Analysing the Impact of Labour Force on the Economic Development of the Yangtze River Economic Belt

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Abstract: The Yangtze River Economic Belt is an inland river economic belt with global influence, a coordinated development belt featuring interaction and cooperation between the East, the West and the East of China. Labour force has an impact on the economic development of the Yangtze River Economic Belt, but the contribution of labour force to the 11 provinces of the Yangtze River Economic Belt has different degrees of impact. The aim of this paper is to explain the difference of labour contribution to the economic development of 11 provinces. By using Cobb-Douglas production function and the data on the local economy and labour force, the paper gets these conclusions: First, except for the abundant and high-quality labour force in Shanghai, labour force has a relatively obvious promoting effect on other provinces. Second, in addition to the effect of labour force on the economy of Hubei Province is not so great, the promoting effect of other provinces is similar and great. Third, the influence of regional factors on the impact of labour on the economy is not obvious.

Keywords: Cobb-Douglas Production Function, Labour Force, Influence factors

1. Introduction

In 2019, the permanent population of the Changjiang River Economic Belt accounted for 42.8% of the population and 46.2% of the total GDP [1]. However, the labor force is unbalanced in each province. In the east part of this region, which includes Shanghai province, Jiangsu province and Zhejiang province. In the factor market of these three provinces, the labor market reform lags behind the commodity and capital markets, and the segmentation index of the labor market is large. The labor market shows the contradiction coexistence of "difficulty in recruiting" and "difficulty in employment", and the human capital of floating population. There is a significant difference between provinces and cities in salary amount, the trend of "convergence" and "divergence" coexists, and there is no obvious convergence of the wage gap. And there are various levels of economic condition, unreasonable industrial structure, discriminatory household registration system, divided barriers to employment and so on [2].

Hubei, Jiangxi, Anhui and Hunan locate in the midland of this economic zone. Hubei Province is a large labor export province, and the labor force flowing to other provinces increasingly tends to work in the province, and the trend of nearby transfer is obvious. In recent years, the economic growth of Hubei Province has converged conditionally, which means the regional economic gap in Hubei Province is narrowing. And the net outflow of labor force in Hubei Province is an obstacle to

the overall economic growth of Hubei Province [3]. While, the present situation of Jiangxi employment is that the unemployed population is increasing, the unemployment rate is rising significantly. And it has low labor participation rate, labor and employment pressure and low level of industrial structure, industrial structure and employment structure mismatch. In order to solve the related problem, it can adjust industrial structure through five aspects: increasing employment; controlling population growth and reduce labor supply; establishing the long-term mechanism of worker training, improve the quality and skills of workers; establishing regional labor transfer mechanism and implement labor transfer strategy; improving the labor market system, strengthen labor market regulation [4]. In Anhui Province, multiple occupations degrees play a decisive role on the rural economy growth, food, agricultural materials, varieties, agricultural machinery. And multiple occupations degrees have obvious effects of four agricultural subsidies, agricultural mechanization and land management factors affecting the efficiency of production factors. While the influence of factors such as age and professional skill was not significant. Therefore, we should make intensive use of funds for agriculture, rural areas and farmers and rural land resources, rely on technological progress to improve total factor productivity [5]. And Hunan Province has a large population and rich labor resources. With the development of economy, more and more rural people in Hunan Province are moving to cities and towns. Although the Hunan provincial government, departments and institutions have imposed restrictions through different means and ways, the current situation of rural surplus labor transfer has not been effectively improved, which has seriously hindered the development of the urbanization process of Hunan Province. Orderly transfer of rural surplus labor can effectively reduce social cost consumption, and has a positive impact on the reasonable flow of labor force and the steady development of urbanization [6].

