

An Empirical Study on the Reverse Linkage of the Industrial Structure Rationalization and Economic Growth in Shaanxi Province of China

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Abstract: *The industrial structure rationalization is an important index to reflect economic, they interact and promote each other. Historical studies show that the labor force structure lags behind the industrial structure. The deviation is not only the stage characteristics of economic development, but also can explain the volatility and cycle of economic growth. I analysis the linkage of industrial structure and economic development in Shaanxi Province found that, there is a reverse linkage in a reasonable period, through the empirical study, it is concluded that the TFP growth rate is the factor, then I puts forward relevant suggestions.*

Keywords: Industrial structure rationalization; Economic growth; Reverse linkage; Empirical study

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1. Introduction

In the 30 years since China's reform and opening up, economic growth is not only fast (GDP average annual growth rate of was about 9.8%) but also lasted for a long time, and in 2010 surpassed Japan to become the world's second largest economy. But since 2012, the downward pressure on the economy is huge, and the problem of irrational industrial structure is serious. With regard to the relationship between industrial structure and economic growth, most researches focus on the relationship between industrial structure change and economic growth. The rationalization of industrial structure is one aspect of them, but there is little research on it. However, it is of great significance corresponding to the current stage of development in China. From the theoretical perspective, the rationalization of industrial structure and economic growth should interact and promote each other, but in China's socialist market economy environment, the relationship between the two has a bias.

2. Literature Review

Gan Chunhui etc. (2011) ^[1] on the basis of measuring the rationality and superiority on the industrial structure of China and constructed an econometric model of industrial structure change and economic growth, the conclusion is that: the rationalization of industrial structure to a certain extent will directly lead to increased economic volatility, rationalization of industrial structure interact with other factors the indirect effect has a certain inhibitory effect on economic fluctuation. Zhou Mingsheng (2013) ^[2] on the analysis of the existing problems in Chinese industrial structure rationalization pointed out that the industrial

structure is irrational but tend to be reasonable, and through empirical analysis knows the rationalization of industrial structure promotes economic growth, but economic growth did not significantly improve the rationalization of industrial structure. Sun Peng, Chen Yufen (2014) ^[3] empirical research Chinese industrial structure change on economic growth and regional differences pointed out that the Chinese superiority of industrial structure on economic growth is greater than the rationalization, but it's relatively materiality have been continuously improved.

The above scholars had carried on the analysis of the present situation of the rationalization of the industrial structure and the relationship with the economic growth on the Chinese level. On the basis of previous studies, this paper analyzes the current situation of Shaanxi's industrial structure rationalization, and finds that there is a certain period; the economic growth of Shaanxi corresponds to the decline of industrial structure and employment structure deviation coefficient. Although previous studies have found the relationship is not only positive, but no specific analysis and interpretation were given. In this paper, we construct a model to analyze the relationship, and to find out the key factors of reverse linkage in this period, then give explanations and suggestions.

3. Discussion

3.1 Analysis on Shaanxi current situation of industrial structure and employment structure

In the process of industrialization and urbanization, the proportion of the secondary and the three industry increased gradually, while the proportion of the first industry was

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gradually reduced. With the development of the secondary and the three industry, the advanced production technology is provided for the primary industry, the productivity is increasing, and the surplus labor is transferred to the industry of the secondary and the three. As the "gateway" of Northwest China, Shaanxi plays an important role in stimulating the economic development of the western region and narrowing the gap between the central and eastern. Therefore, it is very important to analyze the rationalization of industrial structure in Shaanxi area.

By the end of 2015, the structure of the three industrial output value of Shaanxi province was "the secondary, the third, primary", and the employment structure was "primary, the third, the secondary", which means the adjustment of employment structure lags behind industrial structure. The reason is that Shaanxi province is a major agricultural province, nearly 70% of the population in the rural areas, coupled with the differences between urban and rural distribution, and the influence of "physiocracy" tradition, making Shaanxi province a large number of surplus labors in rural areas, not reasonably transfer to the secondary and the three industrial.

From Figure 3.1 and Figure 3.2 we can see that the deviation of industrial structure and employment, Shaanxi Province in recent years has led to economic growth weak (mainly rely on the secondary industry), third industrial output decline and the employment of the secondary and the three was significantly decreased.

