Fiscal Expenditure and Income Gap between Urban and Rural Residents: An Empirical Study Based on Malmquist Index and Spatial Econometrics

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Abstract Based on the analysis methods of non-parametric Malmquist index and spatial econometrics as well as the provincial panel data in 2007 -2010, this paper estimates the efficiency of fiscal expenditure from local governments in china in terms of reducing the income gap between urban and rural residents for the first time and evaluates the spatial correlation and heterogeneity of this efficiency. The results have shown that the fiscal expenditure of most provinces is of low efficiency in reducing the income gap between urban and rural residents, and the expenditure efficiency of local governments is not relevant to their levels of economic development. Besides, the efficiency on reducing the urban-rural income gap between different regions of China has a tendency of convergence. But this is mainly reflected inside the regional economic belt. There is significant difference between the efficiency of each economic belt. The central region has the highest efficiency in a rising trend, the western region has the lowest efficiency in a downward trend, while the eastern region is relatively stable.

Key words Fiscal expenditure, Rural-urban income gap, DEA method, Spatial econometrics

1 Introduction

With 30 years of reform and opening up, China has made remarkable economic achievements. However, underlying problems in social economy have been gradually revealed, especially the problem of widening urban-rural income gap. From the aspect of the ratio between the average disposable income per capita in urban families and the annual net income per capita in rural families, this index has increased from 2.6 in 1978 to 3.2 in 2010, much higher than the urban-rural income ratio of about 1.5 in most countries and regions. China has become one of the countries with the largest urban-rural income gap. The widening of urban-rural income gap not only goes against the objective of equitable economic development in society, but also directly challenges the fundamental premise of reform-social stability. The development experience of Latin American countries tells us that ignoring the income inequality problems while pursuing economic growth will affect the quantity and quality of long-term economic growth. It will be a major issue for China to know how to reverse the present situation and to balance urban and rural development in the future path of development.

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Because of the inferiority of agriculture, high fertility rates and low human capital in rural area and the long-term urban-biased economic policy, there is a wide gap between urban and rural income, which is apt to falling into the steady state of imbalance[2]. The situation of urban-rural inequality tends to get worse when relying on self regulation of economic system. The adjusting and coordinating of the economic policy is urgently needed to reverse the severe imbalance situation. In addition, it is essential to reverse urban-rural income imbalance relying on the fiscal policy on the basis of state-guaranteed political assurance, which is different from the imperfection of the financial system, especially the rural financial operation system[3]. The classical fiscal policy theories have emphasized the important role that public finance is playing in equitable income distribution[11]. This is not only reflected in the fiscal policy of supporting agriculture and benefiting farmers, but also lies in the expenditure on education, social security, medical treatment and other related fields with proper use of fiscal policies to narrow the income gap between urban and rural residents. The parameter estimation method has been applied in a large volume of literature to perform a variable inspection on the impact of the fiscal expenditure and financial support for agriculture policy of the government that has been made on urban-rural income gap[1,4]. But little literature has demonstrated evaluated the effect and efficiency of the general governmental fiscal expenditure on education, social security, medical treatment *etc.* on narrowing the income gap between urban and rural residents as well as the inter-provincial regional difference of this efficiency. In fact, as compared with the effect of direct fiscal expenditure policy, it is obvious that narrowing the urban-rural income gap with the effect of general fiscal expenditure on education, social securi-

ty, and medical treatment *etc*. is more a long-term policy for reversing imbalance between urban and rural.

2 Research Methods and Data

2.1 DEA method and input-output data Malmquist index method based on Data Envelopment Analysis (DEA) is applied to estimate the efficiency of general fiscal expenditure on narrowing the urban-rural income gap. DEA method was proposed by Charnes *et al* (1978). This method applies mathematical programming and statistical data to determine the optimal production frontier and to evaluate the relative efficiency of Decision Making Units (DMU) by comparing them with the production frontier. Malmquist index method based on DEA can be used as the efficiency index[10] to indicate the changes of the overall production efficiency from t period to $t+1$ period. A Malmquist index of greater than 1 means that the production efficiency is on the rise, a Malmquist index of less than 1 means that the production efficiency is trending down, while a Malmquist index of equaling to 1 means that the production efficiency remains unchanged.

