

Original Paper

The Impact of Industrial Structure Changes on Economic Growth in Jiangxi Province, China

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Abstract

China has transformed its industrial and economic structure since the start of the economic reform and the Open-door Policy. While modern cities are participating in this progress, less urbanized areas lagged behind these cities. This paper will attempt to explain this phenomenon by analyzing the impact of industrial structure optimization on economic growth by using a time series model from the data span of 1990 to 2018. This study shows that the modernization and rationalization of the industrial structure have a significant impact on economic growth, and the marginal effect of industrial modernization on economic growth is greater than the rationalization of the industrial structure. Furthermore, when the economic growth is slow, the low-level industrial structure can still maintain economic growth; but when the economic growth rate reaches a certain level, the low-level industrial structure will inhibit economic growth.

Keywords

industrial structure, economic growth, rationalization, modernization, three sector

1. Introduction

China has achieved unprecedented success in economic growth and transformation in recent decades (Morrison, 019), however, like many other countries, it is not shielded from the global economic slowdown, which began in 2008. With the decline of economic growth, China should rethink its internal or domestic economic policies and close the gap of regional economic growth disparity. Therefore, the rationalization and modernization of industrial structure is of great practical significance. Jiangxi Province, a famous cultural capital, has a strategic geographical location, favorable climatic conditions, and abundant natural resources (People's Government of Jiangxi Province, 2015). In recent years, transportation in Jiangxi Province was gradually facilitated and hastened to optimize the

industrial structure to develop the local economy. From the perspective of industrial structure changes in Jiangxi Province, the secondary and tertiary industries are developing slowly, especially the tertiary industry (Tian, Gou, & Zheng, 2016). It is not the only region with favorable conditions for development but advanced slowly. Studying the industrial structure of Jiangxi Province can also provide a reference for provinces and cities with similar development difficulties. In view of this, focusing on the rationalization of Jiangxi's industrial structure and analyzing its impact on economic growth is crucial. Through the status quo and modeling analysis, the author aims to seek the correlation between economic development and industrial structure. While there are ample written data and research on the impacts of rationalization and modernization of industrial structure on a national level in China, there is not much detailed research on the regional aspect. In order to provide a certain research basis for the adjustment of the industrial structure in Jiangxi Province, as well as to make certain references for similar areas. This research will investigate Jiangxi Province's economic transformation and modernization. And study the industrial structure and economic growth of Jiangxi Province by analyzing the current situation of Jiangxi Province's economy and industry and time series econometric analysis.

2. Literature Review

This paper adapts Atikian's definition of Industrial Structure. It is the classification of the three main economic activities: the agricultural, manufacturing, and services sectors, it describes the composition of a country's economic activity and the production of human material provisions (Atikian, 2013).

In the 17th century, Petty discovered for the first time that differences in the industrial structure were the main reasons why countries in the world were in various stages of economic development and the gaps in national income (Hull, 1899). He placed value on the labor force and emphasized the importance of long-term economic planning and statistical data. After the mid-18th century, the industrial sector developed rapidly under the advancement of the first and second industrial revolutions, and the service sector also expanded considerably (Hull, 1899). During the Great Depression of the 1930s, the industrial sector declined, and the service sector had a statistically significant advantage in the economy. Economists Fisher then developed the three-sector model in economics, and the industrial structure theory began to take shape (Endres, 1988). This three-sector model (Fisher, 1939) divides into three sectors of activity, the extraction of raw materials is called primary, manufacturing is the secondary, and the service industry as known as tertiary. On this basis, Japanese economist Akamatsu put forward the "flying geese pattern theory" which explains how an undeveloped country can become more developed through adopting labor-intensive industry from developed countries (Ozawa, 2006). China has adapted this model and for the past three decades, Chinese has improved its economy through the labor-intensive manufacturing sector, this development, however, is concentrated in coastal areas while it is moving slowly inland (Qu, & Fang, 2012) hence resulted in an economic disparity in the country.