In the west part of the economic belt. For example, in Yunnan province, the development of labor market has promoted the economic growth of this region. At the same time, the inter-regional flow of labor force further promotes the opening of Yunnan regional market and the rapid development of commodity market [7]. In Guizhou, with the increase of rural population and the around-the-clock growth of agricultural productivity, the transfer of rural overplus labor force is inevitable. The transfer of rural labor force is important to promote Guizhou's urbanization and rural economic growth [8]. Besides, by analyzing the data of the sixth population census, the current situation of Chongqing's labor resources is the low proportion of labor resources. Besides, the labor participation rate in the past 10 years is continuously decreasing. And this region also has problem in the older and less literate population. The forecast analysis shows that the decline trend of labor force size is difficult to reverse. And the relationship between labor supply and demand will gradually shift from oversupply to structural demand, which is the basic trend of the development of labor supply and demand in Chongqing in the future. Therefore, it needs to timely adjust the rural labor transfer policy, accelerate the pace of industrial upgrading and structural adjustment, accelerate the process of agricultural modernization and so on [9]. In addition, according to census of Sichuan Province, the permanent resident population of Sichuan province in 2020 was 83.675 million, an increase of 3.357 million over 2010. In the past ten years, the permanent resident population of Sichuan province maintained a steady growth trend, but the total working-age population shows a decreasing trend. The relationship between labor supply and demand is the main factor affecting the employment situation. Analyzing and predicting the medium-term and long-term labor supply is beneficial to grasp many problems in the economic operation of the whole province [10].

According to these, it is easy to know that the labor force is different in each province. By studying the exact effort of labor force, the governmental agencies in China can formulate relevant policies to take full advantage of the labor resources and get a larger profit in this region. Therefore,

it is necessary to study the extent to which labor forces influence economic development in different provinces.

2.   Method

In this paper, Cobb-Douglas production function is used to calculate the contribution rate of labor employment. And the model can be simplified like this:

$$Y_t = A_0 e^{\lambda t} \cdot L_t^{\alpha} \cdot K_t^{\beta} \tag{1}$$

And assume Y_t as gross domestic output (GDP) in period t, L_t as capital input in period t, and K_t as labor input in period t. Total output, local employment and total fixed asset investment of 11 provinces in the Changjiang Economic Zone from 2001 to 2017 were selected as sample values. In addition，A_0 is represented as the initial level of technology, t is represented as a particular year, base period is 1 and add one every year after that successively, λ is represented as a dematerialized exogenous rate of technological progress, and $A_0 e^{\lambda t}$ shows that changes with the time, The level of technology increases in the form of power function. α is represented as the output elasticity of labor and β is represented as the output elasticity of capital input. Take the logarithm of (1):

$$lnY = lnA_0 + \lambda t + \alpha logL + \beta logK \tag{2}$$

To avoid the influence of multicollinearity on parameter estimation, assume constant returns to scale. Means: $\alpha + \beta = 1$ it is easy to know:

$$\ln \left(\frac{Y}{L} \right) = lnA_0 + \lambda t + (1 - \alpha) ln \ln \left(\frac{K}{L} \right) \tag{3}$$

Use the least square method for （3）to estimate the parameters, and it can get the estimation of α.

2.1. Shanghai

According to the method above and the data of Shanghai province in appendix, by using SPSS, the following data can be obtained.

Table 1: Input/Remove variables.

Model	Input variables	Remove Variables	Methods
1	t		forward
2	X		forward

Table 2: Coefficient.

Model		Collinear Statistics	
		Tolerance	VIF
1	constant		
	t	1.000	1.000
2	constant		
	t	0.194	5.163
	X	0.194	5.163

Table 2: (continued).

t		0.194	5.163
X		0.194	5.163

According to Table 1, the forward method was used to select the number of variables. Because X is the excluded variable and Table 2 shows that the model 1 was selected. But because what the paper need is to examine the relationship between labor force and economy here, and VIF<10, Therefore, X is selected as the explanatory variable.