As a non-parametric method, estimating the efficiency with Malmquist method based on DEA has the following advantages: (1) there is no need to assume specific production function forms, which will help to avoid deviation of empirical conclusions due to wrong model assumption; (2) this method can be used to evaluate the overall efficiency of multiple input and outputs to avoid unicity of the index; (3) there is no need to perform unit transformation processing for the index variable of input and output, and the optimal efficiency index of the decision making unit has nothing to do with the dimensional selection of input index value and output index value; (4) there is no need to make any weight assumptions, and obtaining the optimal weight with the actual data inputted and outputted by the decision making unit is much more objective.

DEA method comes in many forms, but it can be divided into CCR model and BCC models. The former assumes that returns to scale remains unchanged, while the latter assumes that returns to scale is changeable. In addition, DEA falls into input-oriented model and output-oriented model. The input-oriented model requires minimizing the input without adding the output; whiling the output-oriented model is used to calculate how to maximize the output when the input remains unchanged. When the returns to scale remain unchanged, the technical efficiency values calculated by the above two items are the same. And when the returns to scale are changeable, the efficiency values calculated by the above two items are generally different.

Since this paper aims to study the efficiency of the fiscal expenditure of local governments in China on narrowing the income gap between urban and rural residents, and the objective is to allocate fiscal funds in all fields rationally and to improve the service efficiency of fiscal funds with a certain amount of fiscal funds, we adopt the output-oriented DEA model. After determining the basic mode for DEA calculation, it is required to determine the input-output variable. First, investigate the input variable – the general fiscal expenditure of local governments. Though there are 18 sub items in the general budget expenditure of the statistical yearbook, we believe that the general fiscal expenditure that helps narrow the income gap between urban and rural residents mainly includes four items excluding the obvious rural-biased fiscal expenditure: education expenditure, expenditure for social security and employment, health care expenditure and the expenditure for urban and rural community affairs.

The fiscal educational expenditure provides the poor rural residents with an opportunity to learn and acquire knowledge[12], which is conducive to the improvement of human capital for rural residents and will help to narrow the urban-rural income gap[5]. The expenditure for social security and employment may directly introduce the social wealth to the low – income group from the high – income group through the redistribution effect of income, which is helpful for narrowing the urban-rural income gap. The expenditure for health care as well as urban and rural community affairs is very likely to change the living costs of the urban and rural residents, which will make an impact on the change of urban-rural income gap. As to the output variable "the income gap between urban and rural residents". In this paper, the disposable income per capita for urban residents stated in *China Statistical Yearbook* acts for the income of urban residents, while rural per capita net income acts for the income of rural residents. And the ratio between the net per capita income of rural residents and the disposable income per capita for urban residents is regarded as the proxy variable for the income gap between urban and rural residents. The greater the index is, the fairer the distribution will be, indicating a smaller income gap between urban and rural residents; on the contrary, a smaller index indicates that the distribution is unfair and the income gap between urban and rural residents is getting larger. It is remarkable that this paper has used the ratio between the net per capita income of rural residents and the disposable income per capita for urban residents as the proxy variable for the income gap between urban and rural residents, not the ratio between the income of urban residents and rural residents that is frequently used by scholars. The reason is that DEA method requires that positive correlation exists between the input index and output index.

The empirical research in this paper applies the provincial panel data in China, and the cross section includes 31 provinces, municipalities or autonomous regions in mainland China (hereinafter referred to as the "province"). As significant adjustments have been made to the statistical subjects of financial revenue and expenditure in China, the division of fiscal expenditure is carried out in accordance with the fiscal expenditure functions rather than the nature of expenses originally. There is significant difference in the statistical statement of relevant data on fiscal expenditure in China when adopting the former and latter standard respectively. Based on the comparability principle of the data, we have chosen the fiscal expenditure data in 2007 – 2010 to perform empirical analysis finally. On account of the influence of the price factor,

the base price for all the fiscal expenditure in this paper refers to the price in 2007. In addition, as the population in each province of China varies significantly, we have adopted the ratio between various expenditures and the total population as the input variable in the way of unitization to ensure the comparability of the data. That is to say, this paper applies the education expenditure per capita, expenditure for social security and employment per capita, health care expenditure per capita and the expenditure for urban and rural community affairs per capita based on the constant price in 2007 as the input variables, and applies the ratio between the ratio between the net per capita income of rural residents and the disposable income per capita for urban residents as the output variable. The definitions and descriptive statistics for each variable are shown in Table 1.