During China's centrally planned command economy period, domestic research on the industrial structure was mostly based on theoretical deduction because of the lack of data. However, after the introduction of western economic theories, China's industrial structure research gradually turned to dynamic empirical analysis. Throughout China's industrialization period, local research compared the economic development stages of developed and developing countries and found that the structural expansion of the secondary sector can promote the growth of GDP and the development of science and technology. In the 21st century, the industrial structure appears to have shifted in the developed nations. The tertiary sector's (or "service") output value and labor force increasingly dominate the primary and secondary sectors (Sultan, 2018, p. 28). For China to achieve stability and sustainability in the economy, it is necessary to change the organizational form and production layout and use capital and technology to optimize the industrial production structure. In addition, transforming the traditional agricultural and production structure will improve the contribution rate of the primary, secondary, and tertiary industries to economic growth. Obviously, reducing the scale, realizing the transformation or modernization of the tertiary industry to promote economic growth, and optimizing the industrial structure are the keys to promoting the development of the national economy.

3. Economic Development of Jiangxi Province

In recent years, Jiangxi Province has accelerated the process of industrialization and opening to the outside world, and Jiangxi's economic construction and social development have achieved remarkable results. In 2018, the province's GDP was 2198.478 billion yuan, and the economic growth rate exceeded the average level of China in ten years. With the rapid growth of the economy, the industrial structure of Jiangxi Province has also changed significantly.

To illustrate the change in industrial structure, the author drew a line graph of the GDP and industrial structure data of Jiangxi Province from 1990 to 2020 (Figure 1, Figure 2).

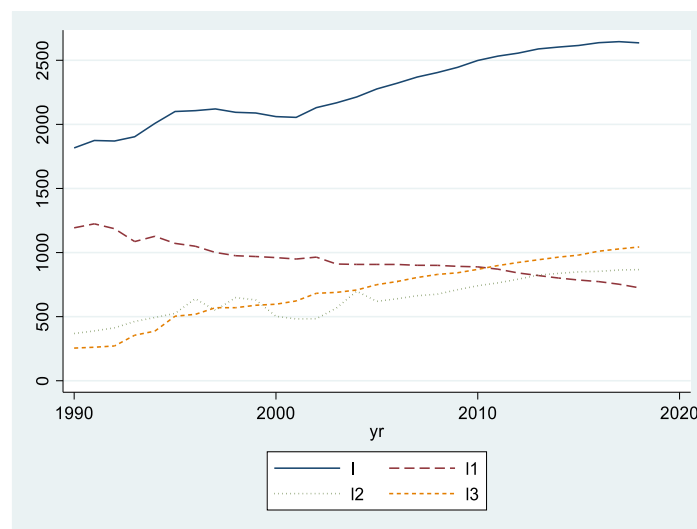


Figure 1. Three Industrial Labor Force Changes in Jiangxi Province from 1990 to 2020

Figure 1 shows that the three industrial labor force changes in Jiangxi Province from 1990 to 2020. The graph illustrates the progress of the three industrial labor forces in Jiangxi for three decades. The icon L denotes the total employed population, and L1, L2, and L3 are the number of employees in the primary, secondary, and tertiary industries, respectively. Figure 1 shows that the overall employment-population is increasing. It also illustrates a continuous decline in the labor force in the primary sector caused by urbanization, the introduction of machines in agriculture, and the industrialization policy of the province. The secondary sector's labor force slightly fluctuated between the mid-1990s to mid-2000s but continued with an upward trend, while the tertiary sector's labor force consistently increased through the decades.

Figure 2 illustrates Jiangxi's GDP between 1990-2020, where y denotes the total amount of GDP, and y_1 , y_2 , and y_3 are the primary, secondary, and tertiary industry GDP, respectively. Figure 2 shows that a minimal change during the first decade in the GDP of the three sectors. It also shows that the increase in the output value of the Primary sector is insubstantial. The output value of the secondary and tertiary sectors, on the other hand, has steadily increased during the following years after the first decade.