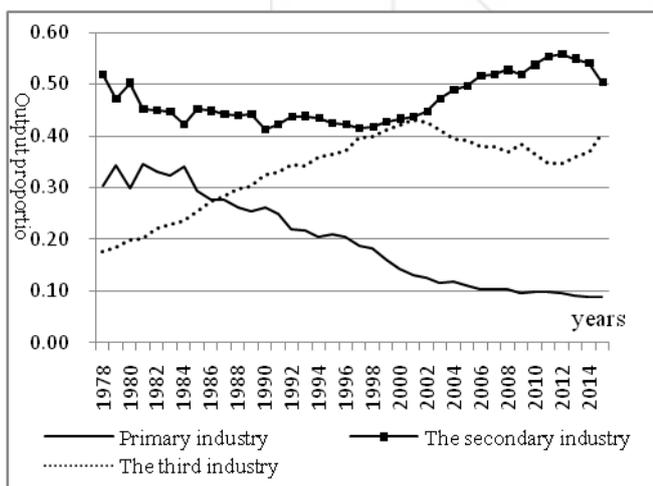


Figure 3.1: Output proportions of three industries
 Source: China Statistical Yearbook

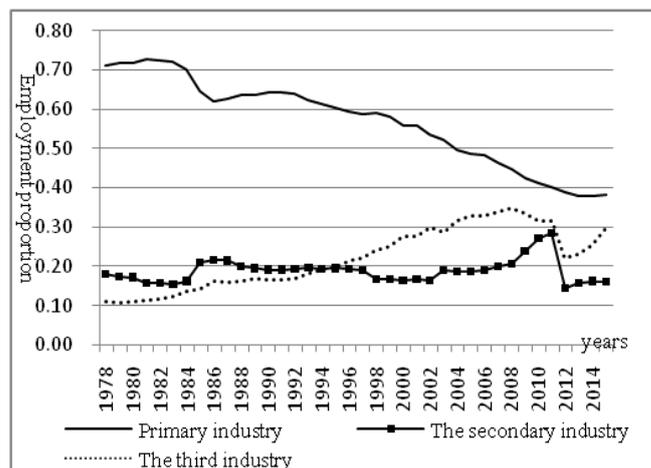


Figure 3.2: Employment proportions of three industries
 Source: China Statistical Yearbook

3.2 Industrial structure and employment structure deviation coefficient

a) Industrial structure and employment structure deviation degree

The proportion of industrial added value to GDP is consistent with the proportion of industrial employment population to the total employment population, which indicates the coordinated development of industrial structure and employment structure. Industrial deviation refers to the difference between the two, reflecting the level of rationalization of the three industries. Figure 3.3 shows the three industrial deviation degree of Shaanxi province from 1978 to 2015.

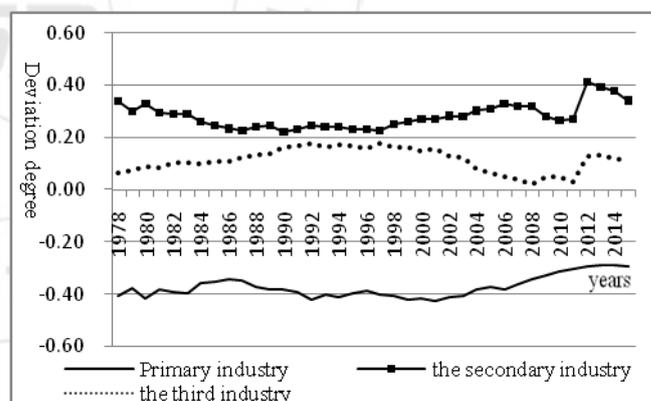


Figure 3.3: 1978-2015 the three industrial deviation degree of Shaanxi
 Source: China Statistical Yearbook

As can be seen from the chart, the deviation of the three industry is changing, showing the characteristics of the stage: ①1978 - 1986 absolute deviation of the first industry fell from 0.41 to 0.34. Subsequent rise in volatility, as of 1999, has risen to 0.42. 2000 is in a downward trend, as of 2015 has dropped to 0.29. ②From the beginning, deviation of the second industry is in a state of decline, after a slight rebound in 1997 decline in 2008, showing a sharp rise in the state in 2012. ③The deviation of the third industries began to rise slowly, and decline in 1997, and then to pick up in 2011.

