Empirical Research on the Development of Regional Service Industry under the Perspective of Generalized Virtual Economy —Take Sichuan Province as an Example

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Abstract. From the perspective of generalized virtual economy, considering physical factors and non-physical factors that affect the development of service industry, a system including three terms and 14 indicators is built to evaluate the development of service industry. With K-means clustering, multiple regression and other methods, an empirical study on the factors that affect the development of regional service industry in Sichuan province is conducted. It is derived that the development of regional service industry is mainly pulled by physical factors and the impact of non-physical factors is increasing. Meanwhile, the impact factors of every region are different and the corresponding policies should be adapted.

Introduction

The service industry plays an important role in the economic activities and its development degree is a significant measure of the region's overall competitiveness and modernization. Therefore it is crucial to find the dominant factors according to the development characteristic of the industry so as to work out some appropriate policies. Jiang(2004) [1] analysed the relationship between the economic development and the industry service from multiple perspectives by using quantitative analysis, and stated in detail about the factors' such as income level, urbanization situation, consumption structure influences on the service industry. Zhang(2007) [2] presented that the dominant obstacle factors for the national modernized service development include low market-oriented level, slow industrialization and urbanization, lack of best talent, low level of internationalization. Wu(2010) [3] showed that institutional innovation, capital investment and technical progress are the three fundamental forces to advance the modern service development.

All the literature above only considered the physical factors, ignoring the non-physical factors' impact on the service industry development. Lin(2010) [4] proposed that generalized virtual economy is the comprehensive economy including the economy satisfies both material and psychological needs and the economy only satisfies the psychological needs. Generalized virtual economy is people-oriented and attaches importance on peoples' total needs. Hu(2011) [5] showed that generalized virtual economy theory provides a new perspective to observe the economic and social development. It is a strategic mission to improve generalized virtual economy.

Current research results focus on the physical factors for the most part, without considering non-physical factors' impact from the perspective of generalized virtual economy on one hand. On the other hand, there are few empirical analysis from the view of generalized virtual economy and it is even a gap for the empirical research on regional service industry. Therefore, our study has an important significance ,it can advance the perspective of research, expand the development space of service industry, lay a foundation for systematic studies on regional service industry, provide references on a better development of regional service industry.

Analysis of affect factors to service industry development

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After summarizing the literature, we found that there is a certain difference among service industry index evaluation systems established by different scholars. Huang and Hong(2007) [6] put forward the factors affecting the service development of Jiangsu Province including: per capita GDP、population density、the added value of the second industry、service industry employment、service industry gross capital formation、urban disposable incomes、social fixed assets investment. Ao and Liu(2009) [7] applied factor analysis, adopted 11 indicators to evaluate the overall development condition of modern service industry in Wuhan Province.

This paper chooses to observe the factors affecting the regional service industry from three aspects, which are service industry development level、development foundation and development ability, based on the existing literature, combining with the reality and characteristics of regional service industry in Sichuan Province, considering the meanings of variables and availability of data. Service industry development level includes gross output value of service industry, service industry employment(Real economy part and Generalized virtual economy part),and service industry gross fixed-asset investment(Real economy part and Generalized virtual economy part); Service development foundation contians per capita disposable income, per capita consumption expenditure, urbanization rate, the government general budget expenditure(Real economy part and Generalized virtual economy part), per capita GDP, grade highway mileage; Service industry development ability includes number of professional and technical personnel and research expenditures.From the perspective of generalized virtual economy, variables are divided into real economy and generalized virtual economy two aspects to find out the principle factors and to provide targeted advices.

The empirical analysis on the development of service industry in Sichuan Province

Cluster analysis and classification

The proportion of service added value in GDP reflects the status of service industry in the national economy and is a principle indicator examining the development of service industry. Therefore we select this indicator, make the cluster analysis and classification for the 21 cities and states with 2011 data. The K-means clustering analysis results as shown in Table1, and clustered into four groups.

Table1 Cluster results for the 21cities and states

Case Number	Cluster	Distance	Case Number	Cluster	Distance	Case Number	Cluster	Distance
Chengdu	1	0.00000	Meishan	3	0.00340	Suining	3	0.00139
Zigong	2	0.01724	Yibin	3	0.01611	Neijiang	3	0.00066
Panzhihua	3	0.00895	Guang'an	2	0.00115	Leshan	2	0.00450
Luzhou	2	0.01677	Dazhou	3	0.00423	Nanchong	2	0.00514
Deyang	3	0.00987	Ya'an	2	0.00858	A'ba	4	0.00841
Mianyang	4	0.02496	Bazhong	4	0.00699	Ganzi	4	0.02182
Guangyuan	4	0.00642	Ziyang	3	0.00961	Liangshan	2	0.00656

Study of factors influencing the regional development of service industry

(1)The province level

With the perspective of generalized virtual, select the service industry gross output value as an explanatory variable, the model is built as:

$$y = a + \sum_{i=1}^{13} b_i x_i + \varepsilon \quad (1)$$

Inside, a is the intercept term, ε is the residual term, x_1 represents the service industry employment in the real economy part, x_2 represents the service industry employment in the generalized virtual economy part, x_3 represents the service industry gross fixed-asset investment in the real economy part, x_4 represents the service industry gross fixed-asset investment in the

generalized virtual economy part, x_5 represents per capita disposable income, x_6 represents per capita consumption expenditure, x_7 represents urbanization rate, x_8 represents the government general budget expenditure in the real economy part, x_9 represents the government general budget expenditure in the generalized virtual economy part, x_{10} represents per capita GDP, x_{11} represents the grade highway mileage, x_{12} represents the number of professional and technical personnel, x_{13} represents research expenditures.

