang, and Tianjin	Ningxia, Guizhou, Gansu, Qinghai, Yunnan	
1999	Shanghai, Beijing, Henan, Xinjiang, Sichuan, Jiangsu, Hubei, Guangdong, Chongqing, Shaanxi, Liaoning, Hainan, Heilongjiang, Shanxi, Hebei, Anhui, Shandong, Jilin, Guangxi, Jiangxi, Hunan, Fujian, Zhejiang, Tianjin	Inner Mongolia, Guizhou, Ningxia, Gansu	Qinghai, Yunnan
2000	Shanghai, Beijing, Henan, Xinjiang, Sichuan, Jiangsu, Hubei, Guangdong, Chongqing, Shaanxi, Liaoning, Hainan, Heilongjiang, Shanxi, Hebei, Anhui, Shandong, Jilin, Guangxi, Jiangxi, Hunan, Fujian, Zhejiang, Tianjin	Inner Mongolia, Guizhou	Ningxia, Gansu, Qinghai, Yunnan

ISSN 2706-6827 Vol. 4, Issue 4: 55-70, DOI: 10.25236/IJFS.2022.040411

2001	Shanghai, Beijing, Henan, Sichuan, Jiangsu, Hubei, Guangdong, Chongqing, Liaoning, Hainan, Heilongjiang, Shanxi, Hebei, Anhui, Shandong, Jiangxi, Hunan, Fujian, Zhejiang, Tianjin	Xinjiang, Shaanxi, Jilin, Guangxi	Inner Mongolia, Ningxia, Guizhou, Gansu, Qinghai, Yunnan
2002	Beijing, Henan, Sichuan, Jiangsu, Hubei, Guangdong, Chongqing, Liaoning, Heilongjiang, Shanxi, Hebei, Anhui, Shandong, Jiangxi, Hunan, Fujian, Zhejiang, Tianjin	Shanghai, Inner Mongolia, Xinjiang, Shaanxi, Hainan, Jilin, Guangxi	Ningxia, Guizhou, Gansu, Qinghai, Yunnan
2003	Beijing, Henan, Sichuan, Jiangsu, Hubei, Guangdong, Chongqing, Liaoning, Heilongjiang, Shanxi, Hebei, Anhui, Shandong, Jiangxi, Hunan, Fujian, Zhejiang, Tianjin	Shanghai, Inner Mongolia, Xinjiang, Shaanxi, Hainan, Jilin, Guangxi	Ningxia, Guizhou, Gansu, Qinghai, Yunnan
2004	Beijing, Henan, Sichuan, Jiangsu, Hubei, Guangdong, Chongqing, Liaoning, Heilongjiang, Shanxi, Hebei, Anhui, Shandong, Jiangxi, Hunan, Fujian, Zhejiang, Tianjin	Shanghai, Inner Mongolia, Xinjiang, Shaanxi, Hainan, Jilin, Guangxi	Ningxia, Guizhou, Gansu, Qinghai, Yunnan
2005	Sichuan, Jiangsu, Hubei, Guangdong, Chongqing, Heilongjiang, Hebei, Anhui, Shandong, Jiangxi, Hunan, Fujian, Zhejiang, Tianjin	Shanghai, Beijing, Inner Mongolia, Henan, Shaanxi, Liaoning, Hainan, Shanxi, Jilin, Guangxi	Ningxia, Xinjiang, Guizhou, Gansu, Qinghai, Yunnan
2006	Jiangsu, Hubei, Guangdong, Hebei, Shandong, Jiangxi, Hunan, Fujian, Zhejiang, and Tianjin	Shanghai, Beijing, Inner Mongolia, Henan, Sichuan, Chongqing, Shaanxi, Liaoning, Hainan, Heilongjiang, Shanxi, Anhui, Jilin, Guangxi	Ningxia, Xinjiang, Guizhou, Gansu, Qinghai, Yunnan
2007	Jiangsu, Hubei, Guangdong, Shandong, Fujian, Zhejiang, Tianjin	Shanghai, Beijing, Inner Mongolia, Henan, Sichuan, Chongqing, Shaanxi, Liaoning, Heilongjiang, Shanxi, Hebei, Anhui, Jilin,	Ningxia, Xinjiang, Hainan, Guizhou, Gansu, Qinghai, Yunnan