For the further analysis of Shaanxi three industrial structure and employment structure coordinated development degree, this paper use the deviation of industrial structure and employment structure coefficient is to measure, its formula is:

$$CIE = \frac{\sum_{j=1}^n (I_j E_j)}{\sqrt{\sum_{j=1}^n I_j^2 \sum_{j=1}^n E_j^2}}$$

Among them, CIE said the industrial structure and employment structure deviation coefficient, I said the proportion of industrial added value of GDP, E said the proportion of industrial employment population of the total employment population, j=1,2,3 said the three industries. The closer CIE is to 1, the more reasonable industrial structure is, and the closer the CIE is to 0, the higher the degree of deviation of the three industries, the more irrational the industrial structure. It can preferably reflect the trend of industrial structure rationalization and the stage characteristics in the process of economic growth. The deviation coefficient and the GDP per capita in Shaanxi province from 1978 to 2014 can be seen in Figure 3.4.

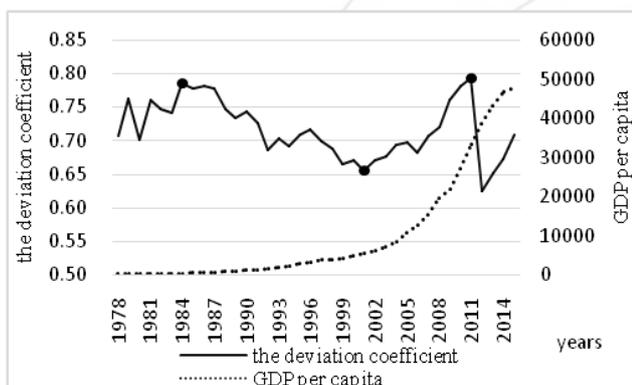


Figure 3.4: 1978-2015 the deviation coefficient and the GDP per capita of Shaanxi

Source: China Statistical Yearbook

Can be seen from the above figure: ① Shaanxi's economic increases rapidly, GDP per capita rose year after year, a large increase, from 291 Yuan in 1978 rose to 46,929 Yuan in 2014, an increase of 160 times. ② The deviation coefficient exhibits the characteristics of periodic fluctuation: 1978 - 1984 years, due to the implementation of the household contract responsibility system, the labor in rural areas has been greatly liberated, prosperity and development of township enterprises, state-owned enterprises and private enterprises has a great attraction to surplus labor force, the deviation coefficient increased. In 1987 the government of Shaanxi renewed and reformed traditional advantageous industries in technological, in 1988 the State Council rectified economic due to overheating, key areas of reform and opening up policy in 1992 changed from investment to internal reformation, in late 90s the state-owned reform and laid off workers, and in 1997 the Asian financial crisis cause the deviation coefficient to decline in 1985 - 2001. 2002 - 2011, the first time the central government created employment as the goal of

macroeconomic regulation and control, making the deviation coefficient rise again. After 2011, due to the extensive production and irrational industrial structure hidden behind the rapid growth of Shaanxi's economy, making the 2011 - 2012 deviation coefficient fell again. ③ 1978 - 1984 and 2002 - 2012, within the two ranges, the rationalization of industrial structure and economic growth is a normal positive linkage, while in 1985 - 2001 and 2011-2012, the linkage relationship reverses, and lasts for a long time, is norm.

b) Horizontal comparison of rationalization of industrial structure in Shaanxi

The industrial structure and employment structure deviation coefficient is an important index to measure the rationalization of industrial structure, it will increase with the advance of industrialization and economy growth, which means the industrial structure and employment structure will tend to reduce the degree of deviation. As a measure of the present stage Shaanxi Province industrial structure rationalization degree and analyze its relationship with economic growth, this paper selects the eastern area of Zhejiang, Jiangsu, Fujian, Guangdong, central of Anhui, Jiangxi, Hunan, Hubei, and west of Sichuan, Guangxi, Guizhou in comparative analysis.

Table 3.1: Comparison of deviation coefficient in different region of China

Region	Province	Deviation Coefficient
Eastern	Zhejiang	0.98
	Jiangsu	0.97
	Fujian	0.96
	Guangdong	0.95
Central	Anhui	0.89
	Jiangxi	0.91
	Hunan	0.82
	Hubei	0.83
Western	Sichuan	0.86
	Guangxi	0.73
	Shaanxi	0.71
	Guizhou	0.65
China		0.93

From the table we can see that ① developed eastern region has higher level of industrial structure, Zhejiang and Jiangsu has as high as 0.98 and 0.97 to 1; central and western regions is relatively backward, did not reach the China average of 0.92, including Guangxi, Shaanxi and Guizhou is lagging behind, below 0.8. ② the level of economic development is positively related to the rationalization of industrial structure, and individual areas will be affected by population structure, social system and various factors.