We use SPSS to deal with the data ranging from 2005 to 2011 and the regression results are shown in Table 2:

Table 2 The regression analysis results for factors influencing the whole province's service sector development. a

Model	Non-standardized coefficients		t	Sig.
	B	Standard error		
(constant)	-2796.380	6.345	-440.727	.001
per capita consumption expenditure	.656	.001	580.670	.001
service industry employment in the generalized virtual economy part	1.758	.004	484.398	.001
service industry gross fixed-asset investment in the generalized virtual economy part	.132	.001	171.720	.004
per capita GDP	.007	.000	16.405	.039

a. Dependent variable: The gross output value of service industry

It is clear that they have the most significant effect on the development of service industry such as per capita consumption expenditure、service industry employment in the generalized virtual economy part、service industry gross fixed-asset investment in the generalized virtual economy part、per capita GDP.

However, the fixed-asset investment for service industry has been mainly focused in the real economy part so far. The proportion of investment for the real economy part is higher than 80%, but the investment for the generalized virtual economy part is less than 20%.

(2)The city or state level

Considering that the service development level is mainly reflected in the output value, we select the per capita output value as the explanatory variable. Under the perspective of generalized virtual, the model is built as below:

$$y = a + \sum_{i=1}^{10} b_i x_i + \varepsilon \tag{2}$$

Inside, a is the intercept term, ε is the residual term, x_1 represents the service industry employment in the real economy part, x_2 represents the service industry employment in the generalized virtual economy part, x_3 represents per capita disposable income, x_4 represents per capita consumption expenditure, x_5 represents urbanization rate, x_6 represents the government general budget expenditure in the real economy part, x_7 represents the government general budget expenditure in the generalized virtual economy part, x_8 represents the grade highway mileage, x_9 represents the number of professional and technical personnel, x_{10} represents research expenditures.

1)The first cluster

Using SPSS to deal with the Chengdu's data ranging from 2005 to 2011, the regression results are shown in Table 3. From the table we can draw a conclusion that this indicators have the most significant influence on the development of service industry in Chengdu area.

Table 3. The regression analysis results of factors influencing the service industry development in region I[a]

Model	Non standardized coefficients		t	Sig.
	B	Standard error		
(Constant)	1446.329	1335.157	1.083	.340
per-capita disposable income	.959	.089	10.808	.000

a. Dependent variable: per capita output value of the service industry

2)The second cluster

Based on the data ranging from 2005 to 2011 in Zigong, Luzhou, Leshan, Nanchong, Guang'an, Ya'an, Liangshan, using SPSS, we can obtain the results that those indicators have the most significant influence on the development of service industry in these five cities. shown in Table 4.

Table 4 The regression analysis results of factors influencing the service industry development in region II[a]

Model	Non standardized coefficients		t	Sig.
	B	Standard error		
(Constant)	936.162	163.577	5.723	.000
per capita GDP	.235	.011	22.117	.000
service industry employment in the real economy part	19.387	4.035	4.805	.000
Research expenditures per capita	24.301	9.230	2.633	.013

a. Dependent variable: per capita output value of service industry

3)The third cluster

Based on the data ranging from 2005 to 2011 in Panzhihua, Deyang, Suining, Neijiang, Meishan, Yibin, Dazhou and Ziyang, using SPSS, we can obtain the regression results shown in Table 5. Those indicators have the most significant influence on the development of service industry in these eight cities.

Table5 The regression analysis results of factors influencing service industry development in region III[a]

Model	Non standardized coefficients		t	Sig.
	B	Standard error		
(Constant)	-466.118	191.345	-2.436	.019
per capita GDP	.189	.010	18.763	.000
urbanization rate	3180.105	810.078	3.926	.000
government general budget expenditure in the real economy part	.161	.054	2.998	.004

a. Dependent variable: per capita output value of service industry

4)The forth cluster

Based on the data ranging from 2005 to 2011 in Mianyang, Guangyuan City, Bazhong, Aba and Ganzi, using SPSS, we can obtain the regression results shown in Table 6.

Table 6. The regression analysis results of factors influencing service industry development in region IV [a]

Model	Non standardized coefficients		t	Sig.
	B	Standard error		
(Constant)	-1230.311	329.384	-3.735	.001
per capita GDP	.192	.032	5.910	.000
number of professional and technical personnel	5.936	.900	6.596	.000
per capita disposable income	.227	.062	3.662	.001
government general budget expenditure in the generalized virtual economy part	.175	.074	2.352	.027

a. Dependent variable: per capita output value of service industry

From the table ,we can draw the conclusion that those indicators have the most significant effect on the development of service industry .

Conclusion

From the perspective of generalized virtual economy, considering physical factors and non-physical factors, this paper built a system to evaluate the development of Sichuan service industry, which including three terms and 14 indicators. With K-means clustering, multiple regression and other methods, an empirical study on the factors that affect the development of

regional service industry is conducted.The results show that: firstl, the factors influencing the regional service industry development are obviously different, therefore, the policies improving the service development should be adapted to local conditions. Secondly, the development of regional service industry is mainly pulled by physical factors. Thirdly, non-physical factors have great impacts on the development of service industry.Our study enhances the perspective of services research, and expands the direction of the development of service industry.

Empirical research on China's service can be further research directions under the perspective of the generalized virtual economy.

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