The Relationship between Service Industry Development and Employment

Models and Empirical Analysis Based on The Data of Jiangsu Province

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Abstract—The main aim of this study wanted to find that changes in the absorptive capacity of employment of service industry. We use Jiangsu province as an example, calculating the employment elasticity coefficient to compare the absorptive capacity of employment of the three major industries, and also to compare the absorptive capacity of employment within various industries in services. Then we establish the regression model to predict the GDP of service industry (it is equal to the third industry in this study) from 2014 to 2018 in Jiangsu province, using C - D function method to establish model to predict the employments in service industry from 2014 to 2018. Finally, we predict the absorptive capacity of employment of service industry in Jiangsu province in the future 5 years. Our results show that there is some fluctuation in the employment absorbing ability of service industry in this period of time, the growth the GDP of service industry is a bigger leading role to the employment.

Keywords—services; employment absorption capacity; employment elasticity coefficient; regression analysis; prediction

I. INTRODUCTION

The services mentioned in this paper means the third industry.

II. EMPLOYMENT ABSORPTION CAPACITY COMPARISON BETWEEN THREE INDUSTRIES IN JIANGSU PROVINCE

Employment Elasticity Coefficient is the ratio of the employment growth rate and the GDP growth rate. That is to say 1% GDP growth will promote how many points of employment growth. Larger the coefficient is, the employment absorption capacity is stronger. The weaker is conversely.

The mathematical model of the employment elasticity coefficient is:

\[ E_{xy} = \frac{\Delta L_x / L_x}{\Delta GDP / GDP} \]  (1)

\( E_{xy} \) — Industry employment elasticity coefficient.

\( x \) — The x industry. Take x as 1, 2, 3 to main the first, second and third industry.

\( GDP_x \) — the GDP value of the x industry.

\( \Delta GDP \) — GDP changing rate of the x industry.

\( L_x \) — Employment quantity of the x industry.

\( \Delta L_x \) — Employment changing rate of the x industry.

The employment elasticities of the three industries of Jiangsu province was calculated using the above model based on the data of GDP of the three industries and the data of employment from 1990 to 2013 of Jiangsu province. In order to see the change of employment elasticity coefficient clearly ,four periods were divided as 1990-1997,1998-2003,2004-2009,2010-2013.In the Fig.1. below, the change of average employment elasticity coefficient in four periods was appeared.

Fig. 1. The employment elasticity coefficient of variation of the three industries in1990-2013 in Jiangsu province

It appears a downward trend in the employment elasticity of Jiangsu province. Although large number of workers in the first industry in Jiangsu province in the past twenty years, the employment elasticity coefficient value is negative and appears a downward trend. The accommodation of labors is becoming saturate in the first industry. On the contrary, is crowding out for labors. It also appears a downward trend in the employment elasticity of the second industry. Employment absorption capacity is weak. It is concerned with the situation of the enterprise reforms. Reduce use of outdated production capacity caused spillover effect of employment. Employment absorption capacity was rapidly rising in the first period. It is move smoothly in the three periods later. And it’s appearing rising trend. So the employment absorption capacity of service
industry appears relatively stronger. It is a good way to develop the service to increase the employment.

III. EMPLOYMENT ABSORPTION CAPACITY COMPARISON AMONG SECTORS OF SERVICE INDUSTRY OF JIANGSU PROVINCE

A. Employment Absorption Capacity Comparison between Traditional Service Industry and Modern Service Industry of Jiangsu Province

Data was collected according to “the provisions of the three divisions of industry” which was published by the National Bureau of Statistics in 2003. Traditional service industry was divided into Wholesale and retail (WR), The transportation, warehousing and the postal service (TWPS), Accommodation and catering industry (ACI), Education (Ed), The department of health and social work (DHSW) with reference to the standard of the world trade organization (WTO) and the current situation of China. Because there is no clear standards of traditional service and modern service now. The modern service include Information transmission, software and information technology services(TSITS), The financial sector(FS), The real estate industry(REI), Leasing and business services(LBS), Scientific research, technical services(SRTS), Water resources, environment and public facilities management(WREPFM), Residents service, repair and other services(RSROS), Culture, sports and entertainment(CSE), Public management, social security and social organization(PMSSSO).

From the table 1, Employment elasticity coefficients of traditional service industry of Jiangsu province in 2013 is 3.56. Employment elasticity coefficient of modern service industry of Jiangsu province in 2013 is 2.45. There is larger advantage of absorbing employment in traditional service industry than in modern service industry. This is closely related to the industry. Modern service industry is the prime mover in technology innovation and improving productivity. It can also promote the human capital accumulation. The striking features of modern service are high knowledge intensive and technology intensive, Conservation and rational utilization of human resources. So its employment absorption capacity is a bit poor than traditional labor-intensive service industry.

B. Employment Absorption Capacity Comparison among sectors of service industry in Jiangsu province

From the table 2, Employment elasticity coefficients among sectors of service industry are different. ACI appears relatively stronger. It is a good way to develop the service to increase the employment.

IV. FORECAST ANALYSIS OF EMPLOYMENT ABSORPTION CAPACITY IN SERVICES OF JIANGSU PROVINCE

A. GDP forecast

Determination of time series trend was done first using the software SPSS basing on the data of the service industry of Jiangsu province from 1990 to 2013. The observation Out of the service area GDP scatterplot is growth up with the time. And the growth trend year by year. Variety of models were tried in order to get more accurate results.