3.3 An empirical analysis on the relationship between the rationalization of industrial structure and economic growth

The deviation coefficient reflects the rationalization of industrial structure. According to the comparison of

industrial structure rationalization in different region, it can be found that the positive linkage between rationalization of industrial structure and economic growth is the basic law. But in Shaanxi Province, in the process of urbanization and rapid industrialization, there are reverse linkage and has become the norm, find this feature causes is of great significance to promote the sustained economic growth of Shaanxi province.

a) Interpretation of reverse linkage

(1) The labor force population trough effect

Labor resource is an important factor of economic factors, it represents the level of productivity level and economic development potential. In the industrial structure adjustment process, structure of labor force also made the corresponding adjustment in time. Therefore, the labor force population factor is one of the factors that may lead to the industrial structure rationalization and economic growth reverse linkage. In this paper, the value of the proportion of the labor force is added to reflect the impact of population change on the rationalization of the industrial structure and the linkage of economic growth.

(2) Institutional incentive effect

The effective institutional arrangement is the premise to improve the efficiency of social resource allocation, and the political and economic system under the background of transition explains a considerable part of the difference of the industrial structure in China. In this paper, the period of reverse linkage is in the socialist market economic system from the establishment to the mature stage of development, changes in ownership structure influence on the efficiency of resource allocation and its influence on industrial structure and economic growth may be caused by one of the reasons of reverse linkage. In this paper, we choose the proportion of fiscal expenditure to GDP to measure the impact of this factor on the rationalization of industrial structure and economic growth.

(3) Impact of technological progress

As an important factor in promoting industrial productivity and economic growth, technological progress will not only promote the improvement of industrial structure, but also affect the structure of trade. This paper selects the TFP Solow residual method to calculate growth rate reflects the influence of technological progress and economic growth to the level of rationalization of industrial structure.

(4) FDI drive

FDI is an important factor to promote economic growth, but also to promote the optimization of the industry. Since the reform and opening up, with the continuous inflow of foreign direct investment, China's industrial structure changes have a significant impact. In this paper, the proportion of foreign direct investment in GDP reflects the impact of FDI on the rationalization of industrial structure and economic growth.

(5) Urbanization drive

In recent years, the urbanization rate of Shaanxi has been increasing, and in 2013 the urban population began to exceed the rural population. On the one hand, the promotion of urbanization reflects the economic growth, on the one hand, it is also the result of the adjustment of labor distribution. In this paper, the proportion of urban population to the total population to measure the effect of urbanization on the rationalization of industrial structure and economic growth.

b) Empirical Analysis

In order to clarify the dominant factor which causes reverse linkage, this paper select the value of the proportion of the labor force is added(L), the proportion of fiscal expenditure to GDP(Z), the growth rate of total factor productivity(Q), the proportion of FDI to GDP (F), the proportion of urban population(S), economic growth (index of per capita GDP) (J)and deviation factor (X)to analysis.

(1) Unit root test

At first, the unit root test was carried out for each correlation variable. The results are as follows Table 3.2.

Table 2: Unit root test results

Series	Prob.	Lag	Max Lag	Obs
L	0.0315	1	2	17
F	0.0047	1	2	17
S	0.0075	1	2	17
Z	0.9996	1	2	17
Q	0.0065	1	2	17
J	0.0015	1	2	17
X	0.0044	1	2	17

The table shows that the proportion of fiscal expenditure to GDP in the case of a confidence of 5% not passed inspection. So that the labor force is added, the proportion of the population accounted, the proportion of FDI to GDP, the proportion of urban population, the TFP growth rate and GDP per capita, the deviation coefficient is stable, exists stable co integration relationship.

(2) Co integration analysis

The regression equations of J and X with L, F, S and Q were established respectively:

$$J = \alpha_1 + \beta_1 * L + \gamma_1 * F + \delta_1 * S + \epsilon_1 * Q + \mu_1 \quad \textcircled{1}$$

$$X = \alpha_2 + \beta_2 * L + \gamma_2 * F + \delta_2 * S + \epsilon_2 * Q + \mu_2 \quad \textcircled{2}$$

First, the regression ① results are obtained:

$$J = 1.014 * 10^{-15} + 0.101 * L + 1.008 * Q \quad \textcircled{3}$$

(0.000) (4.579) (45.545)

The regression ③R²=0.993, the variables were also tested, and the residual for a smooth sequence. A regression results can be determined, a regression relationship stability between per capita GDP and total factor productivity growth, and the growth rate of total factor productivity and labor population proportion of added value increased by 1%, the per capita GDP increased 0.101% and 1.008%.