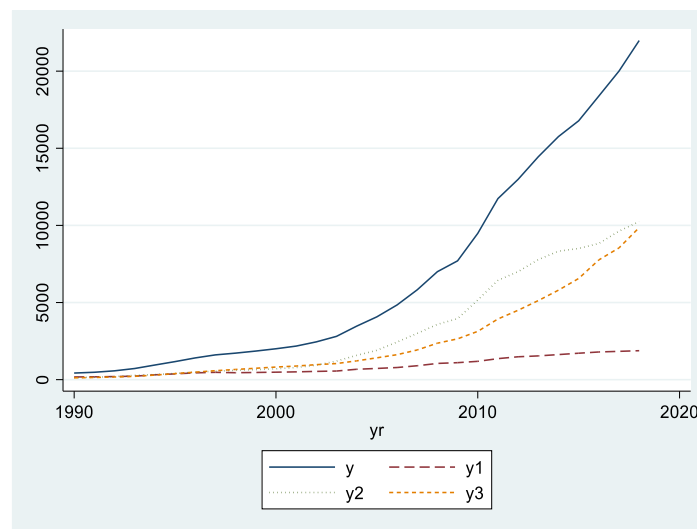


Figure 2. Jiangxi Province's 1990-2020 Total GDP and three Industry GDP

These illustrations showed a positive trend for Jiangxi Province, especially in the recent decade indicating rapid growth in GDP. Upon analyzing the data collected, the primary sector's labor force continuously declined over the span of three decades and has the least contribution to the growth of Jiangxi compared to the other two industries. For the past thirty years, an increasing number of the primary sector's labor force abandoned the industry to find employment in the other sector or move to a more developed region (Qian, Wand, & Zheng, 2016). This change in the primary sector resulted in an increase in the labor force in both the secondary and tertiary sectors as seen in Figure 2. Although the GDP produced by the secondary or the manufacturing sector has the largest share of the data, the problem lies in the low productivity of industrial processing and low technological content. The tertiary

or service sector has shown a steady upward trend in GDP in the past decade, and it is almost catching up with the secondary sector. The increase in GDP for the service industry was due to the increase in the labor force seen in Figure 1.

4. Empirical Analysis and Data Sources

4.1 Time Series Econometric Model

To directly analyze the impact of industrial structure on economic growth, the author introduced the modernization and rationalization indicators of industrial structure and built a time series model to analyze the industrial structure quantitatively.

The measurement formula for the modernized industrial structure adopts the ratio of the output value of the tertiary industry to the secondary industry.

$$TS=Y3/Y2 \quad (1)$$

If TS is on the rise, it means that the industrial structure is gradually advancing (Gan Chunhui, 2011).

The rationalization of industrial structure is the premise and foundation of obtaining the best economic benefits; the relevant index to measure the rationality of industrial structure is the degree of deviation of industrial structure.

$$E = \sum_{i=1}^n \left| \frac{Y_i/L_i}{Y/L} - 1 \right| = \sum_{i=1}^n \left| \frac{Y_i/Y}{L_i/L} \right| \quad (2)$$

$$TL = \sum_{i=1}^n \left(\frac{Y_i}{Y} \right) \ln \left(\frac{Y_i/Y}{L_i/L} \right) \quad (3)$$

In the equation, E represents the degree of deviation of the industrial structure, Y represents the GDP, and L represents the labor force of each industry. $i=1, 2,$ and 3 represent the primary, secondary and tertiary industries, respectively. Y/L can represent output efficiency to a certain extent and can measure the coordination degree between industries. Therefore, this paper uses the above formula and index TL to measure the impact of industrial structure rationalization on economic growth.

$$Y_i = \beta_0 + \beta_1 \ln TL_i + \beta_2 \ln TS_i + \beta_3 (y_i * \ln TL_i) + \beta_4 (y_i * \ln TS_i) + \mu_i \quad (4)$$

Where, i represents the year. To reduce the heteroskedasticity problem of the model, this model adopts the logarithmic form of TS and TL. In addition, considering the impact of economic growth on the industrial structure, the model adds interaction terms ($y_i * \ln TL_i$) and ($y_i * \ln TS_i$) respectively.