Continue to use SPSS, according to the power of F-statistic equal to 0.000 and the power of t-statistic equal to 0.000, which are less than 0.05, it is easy to know that regression equation and regression coefficient are significant. And DU > 0.463, therefore, it does not pass the test.

In this case, the iterative method is used to solve the problem.

Table 3: Coefficient of model.

Model			t	Significance
Model	constant	0.223	91.904	0.000
	X	0.990	209.822	0.000

According to Table 3, and the power of F-statistic equal to 0.000 and he power of t-statistic equal to 0.000, which are less than 0.05, it is easy to know that regression equation and regression coefficient are significant. And because DW = 1.881, so the DU<1.881<4-DU, therefore, it passes the test. According to the equation:

$$Y = 1.25L^{0.01} * K^{0.99} \tag{4}$$

Because of this equation, the elasticity coefficient of labor input is 0.01, and it can know that the increase of labor employment growth rate by 1 percentage point will cause the increase of local total output growth rate by 0.01 percentage point. The elasticity coefficient of capital input is 0.99 and the increase of capital input by 1 percentage point will cause the growth rate of local total output to increase by 0.99%. And the elasticity coefficient of labor input is smaller than that of capital input, which indicates that the growth of Shanghai's total local output also depends on the growth of capital input.

2.2. Yunnan

Using the method above and the data of Yunnan province, it is easy to get:

$$Y = 8.507L^{0.628} * K^{0.372} \tag{5}$$

The elasticity coefficient of labor input is 0.628, which means the growth rate of local total output will increases 0.628%, if the growth rate of labor employment increases 1%. The elasticity coefficient of capital input is 0.372, so if capital input increases 1%, the growth rate of local total output will increase 0.372%. The elasticity coefficient of labor input is greater than that of capital input, which indicates that the growth of Yunnan's total output also depends on the growth of labor input.

2.3. Chongqing

According to the method above, the equation below can be calculated:

$$Y = 1.22L^{0.504} * K^{0.496} \tag{6}$$

The elasticity coefficient of labor input is 0.504, which means if the growth rate of labor employment increases 1%, the growth rate of local total output will increase 0.504%. The elasticity coefficient of capital input is 0.496, that is, every 1% increase in capital input would lead to he growth rate of local total output increases 0.496% in t. The elasticity coefficient of labor input is greater than that of capital input, which indicates that the growth of Chongqing's total output also depends on the growth of labor input.

2.4. Jiangsu

Since the method in 2.1 and the data of Jiangsu, it is easy to get this conclusion:

$$Y = 1.306L^{0.615} * K^{0.385} \tag{7}$$

Therefore, the elasticity coefficient of labor input is 0.615, that is, the growth rate of labor employment increases 1% will lead to the growth rate of local total output increases 0.615%. And the elasticity coefficient of capital input is 0.385. So the elasticity coefficient of labor input is greater than that of capital input, which indicates that the growth of Jiangsu's total output also depends on the growth of labor input.

2.5. Zhejiang

Using the method above and the data of Zhejiang province, it is easy to get

$$Y = 1.329L^{0.625} * K^{0.375} \tag{8}$$

That is, the elasticity coefficient of labor input is 0.625 and the elasticity coefficient of capital input is 0.375. The elasticity coefficient of labor input is greater than that of capital input, which indicates that the growth of Zhejiang's total output also depends on the growth of labor input.

2.6. Anhui

Trough the way above and the data of local place, the equation below can be got:

$$Y = 1.59L\hat{}0.371 * K\hat{}0.629 \tag{9}$$

The elasticity coefficient of labor input is 0.371, and increasing every 1% in labor employment growth, the growth rate of local total output will increasing 0.371%. The elasticity coefficient of capital input is 0.629. In that case, the elasticity coefficient of labor input is smaller than that of capital input, which indicates that the growth of Anhui's total output also depends on the growth of capital input.