From the table 2, Employment elasticity coefficients among sectors of service industry are different. ACI appears relatively stronger. It is a good way to develop the employment growth of 81.90%. The weakest employment absorption capacity is existed in the financial sector. Per GDP growth of 1%, only will drive the employment growth of 0.23%.

Fig. 2. GDP Scatter diagram of service industry of Jiangsu province 1990-2013 Qata Source: Jiangsu statistical yearbook

Modeling prediction analysis in Service industry:
From the appeal of SPSS software analysis results can be concluded:

The value of R Square of Determination coefficient index model in service industry is up to 0.985, it is the highest one. So, exponential model was chosen to forecast the value of GDP in service industry.

\[ Y(t) = 429.714e^{0.175t} \]  

Bring the time value into the model (2) to calculate the value of GDP in services industry of Jiangsu province in the period of 2014-2018:

<table>
<thead>
<tr>
<th>TABLE IV. THE VALUE OF GDP FORECAST OF SERVICE INDUSTRY OF JIANGSU PROVINCE IN 2014-2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>2014</td>
</tr>
<tr>
<td>2015</td>
</tr>
<tr>
<td>2016</td>
</tr>
<tr>
<td>2017</td>
</tr>
<tr>
<td>2018</td>
</tr>
</tbody>
</table>

By the forecast results, an upward trend of service industry GDP is appeared. Its accounts for nearly fifty percent of GDP, It has a large room to improve.

B. Employment forecast

C-D production function was put forward by mathematician Cobb and economist Douglas in the 1930s. It is very useful to modern production. The model is:

\[ Q = A \times L^\alpha \times K^\beta \]

\( Q \)—Products

\( L \)—Labor

\( K \)—Capital inputs

\( A, \alpha, \beta \)—parameter, \( 0 < \alpha, \beta < 1 \)

Using C-D production function, a model is built analyzing the relationship between employment and the value of GDP of service industry. Than the service industry employment in 2014-2018 is forecasted.

\[ X(t) = F[Y_1(t), Y_2(t), Y_3(t)] = A(t)^\alpha Y_1(t)^\alpha Y_2(t)^\beta Y_3(t)^\gamma \]  

\( X_1(t), X_2(t), X_3(t) \)—the employment of the first industry, the employment of the second industry, the employment of the service industry in t period.

\( Y_1(t), Y_2(t), Y_3(t) \)—the GDP of the first industry, the GDP of the second industry, the GDP of the service industry in t period.

Due to the natural logarithm transformation of data don't change the original relationship, and it can make its change trend linearization, also eliminate the phenomenon of time series variance of variation, so natural logarithms was taken on both sides of equation:

\[ \ln X(t) = \ln A(t) + \alpha \ln Y_1(t) + \beta \ln Y_2(t) + \gamma \ln Y_3(t) \]  

Based on the time series data of the third industry (service industry) and employment in 1990-2013, regression analysis is done by using the least square method with the help of SPSS software. The analysis results are as follows:
### TABLE VII. EMPLOYMENT ABSORPTION CAPACITY FORECAST OF JIANGSU PROVINCE IN 2014-2018

<table>
<thead>
<tr>
<th>Years</th>
<th>GDP (Billion yuan)</th>
<th>△GDP/GDP</th>
<th>Employment (Ten thousand people)</th>
<th>△L/L</th>
<th>Employment elasticity coefficient in service industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>26421.65</td>
<td>0.10</td>
<td>615.07</td>
<td>0.20</td>
<td>1.59</td>
</tr>
<tr>
<td>2014</td>
<td>30664.87</td>
<td>0.25</td>
<td>790.98</td>
<td>0.20</td>
<td>1.13</td>
</tr>
<tr>
<td>2015</td>
<td>38441.87</td>
<td>0.24</td>
<td>1036.97</td>
<td>0.31</td>
<td>1.29</td>
</tr>
<tr>
<td>2016</td>
<td>47706.29</td>
<td>0.23</td>
<td>1311.78</td>
<td>0.26</td>
<td>1.15</td>
</tr>
<tr>
<td>2017</td>
<td>58742.29</td>
<td>0.23</td>
<td>1710.53</td>
<td>0.30</td>
<td>1.64</td>
</tr>
</tbody>
</table>

The result in table 5 shows that there are some swings in the employment Absorption Capacity of Jiangsu province in 2014-2018. But the overall trend is stable. The exemplary role of the GDP growth in service industry is strong to the employment.

### V. CONCLUSION

After analysis we found that the overall employment elasticity of Jiangsu province is declining. The employment elasticity of the service industry is falling lower and leveled off late on. The employment absorption capacity of the traditional service industry in Jiangsu province is stronger than the modern service industry. There are big differences of the employment elasticity coefficient in internal industries of the service industry in Jiangsu province. ACI appears the strongest employment absorption capacity. The weakest employment absorption capacity is appeared in the financial sector. There is an upward trend in GDP of the service industry of Jiangsu province. The employment proportion of service industry in Jiangsu province is increasing steadily. There is some fluctuation in the employment absorbing ability in the future 5 years, but it is relatively stable. Leading role of GDP growth in the services industry is bigger to the employment.

### REFERENCES