4.2 Variables and Data

The author used the data of Jiangxi Province's total GDP, three industry GDP and employees from 1990 to 2018, which were extracted from the Jiangxi Statistical Yearbook. Table 1 shows the calculated economic growth rate Y of Jiangxi Province, the industrial modernized index TS, and the industrial rationalization index TL.

Table 1. The Data of Each Indicator after Processing

yr	Y	TS	TL
1990		0.892	0.131
1991	0.082	0.894	0.150
1992	0.148	0.867	0.167
1993	0.137	0.753	0.137
1994	0.088	0.809	0.139
1995	0.068	0.893	0.098
1996	0.117	0.893	0.033
1997	0.123	0.881	0.092
1998	0.071	0.892	0.049
1999	0.078	0.927	0.052
2000	0.080	0.959	0.127
2001	0.088	0.917	0.142
2002	0.105	0.827	0.170
2003	0.130	0.715	0.168
2004	0.132	0.662	0.102
2005	0.138	0.626	0.184
2006	0.114	0.592	0.209
2007	0.132	0.563	0.226
2008	0.133	0.536	0.249
2009	0.132	0.507	0.260
2010	0.140	0.477	0.280
2011	0.124	0.394	0.487
2012	0.110	0.445	0.293
2013	0.101	0.430	0.295
2014	0.097	0.423	0.299
2015	0.091	0.425	0.298
2016	0.090	0.436	0.295
2017	0.088	0.445	0.285
2018	0.087	0.453	0.278

5. Results and Analysis

5.1 Scatter Plot of Y, TS, and TL by Year

Firstly, the author used stata16.0 to describe the scatter chart trend of Jiangxi Province's economic growth rate Y, the rationalization index TL of the industrial structure and the modernization index TS of

the industrial structure.

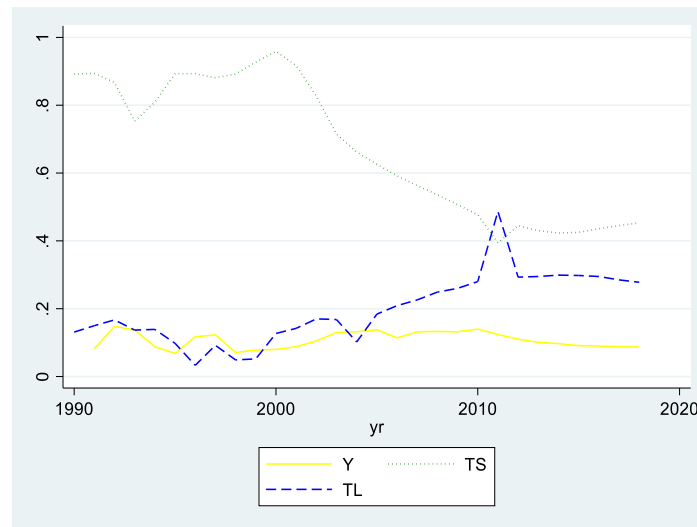


Figure 3. Jiangxi Province's Real GDP Growth Rate from 1990 to 2020

As shown in Figure 3, the modernization index of industrial structure in Jiangxi Province shows a downward trend, because Jiangxi Province has introduced several industrial industries in the past ten years, while the development of the service industry is slow. This is also in line with the development status of Jiangxi Province. In addition, the rationalization of industries in Jiangxi Province is increasing each year, because the government is rationalizing the allocation of industrial parks yearly, gradually introducing large shopping malls, optimizing tourism, and developing the tertiary industry. The industrial structure has gradually changed from single to rich. Further, the economic growth rate of Jiangxi Province has slowed down in recent years, but the overall economic development momentum is improving.

5.2 Regression Results and Discussion

So far, we can only judge the relationship between industrial structure and economic growth from the rough angle shown in the diagram. Therefore, the author used stata16.0 to make regression results as shown in Table 2.