Table 1 Definition and descriptive statistics of input and output variables

Variable	Definition	Observed number	Average value	Standard deviation	Minimum value	Maximum value
Ratio between per capita income of rural and urban residents	Net per capita income of rural residents/the disposable income per capita for urban residents	124	0.33	0.06	0.22	0.46
Education expenditure per capita	Education expenditure/population	124	835.16	414.40	348.09	2294.79
Social security and employment expenditure per capita	Social security and employment expenditure/population	124	67239	422.75	188.20	3365.95
Health care expenditure per capita	Health care expenditure/population	124	313.18	187.90	93.15	1065.45
Expenditure for urban and rural community affairs per capita	Expenditure for urban and rural community affairs/population	124	480.83	550.54	72.88	3135.67

Data source: *Comprehensive Statistical Data and Materials on* 50 *Years of New China and China Statistical Yearbook*, the same as below.

2.2 Spatial econometrics and weight matrix As significant heterogeneity exists between the regions targeted at inter-provincial units, the efficiency of fiscal expenditure on reducing the urban-rural income gap varies between regions. Analyzing the dynamic change trend and specific form of expression for this heterogeneity plays a critical role in the reasonable arrangement of spatial configuration for financial resources and efficiency optimization of fiscal expenditure. This paper will estimate the spatial correlation of fiscal expenditure efficiency based on the Moran'I index and scatter diagram in Spatial Econometrics. Moran'I index is a frequently used index for determining the spatial correlation[6,8] with the value range of[-1,1]. A value of 0 indicates that spatial correlation does not exist between regions, a value of greater than 0 indicates that positive spatial correlation exists between the efficiency of regional fiscal expenditures, while a value of less than 0 indicates negative correlation. The greater the absolute value is, the stronger the spatial correlation of efficiency will be, vice versa. The specific computational formula is as follows:

$$Moran's\ I = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} W_{ij}(x_i - \bar{x})(x_j - \bar{x})}{S^2 \sum_{i=1}^{n}\sum_{j=1}^{n} W_{ij}} \quad (1)$$

where $S^2 = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2$, $\bar{X} = \frac{1}{n}\sum_{i=1}^{n} x_i$, i and j refer to various regions, n refers to the total number of units in a region, while x_i and x_j refers to the observed index value for I and j regions respectively, *i. e.* the efficiency level of fiscal expenditure for various regions. W_{ij} refers to the spatial weight matrix elements applying frequently assignment method. The squared value of inverse distance between regions is used as the element value in the spatial weight matrix, *i. e.*:

$$W_D = \begin{cases} d_{ij}^{-2} & i \neq j \\ 0 & i = j \end{cases} \quad (2)$$

In the above formula, d_{ij} refers to the spatial distance between i region and j region applying the spherical distance between provincial capitals for measurement. The specific computational process is as follows: first of all, obtain the longitude and latitude of provincial capitals for i province and j province respectively according to the National Center for Geographic Information, *i. e.* (lon_i, lat_i) and (lon_j, lat_j). lon_i and lon_j refer to the longitude of provincial capitals for i province and j province (radian), while lat_i and lat_j refer to the latitude of provincial capitals for i province and j province (radian); then according to the computational formula of spherical distance: $D_{ij} = R * \arccos(\sin lat_i * \sin lat_j + \cos lat_i * \cos lat_j * \cos(|lon_i - lon_j|)$, calculate the spatial distance between provincial capitals with R referring to the hemisphere.

3 Empirical Research Results and Analysis

3.1 Measured results of inter-provincial efficiency Prior to calculating the efficiency with DEA method, verify the index for input, output and the decision making unit respectively at first. Firstly, DEA method requires that the number of decision making units is more than twice of amount of the input and output indexes. The objects of study in this paper are the provincial – level local governments in China, and the decision making units are the 31 provinces in China. And there are 5 input and output indexes in total, which meets the requirements. Secondly, DEA method requires that positive correlation exists between the input and output indexes. Therefore, a correlation test needs to be carried out for the input variables and output variables before calculating with DEA method to make sure that the correlation coefficient between the above two is a positive value. Pearson correlation coefficients between input variables and output variables are shown in Table 2.