Then, the regression ② results are obtained:

$$X = -4.580 * 10^{-15} - 0.883 * Q \text{ ④}$$

(0.000) (-7.298)

The residual of regression ④ in the case of a confidence of 5% passed inspection $R^2=0.780$. It can be seen that there is a long-term stable co integration relationship between the deviation coefficient and total factor productivity growth rate, and the total factor productivity of 1% per liter, the growth rate of coordination coefficient decreased by 0.883%.

(3) Result analysis

The proportion of fiscal expenditure to GDP in the case of a confidence of 5% not passed inspection, the labor value, the proportion of urban population, the proportion of FDI to GDP, the proportion of urban population, the TFP growth rate and GDP per capita, the deviation coefficient is stable, exists stable co integration relationship. If FTP growth rate is the main variables affecting economic growth and industrial structure rationalization, and two regression results of opposite sign, namely: FTP growth rate is the main variable between the rationalization of industrial structure and the economic growth rate of reverse linkage.

4. Conclusion and Suggestion

4.1 Conclusion

Based on the analysis of the deviation of the three industrial structure and employment structure in Shaanxi Province, and empirical analysis on the relationship between the rationalization of industrial structure and economic growth, the following conclusions can be obtained:

- 1) The coordination degree of industrial structure and employment structure of Shaanxi province is on the rise in general, but the level is not high (lower than the average value of China).
- 2) There is a linkage between the rationalization of industrial structure and economic growth in Shaanxi province.
- 3) FTP growth rate is the main variable between the rationalization of industrial structure and the economic growth rate of reverse linkage. This is because most of the city in Shaanxi Province invested in the growth stage of economic development, the extensive mode of economic development with the level of total factor productivity improvement, but from the development point of view, even lower to improve the technical efficiency of drag effect, can only be counted as reserves and technical knowledge into productivity ability, contribution to improve the industrial structure and employment structure is low.

4.2 Suggestion

On this basis, this paper puts forward the following suggestions:

- 1) Optimize the internal structure of industry, vigorously develop modern service industry. Shaanxi Province

Economic is characteristic of heavy industrialization, internal development is not balanced, restricting the development of economy. Therefore, the second industry to the energy industry as the starting point to adjust the focus of resource development scale and product structure, change the past the main output of primary resources products, actively develop the deep processing and fine processing of mineral products, extend the industrial chain, improve the added value. In addition, the service industry especially the modern service industry is the urgent need to speed up the transformation of economic growth mode, reduce the energy consumption of resources and environmental pollution, also can effectively increase employment and expand consumer demand of major initiatives to contribute to the economic growth. However, the third industry in Shaanxi province shows a certain lag in the adjustment of industrial structure, which restricts the development of the whole industrial structure of Shaanxi. Therefore, we should implement the open cooperation strategy to develop modern service industry.

- 2) Promote scientific and technological innovation, enhance the value chain. Technological innovation is the fundamental way to promote the transformation and upgrading of traditional industries, it can not only improve the industrial chain, promoting the traditional industry and leading industry value chain from low-end to high-end transformation, can also promote clean production, accelerate the use of resources to green low-carbon, clean transformation. First of all, we should increase the financial support of the provincial level, improve the system of intellectual property rights and improve the system of tax incentives, and strive to improve the development environment of high-tech industries. Secondly, tackle key problems of the core technology, enhance the ability of independent innovation. Then, deepen the reform of scientific research system, the formation of the development of productive forces as the main body, the integration of scientific research and production research and development system, to promote scientific and technological achievements into practical productive forces.

- 3) Break down barriers, promote the rural labor flow. Shaanxi province is a big agricultural province, the rural population stays in the rural areas, provides adequate labor reserves to the secondary and three industry, to further improve the rural land transfer mechanism, and relief of city and countryside impede labor mobility constraints, such as household registration, social security system. At the same time, we should also improve the quality of labor force, and provide personnel support for the adjustment of industrial structure, such as balancing urban and rural employment training, attaching importance to vocational and technical education.

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