ISSN 2706-6827 Vol. 4, Issue 4: 55-70, DOI: 10.25236/IJFS.2022.040411

		Guangxi, Jiangxi, Hunan	
2008	Jiangsu, Hubei, Guangdong, Shandong, Fujian, Zhejiang, Tianjin	Shanghai, Beijing, Chongqing, Shaanxi, Liaoning, Heilongjiang, Shanxi, Hebei, Anhui, Jilin, Guangxi, Jiangxi, Hunan	Ningxia, Inner Mongolia, Henan, Xinjiang, Sichuan, Hainan, Guizhou, Gansu, Qinghai, Yunnan
2009	Jiangsu, Guangdong, Fujian, Zhejiang, Tianjin	Shanghai, Beijing, Hubei, Shandong, Liaoning, Hebei, Guangxi, Hunan	Ningxia, Xinjiang, Inner Mongolia, Sichuan, Chongqing, Shaanxi, Hainan, Heilongjiang, Shanxi, Anhui, Guizhou, Jilin, Gansu, Jiangxi, Qinghai, Yunnan
2010	Jiangsu, Guangdong, Fujian, Zhejiang, Tianjin	Shanghai, Beijing, Henan, Hubei, Liaoning, Shandong, Hunan	Ningxia, Xinjiang, Inner Mongolia, Sichuan, Chongqing, Shaanxi, Hainan, Heilongjiang, Shanxi, Hebei, Anhui, Guizhou, Jilin, Gansu, Guangxi, Jiangxi, Qinghai, Yunnan
2011	Jiangsu, Guangdong, Fujian, Zhejiang, Tianjin	Shanghai, Henan, Hubei, Liaoning, Shandong, Hunan	Beijing, Ningxia, Xinjiang, Inner Mongolia, Sichuan, Chongqing, Shaanxi, Hainan, Heilongjiang, Shanxi, Hebei, Anhui, Guizhou, Jilin, Gansu, Guangxi, Jiangxi, Qinghai, Yunnan

ISSN 2706-6827 Vol. 4, Issue 4: 55-70, DOI: 10.25236/IJFS.2022.040411

2012	Jiangsu, Fujian, Zhejiang	Shanghai, Inner Mongolia, Henan, Hubei, Liaoning, Shandong, Hunan, Tianjin	Beijing, Ningxia, Xinjiang, Sichuan, Chongqing, Shaanxi, Hainan, Heilongjiang, Shanxi, Hebei, Anhui, Guizhou, Jilin, Gansu, Guangxi, Jiangxi, Qinghai, Yunnan
2013	Jiangsu, Fujian, Zhejiang	Shanghai, Inner Mongolia, Henan, Hubei, Liaoning, Shandong, Hunan, Tianjin	Beijing, Ningxia, Xinjiang, Sichuan, Chongqing, Shaanxi, Hainan, Heilongjiang, Shanxi, Hebei, Anhui, Guizhou, Jilin, Gansu, Guangxi, Jiangxi, Qinghai, Yunnan
2014	Jiangsu, Fujian, Zhejiang	Shanghai, Inner Mongolia, Henan, Hubei, Liaoning, Shandong, Hunan, Tianjin	Beijing, Ningxia, Xinjiang, Sichuan, Chongqing, Shaanxi, Hainan, Heilongjiang, Shanxi, Hebei, Anhui, Guizhou, Jilin, Gansu, Guangxi, Jiangxi, Qinghai, Yunnan
2015	Jiangsu, Fujian, Zhejiang	Shanghai, Inner Mongolia, Henan, Hubei, Liaoning, Shandong, Hunan, Tianjin	Beijing, Ningxia, Xinjiang, Sichuan, Chongqing, Shaanxi, Hainan, Heilongjiang, Shanxi, Hebei, Anhui, Guizhou, Jilin, Gansu,

ISSN 2706-6827 Vol. 4, Issue 4: 55-70, DOI: 10.25236/IJFS.2022.040411

			Guangxi, Jiangxi, Qinghai, Yunnan
2016	Jiangsu, Fujian, Zhejiang	Shanghai, Inner Mongolia, Henan, Hubei, Liaoning, Shandong, Hunan, Tianjin	Beijing, Ningxia, Xinjiang, Sichuan, Chongqing, Shaanxi, Hainan, Heilongjiang, Shanxi, Hebei, Anhui, Guizhou, Jilin, Gansu, Guangxi, Jiangxi, Qinghai, Yunnan