Table 2 indicates that the correlation coefficients between the input variables and output variables are all positive values, and significant positive correlation is presented under the significance

level of at least 5%. Therefore, the input and output variables selected in this paper meet relevant requirements, and DEA method can be applied to estimate the efficiency of fiscal expenditure. According to the above DEA application method, we have measured and calculated the efficiency value of fiscal expenditure from the provincial-level local governments in china in terms of reducing the income gap between urban and rural residents as well as the corresponding Malmquist indexes, as shown in Table 3.

Table 2 Table of Pearson correlation coefficients between input variables and output variables

	Education expenditure per capita	Social security and employment expenditure per capita	Health care expenditure per capita	Expenditure for urban and rural community affairs per capita
Ratio between per capita income of rural and urban residents	0.31*** (0.00)	0.18** (0.05)	0.20** (0.02)	0.50*** (0.00)

Note: the figure in brackets refers to p value, while *** and ** indicate that significant correlation exists at the significance level of 1% and 5% respectively.

Table 3 Fiscal expenditure efficiency of each province in China and Malmquist index calculation in 2007 – 2010

	Efficiency of fiscal expenditure				Malmquist index			
	2007	2008	2009	2010	2007	2008	2009	2010
Beijing	0.32	0.34	0.38	0.41	1.00	1.08	1.12	1.00
Tianjin	0.50	0.50	0.55	0.56	1.00	1.01	1.09	0.92
Hebei	1.00	0.94	0.97	1.00	1.00	0.94	1.02	1.00
Shanxi	0.66	0.64	0.68	0.74	1.00	0.98	1.07	0.94
Inner Mongolia	0.55	0.55	0.49	0.48	1.00	1.00	0.91	0.92
Liaoning	0.74	0.83	0.74	0.86	1.00	1.12	0.90	0.95
Jilin	0.77	0.77	0.76	0.78	1.00	1.00	0.99	0.96
Heilongjiang	0.84	0.94	0.93	1.00	1.00	1.13	0.98	1.00
Shanghai	0.31	0.31	0.41	0.48	1.00	1.03	1.29	0.97
Jiangsu	1.00	1.00	0.98	1.00	1.00	1.00	0.99	1.00
Zhejiang	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Anhui	0.97	0.91	0.96	0.91	1.00	0.94	1.05	0.92
Fujian	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00
Jiangxi	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Shandong	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Henan	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hubei	1.00	0.99	1.00	1.00	1.00	0.99	1.01	1.00
Hunan	1.00	1.00	0.94	0.97	1.00	1.00	0.94	1.06
Guangdong	0.79	0.75	0.78	0.89	1.00	0.95	1.05	1.06
Guangxi	0.89	0.92	0.74	0.75	1.00	1.04	0.81	1.00
Hainan	0.78	0.73	0.67	0.66	1.00	0.93	0.93	0.88
Chongqing	0.71	0.72	0.69	0.70	1.00	1.01	0.97	0.94
Sichuan	0.97	0.92	0.91	0.87	1.00	0.95	0.99	0.94
Guizhou	1.00	0.86	0.83	0.85	1.00	0.86	0.97	1.00
Yunnan	0.64	0.65	0.58	0.66	1.00	1.02	0.89	1.07
Tibet	0.34	0.24	0.25	0.32	1.00	0.69	1.05	0.99
Shaanxi	0.58	0.50	0.49	0.49	1.00	0.87	0.98	0.99
Gansu	0.61	0.62	0.60	0.58	1.00	1.01	0.98	0.99
Qinghai	0.45	0.38	0.37	0.33	1.00	0.84	0.99	0.98
Ningxia	0.54	0.46	0.50	0.57	1.00	0.86	1.09	1.00
Xinjiang	0.56	0.54	0.54	0.58	1.00	0.96	1.00	0.98
Whole country	0.74	0.74	0.73	0.75	1.00	1.00	0.99	0.98