2.7. Jiangxi

According to the method and the data, it can easily get the equation below:

$$Y = 1.19L^{0.622} * K^{0.378} \qquad (10)$$

The elasticity coefficient of labor input is 0.622 and the elasticity coefficient of capital input is 0.378. So the elasticity coefficient of labor input is bigger than that of capital input, which indicates that the growth of Jiangxi's total output also depends on the growth of labor input.

2.8. Hubei

Using the method and data of Hubei province, the equality can be obtained:

$$Y = 1.12L^{0.25} * K^{0.75} \qquad (11)$$

The elasticity coefficient of labor input is 0.25, so increasing every 1% point in labor employment growth will contribute to a 0.25% increase in the growth rate of local total output. Besides, the elasticity coefficient of capital input is 0.75. So the elasticity coefficient of labor input is smaller than that of capital input, which indicates that the growth of Hubei's total output also depends on the growth of capital input.

2.9. Hunan

According to the method and the data of Hunan, it can easily get the equation below:

$$Y = 1.27L^{0.557} * K^{0.443} \qquad (12)$$

The elasticity coefficient of labor input is 0.557, so the elasticity coefficient of capital input is 0.443, which means the elasticity coefficient of labor input is bigger than that of capital input, which indicates that the growth of Hunan's total output also depends on the growth of labor input.

2.10. Sichuan

Trough the way above and the data of local place, the equation below can be got:

$$Y = 1.54L^{0.471} * K^{0.529} \qquad (13)$$

The elasticity coefficient of labor input is 0.471 and the elasticity coefficient of capital input is 0.529, that is. So the elasticity coefficient of labor input is smaller than that of capital input, which indicates that the growth of Sichuan's total output also depends on the growth of capital input.

2.11. Guizhou

According to the method above and the data, the equation below can be obtained:

$$Y = 1.4L^{0.443} * K^{0.557} \qquad (14)$$

The elasticity coefficient of labor input is 0.371 and the elasticity coefficient of capital input is 0.629, that is, the elasticity coefficient of labor input is smaller than that of capital input, which indicates that the growth of Guizhou's total output also depends on the growth of capital input.

3.   Results and Discussion

According to Method, the growth rate of labour employment of Shanghai, Yunnan, Chongqing, Jiangsu, Zhejiang, Anhui, Jiangxi, Hubei, Hunan, Sichuan and Guizhou respectively are 0.01, 0.628, 0.504, 0.615, 0.625, 0.371, 0.622, 0.25, 0.551, 0.471 and 0.443. Expect Shanghai, the improvement of labour force in other province has an effect on the development of the economy. The role of labour in accelerating the economy of Shanghai province is very little, this may because in the Yangtze River Delta regional factor market, the labour market reform lags behind the commodity market, the capital market, and the labour market. In this area, there are too many excellent labours competing, so there may be not lack of labour resources, even producing a surplus of working age man. In this case, the labour resource has little effect on economic development.

Besides, the eastern region of the Changjiang Economic Zone includes Chongqing, Yunnan, Sichuan, Guizhou, central region of the area includes Jiangxi, Hubei, Hunan, the western region of the economic belt includes Anhui, Zhejiang, Jiangsu, Shanghai. According to the growth rate of labor employment in these areas, the effect of labor resource in these areas without Shanghai and Hubei is similar. So that, the region factor is not that obvious. While in fact the labor resource may have different effects. Why the difference of the conclusions above is not big may be that the economy is affected by many other reasons, however, in this article, there is not discussing the other factors. So may it need to add some extra influence factor.

4.   Conclusion

Through examining the labour force data in each province and using the Cobb-Douglas production function, it can get the conclusion that 11 provinces of the Yangtze River Economic Belt, besides Shanghai and Hubei, the influence of labour force in these regions are similar. This paper actually demonstrates that labour force has a good effect for the economic belt region expect Shanghai and Hubei, so these areas can attract more labour resources to promote the economic development. However, it fails to tap into the key reasons for the impact of labour on the region. This paper can be developed in this direction.

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