Table 2. Regression Results

	Coef.	Std.Err.	t	P> t	R-squared	D-W value
lnTL	0.0393388	.0027056	14.54	0.000	0.9791	1.987035
lnTS	0.0738673	.0089488	8.25	0.000		
y* lnTL	-.3788871	.0187677	-20.19	0.000		
y* lnTS	-.717073	.0826867	-8.67	0.000		
_cons	.1038608	.0050231	20.68	0.000		

The return results show that, for each percentage point of the industrial structure rationalization indicator TL, the economic growth rate increased by 0.03 percentage point; the industrial structure's modernization indicator TS increased by a percentage point each, and the economic growth rate increased by 0.07 percentage point. The symbols of the core indicators are positive, and the improvement of the advanced level of industrial structure in Jiangxi Province and the rationalization level of the industrial structure promotes economic growth. Jiangxi's industrial structure should continue the upward trend and continue to introduce modern or high-tech industries to achieve optimal development and economic growth.

The modernization margin coefficient of industrial structure is greater than the coefficient of rationalization of the industrial structure. The positive role of the modernization industrial structure is slightly greater than the positive role of the industrial structure rationalization. In recent years, the industrial structure has been declining due to development of the industry. Therefore, the province should consider advancing or modernizing and rationalizing the industrial structure. While developing the industries, it is necessary to synchronize the development of tertiary industries such as finance, health service, transportation, education, entertainment, tourism, sales, and retail and transform the traditional industries into a modern intelligent industry. All industries are integrated and pursue sustainable development.

The marginal effect of YI on $Lntli = \beta_1 + \beta_3 * y_i$, $\beta_1 > 0$, $\beta_3 < 0$, indicates that when the economic growth is fast, the unrationalized industrial structure will suppress economic growth; and under the condition of slow economic growth, a certain degree of industrial structure can still maintain economic development. The marginal effect of YI on $LNTSI = \beta_2 + \beta_4 * y_i$, $\beta_2 > 0$, $\beta_4 < 0$, indicates that when economic growth is rapid, the underdeveloped industrial structure has inhibitory effects on economic growth; and when economic growth is slow, to a certain extent, the underdeveloped industrial structure can maintain economic development.

The data shows that modernization and rationalization of industrial structure both had a positive impact on the economic growth of Jiangxi Province, however, the coefficient equation shows that an underdeveloped industrial structure will restrict economic growth which is why it is vital to promote the development of industrial structures in the province. According to the data, in recent years, the modernization index of industrial structure in Jiangxi Province has been decreasing each year due to the unbalanced development in the three sectors. There is rapid development in the manufacturing sector, a relative lag in the financial and service sector, and a huge decline in the primary sector, these affect economic growth negatively, which causes slow developmental progress. On that account, it is necessary to promote an inclusive coordinated development of all three sectors. It is critical to promote innovation, finance, human resource-related, and science and technology to modernize and speed up the development of the traditional agriculture, manufacturing, and service industries. To achieve optimal development in Jiangxi, industrial rationalization is as important as modernization. Rationalization aims for efficiency, reducing costs, standardizing the process, and overall improving the

economy.

6. Conclusion

In conclusion, this study shows that an unrationalized industrial structure will impede economic growth. In order to promote the optimal development of the region, Jiangxi Province needs to focus on promoting the modernization of primary, secondary and tertiary industries. A modernization does not only include the transition from an agricultural economy to an industrial economy but also introducing the idea of a market economy, the application of advanced technologies and energy, mechanization, automation, and promoting the manufacturing and service industries instead of the primary sector. However, the Jiangxi local government should also promote the rationalization of industrial distribution. This will contribute to the development and transformation of the region. Additionally, to address the provincial economic disparity among the cities and counties in Jiangxi, these areas should focus on developing their domain industries, pursue automation, and promote the modernization and rationalization of industrial structures according to local conditions. For example, Jingdezhen vitalizes tourism through porcelain artisanship, while Southern Jiangxi improves the commercial service industry with red tourism culture. Besides, according to the characteristics of unbalanced development within Jiangxi Province, to obtain more accurate and microscopic conclusions, the research objects can be subdivided into municipal and county-level units in Jiangxi Province in the future, and a dynamic panel model can be constructed for detailed analysis.

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