Table 3 provides the calculation data for fiscal expenditure efficiency of each province in China and Malmquist index during 2007 – 2010. The efficiency of fiscal expenditure varies significantly between each province of China. In 2007, the minimum efficiency value is 0.31 in Shanghai, which is far from the efficiency value of the efficiency frontier – 1. While in 2008, 2009 and 2010, Tibet had the lowest efficiency values of 0.24, 0.25 and 0.32 respectively, which are far from that of the provinces at the efficiency frontier. It is remarkable that though the fiscal expenditure efficiencies of Shanghai and Tibet are at a lower level throughout the country, there is great difference between the economic development levels, local financial levels and the fiscal expenditures per capita of them. This indicates that the fiscal expenditure efficiency of local governments in China has nothing to do with its economic development level (applying pooled regression for fiscal expenditure efficiency using GDP per capita, with the regression coefficient of – 0.006 and T value of 0.79. And null hypothesis can not be rejected under the significance level of 10%).

From the aspect of Malmquist index, six provincial regions including Beijing, Zhejiang, Fujian, Jiangxi, Shandong and Henan have presented a rising trend (Malmquist index of greater than 1) in the fiscal expenditure efficiency for three consecutive years, while only three provinces and cities including Hainan, Shaanxi and Qinghai have presented a downward trend (Malmquist index of lower than 1) for three consecutive years. This indicates that the fiscal expenditure efficiencies of most provinces in China have failed to present a stable tendency.

The bottom line in Table 3 provides the average value of fiscal expenditure efficiency and Malmquist index in 2007 – 2010 throughout the country. From the aspect of fiscal expenditure efficiency, the efficiency of fiscal expenditure from provincial-level local governments in china in terms of reducing the income gap between urban and rural residents is relatively low. The average efficiency value of the four years is maintained at around 0.73, which is far from the efficiency frontier.

From the aspect of Malmquist index, the average efficiency values of provincial-level local governments haven't got significant improvements. The Malmquist index of China in 2008 is 1.00, which is not improved when compared with the average efficiency of local governments in 2007. The troubling fact is that the Malmquist indexes in 2009 and 2010 are 0.99 and 0.98 respectively, which are lower than 1. This indicates that the fiscal expenditure efficiencies of 2009 and 2010 in China have declined slightly when compared with that of 2008.

The empirical results indicate that the efficiency of fiscal expenditure in most provinces in terms of reducing the income gap between urban and rural residents is relatively low with various reasons.

(1) We believe that this is very much related to the development pattern of "pure economic growth" of local governments at present. According to the study of[7], local officials prefer to use GDP index to indicate the preference of residents, and superior leaders also glad to use the simple and measurable index-GDP to judge the promotion qualification of subordinate officers under the promotion system in the mode of championships for local officials in China. As a result, HDP growth has become the primary goal of local officials, and it is also an important goal orientation for governmental financial expenditures. Meanwhile, other indexes such as the income gap between urban and rural residents *etc*. are relatively ignored, which constitutes a major cause on the part of local governments when low fiscal expenditure efficiency exists in the economic fairly-developed and less-developed areas.

(2) Unreasonable scale of general fiscal expenditure constitutes another reason for low fiscal expenditure efficiency. Although the general fiscal expenditures on education, social security and employment *etc*. have been increased significantly in recent years in China, their relative scale is still at a low level. Taking the education expenditure for example, though the share of education expenditure in GDP has been increased to 3.1% in 2010, it's still far less than 4.9% of the world average and 5.1% of the developed countries. The relative scale is at a low level, which prevents the general fiscal expenditures from playing a part in narrowing the urban-rural income gap.

(3) The service efficiency of fiscal funds is very low. After the tax allocation reform in 1994, the fiscal funds in China have been centralized by the central government gradually, and the local governments need to obtain fiscal funds from the central government in the form of project approval. In order to obtain the capital investments from the higher level soon, the project approval of local governments usually has the characteristics of blindness and arbitrariness, lacking the feasibility study on the real-world environment including the local economic society *etc*. In this way, the service efficiency of fiscal funds is reduced. In addition, the phenomenon that the higher budget unit retains or diverts part of the funds utilizing its fund allocation right in the process of fund appropriation is relatively common, although the centralized treasury payment reform has been introduced. Moreover, malversation of local government officials will cause loss of fiscal expenditure funds, while will also reduce the efficiency of fiscal expenditures from local governments apparently. And this phenomenon will go against its effect on narrowing the urban-rural income gap.

3.2 Spatial correlation and heterogeneity of inter-provincial efficiency The measured results of inter-provincial efficiency for fiscal expenditure in China and Malmquist index show that the fiscal expenditure efficiencies of most of the provinces are relatively low, and the fiscal expenditure efficiency varies significantly between different regions of China. This paper will determine the spatial correlation of fiscal expenditure efficiency based on the Moran'I index and scatter diagram in Spatial Econometrics. In Table 4, the calculated results of Moran'I index show that the fiscal expenditure efficiency between regions during the inter-temporal investigation presents an obvious spatial correlation, which has been strengthened increasingly since 2008.

Table 4 Inter-provincial Moran'I index in China during 2007 – 2010

	2007	2008	2009	2010
Moran'I	0.170*** (0.01)	0.166*** (0.01)	0.191*** (0.01)	0.215*** (0.00)

Note: the same as Table 2.

Moran's I index reflects the global spatial autocorrelation of the overall efficiency level. For more information on the local spatial autocorrelation between regions, the Moran's I scatter diagram needs to be depicted. In Fig. 1, the local Moran's I scatter diagram is depicted for the year of 2010. Seen from the quadrant distribution of various regions, only a few regions are located in the second and the fourth quadrants, and most of the regions are located in the first and the third quadrants. That is to say, cluster regions of high-high and low-low types are dominant, and the efficiency level of fiscal expenditure presents a significant feature of clustered distribution according to the economic belts. The central provinces including Anhui, Jiangxi and Henan *etc*. are located in the first quadrant, while the western provinces including Gansu, Qinghai and Xinjiang *etc*. are located in the third quadrant. The division of high-high and low-low modes for the efficiency of regional fiscal expenditure indicates that the fiscal expenditure efficiency may present some kind of heterogeneity between the eastern, central and western regions according to the economic belts.

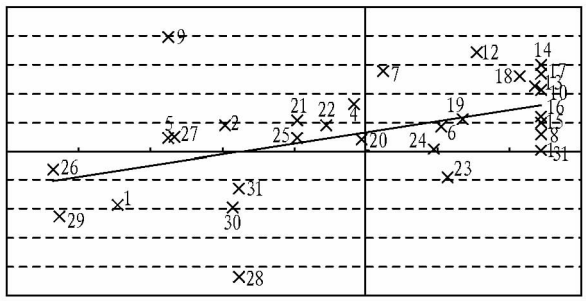

Fig. 1 Inter-provincial Moran's I scatter diagram of the year 2010

Table 5 shows the fiscal expenditure efficiency and Malmquist index of the eastern, central and western regions, and there is significant difference in the fiscal expenditure efficiency of the three regional economic belts. The central region has the highest fiscal expenditure efficiency (the mean value of the 4 years is 0.87) in a rising trend, the western region has the lowest fiscal expenditure efficiency (the mean value of the 4 years is 0.59) in a downward trend, while the mean value of fiscal expenditure efficiency for the eastern region of China is 0.78. This indicates that obvious regional heterogeneity exists on the effi-

ciency of fiscal expenditure in terms of reducing the income gap between urban and rural residents.

Table 5 Fiscal expenditure efficiency and annual averages of Malmquist index in the eastern, central and western regions during 2007 – 2010

Index	Efficiency of fiscal expenditure				Malmquist index			
	2007	2008	2009	2010	2007	2008	2009	2010
Eastern region	0.77	0.77	0.77	0.80	1.00	1.03	1.02	0.98
Central region	0.81	0.86	0.87	0.92	1.00	1.06	1.02	0.99
Western region	0.62	0.60	0.55	0.59	1.00	0.94	0.94	0.98
Nationwide	0.74	0.74	0.73	0.75	1.00	1.00	0.99	0.98

In order to judge whether there is difference in the fiscal expenditure efficiency between the eastern, central and western region in China, we have applied the Kruskal – Wallis rank-sum test to perform inspection. The hypothesis testing is set as follows: null hypothesis; alternative hypothesis of H_0: $x_1 = x_2 = x_3$ and H_1: $x_{\neq} x_2 \neq x_3$. Where x_1 refers to the efficiency value of each province in the eastern region in 2007 – 2010, x_2 refers to the efficiency value of each province in the central region in 2007 – 2010, while x_3 refers to the efficiency value of each province in the western region in 2007 – 2010. The specific test results are shown in Table 6.

Table 6 Kruskal – Wallis rank-sum test for the difference in fiscal expenditure efficiency between eastern, central and western regions in China during 2007 – 2010

Average efficiency value of each province in 2007 – 2010		Eefficiency value of each province in 2007 – 2010	
Chi – Square value	P value	Chi – Square value	P value
7.59	0.029**	24.31	0.00***

Note: *** and ** indicate that significant correlation exists under the significance level of 1% and 5% respectively.

Table 6 shows that significant difference on fiscal expenditure efficiency exists between the eastern, central and western regions in 2007 – 2010 under the significance level of 5%, no matter the average efficiency value or the efficiency value. The results show that significant difference on fiscal expenditure efficiency exists between the eastern, central and western economic regions. Combining with the measured results of Moran's I index, we believe that though the fiscal expenditure efficiency between different regions of China has shown a tendency of convergence recently, this phenomenon is mainly reflected inside the regional economic belt. The fiscal expenditure efficiency of the eastern, central and western economic belt has presented an obvious scattering tendency. When applying the fiscal expenditure policies to reduce the urban-rural income gap, the government needs to take this spatial heterogeneity into account to allocate financial resources reasonably and effectively.

4 Conclusion and recommendations

According to the research on panel data of provinces in China in 2007 – 2010, the fiscal expenditure of most provinces is of low efficiency in reducing the income gap between urban and rural residents, and the expenditure efficiency of local governments has nothing to do with their levels of economic development. The analysis results of spatial econometrics and other methods show that the efficiency on reducing the urban-rural income gap between different regions of China has a tendency of convergence. But this is mainly reflected inside the regional economic belt. There is significant difference between the efficiency of each economic belt. The central region has the highest efficiency in a rising trend, the western region has the lowest efficiency in a downward trend, while the eastern region is relatively stable. This indicates that obvious regional heterogeneity exists on the efficiency of fiscal expenditure in terms of reducing the income gap between urban and rural residents.

The continue widening of urban-rural income gap has become an obstacle for the overall urban and rural development, while narrowing the urban-rural income gap through fiscal means is an important measure for reversing the imbalance of urban and rural income. In order to improve the efficiency of fiscal expenditure on narrowing the urban-rural income gap, we recommend:

(1) Incorporating the narrowing of urban-rural income gap into the performance indicators of local governments in order to change the development pattern of "pure economic growth".

(2) Increasing the public finance expenditure on education, social security, medical insurance and other public domain.

(3) Taking the opportunity of the reform on public financial system to improve the public fiscal system, promote government transformation, establish a service-oriented government system and improve the service efficiency of fiscal funds.

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mentation of ISO9000 Series Standards.

4.2 Policy recommendations According to the results of empirical research, we put forth the following recommendations for promoting food enterprises' implementation of ISO9000 Series Standards.

(1) Food enterprises pay more attention to enhancing the level of quality safety in various stages of their own development, but the procedures of implementation of ISO9000 Series Standards are cumbersome, needing to take a long time and a certain cost, which are subject to the restrictions of capital, technology and other aspects. Government should provide further policy support, such as tax incentives or direct funding and technical support, to improve enterprises' enthusiasm for implementing ISO9000 Series Standards.

(2) Under the grim situation of food security, institutional factors become the main factors affecting food enterprises' implementation of ISO9000 Series Standards. Government should strengthen food safety control, orient the opinion of the public and media, make certification agencies ensure certification service quality, and create the institutional environment for enterprises' implementation of ISO9000 Series Standards.

(3) Employees' quality is one of the factors restricting food enterprises' implementation of ISO9000 Series Standards. Employees' average educational level plays a prominent role in promoting enterprises' implementation of ISO9000 Series Standards. When the corporate decision-makers carry out quality safety management, they should also enhance the quality safety training for employees. In addition, in the implementation of ISO9000 Series Standards, enterprises should assess the certification cost and benefit, and pay attention to compatibility between ISO9000 Series Standards and original certification system, to reduce the cost of implementing ISO9000 Series Standards and ensure the reasonableness and validity of implementation of ISO9000 Series Standards.

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