

# The Impact of Rural Medical Infrastructure Construction on the Upgrading of Agricultural Industrial Structure in China

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**Abstract:** This paper uses TL index to measure the degree of agricultural industrial structure optimization in 31 provinces of China from 2007 to 2016, and empirically analyzes the impact of rural medical infrastructure construction on the upgrading of agricultural industrial structure. The results show that rural medical infrastructure has an impact on the optimization of agricultural industrial structure but has significant regional differences. From a national perspective, rural medical infrastructure has not effectively promoted the optimization and upgrading of the agricultural industrial structure. In terms of regions, the impact of rural medical infrastructure in the eastern and central regions on the optimization of agricultural industrial structure is negative and significant. Rural medical infrastructure can promote the optimization and upgrading of agricultural industrial structure in the western region but it is not significant.

**Keywords:** Rural medical infrastructure; Agricultural industrial structure upgrading; Regional differences

## 1. Introduction

The optimization of the agricultural industrial structure is an important purpose and main content of the effective implementation of the "Village Revitalization" strategic plan. Since the reform and opening up, the outflow of large numbers of labor has led to the slow development of modern agriculture in rural areas. The adjustment of industrial structure is unreasonable in some areas, and the serious environmental pollution and natural disasters have occurred frequently in recent years. It is difficult for the primary industry to transfer to high-tech information, light industry and tourism. In addition, the state has stepped up efforts in agricultural production in recent years, and encouraged some farmers to develop ecotourism and aquaculture in remote mountainous areas so that it revitalized the vitality of rural economic development by cultivating new occupational agriculture and vigorously building agricultural big data platforms. The re-emergence of the rural economy has attracted a large number of migrant workers to return to their hometowns for diversified agricultural production and tourism services. The prosperity of rural tourism directly promotes the rapid development of local services. Rural economic development and farmers' income levels have been significantly improved in recent years, but the industrial structure is not optimized, and the backward rural infrastructure is seriously hindered by the optimization and upgrading of industrial structure, in which rural medical infrastructure is very backward. Most rural entrepreneurs

give up entrepreneurship and work in the country side because they do not have effective rural health care. Therefore, studying the impact of rural medical infrastructure construction on the upgrading of agricultural industrial structure is conducive to promoting rural economic development and agricultural industrial structure upgrading.

## 2. Literature Review

Research scholars at home and abroad have conducted some research on the measurement and influencing factors of the agricultural industrial structure upgrading coefficient. Jiao Jian, Tang Chong et al<sup>[1]</sup> evaluated and analyzed carefully the natural environment and economic development level of Bazhou, Xinjiang, and believed that the ecological vulnerability of the region, the huge fluctuations of agricultural markets at home and abroad, and the agricultural transportation infrastructure seriously hindered The agricultural industry structure is optimized and upgraded. Wu Xuying<sup>[2]</sup> analyzed deeply the practical experience of information networks in some developed countries on agricultural production and studied the Internet construction in China and its role in agricultural production. He pointed out that China's current agricultural database construction was imperfect and network informatization was not high and the agricultural e-commerce platform and agricultural product promotion model also need to be further improved. Zhu Guangqi and Zhao Jiafeng<sup>[3]</sup> studied the impact of industrial trans-

fer on the optimization of agricultural industrial structure under the background of international and China's domestic regional industrial adjustment and transfer. It is suggested that China's domestic agricultural technology innovation must be strengthened and agricultural production methods should be comprehensively reformed and constructed to suit various regions. The development of the agricultural structure system should be built too. Jiang Yanjun and Huang Ying<sup>[4]</sup> used the TL index to measure the agricultural industrial structure upgrading coefficient of 31 provinces in China and empirically analyzed the impact of various agricultural infrastructures on the upgrading of agricultural industrial structure. Studies had shown that various rural infrastructures had significant regional differences in the optimization of agricultural industrial structure. Rural energy and transportation infrastructure could effectively promote the upgrading of agricultural industrial structure and agricultural water conservancy infrastructure had little effect. Scholars have conducted some discussions on the impact of rural infrastructure construction on agricultural investment models and agricultural economic development. Fan<sup>[5-6]</sup> analyzed statistically the construction of various rural infrastructures in China and India and found that road construction, power equipment and irrigation facilities could effectively promote agricultural economic development and there were also obvious regional differences. Daube<sup>[7]</sup> believed that the PPP model could not effectively improve the macro-control of agriculture and the efficiency of cooperative operation of farmers, nor could it effectively attract foreign investors to invest in agricultural production in the local area. E.C.Mamatzakis<sup>[8]</sup> used the a priori log cost function to study the impact of public investment in agricultural infrastructure in Greece on economic production efficiency. Empirical tests showed that infrastructure construction had effectively reduced agricultural production costs. In summary, most scholars concentrated on study the measurement of agricultural industrial structure upgrading and the impact of various agricultural infrastructure on industrial structure optimization. However, few scholars study the impact of agricultural medical infrastructure on the upgrading of agricultural industrial structure in China now. It is very meaningful to study on the effective implementation of the strategy of rural revitalization and the upgrading of agricultural industrial structure.

### 3. Analysis of Impact Mechanism

Since the reform and opening up, with the development of the economy and the continuous advancement of urbanization, a large number of rural laborers have flocked to cities and go out to work. The development of rural public infrastructure lags far behind the developed countries in the West. In particular, it is insufficient for the supply of rural medical infrastructure. The inconvenience

caused by many rural investors and farmers is not conducive to the development of rural economy and the optimization of industrial structure. The impact mechanism of backward rural medical infrastructure on the upgrading of agricultural industrial structure is mainly reflected in the following aspects: (1) Meeting the modern medical assistance of farmers and promoting the outflow of rural labor. In most rural areas of China, many farmers are unable to get medical assistance in time because of the backward medical conditions so that they chose to live in the city or go to work in other provinces. At the same time, it dues to a serious shortage of rural labor. Some small rural enterprises have closed down due to lack of human resources, which affected the development of the local economy. Thus, the government's income from various taxes and fees has fallen sharply and the investment in public infrastructure has been insufficient. The construction of medical infrastructure has become ruined and triggered a vicious circular reaction. (2) It is unable to effectively solve the sudden incidents of tourists in the scenic mountainous areas, and the development of tourism in mountainous areas is slow. Due to the current noisy urban life and serious pollution of air and water resources, many people living in cities choose to travel to rural areas and take part in activities such as rural tourism because of the pleasant rural scenery and tranquility. In order to meet the diverse lifestyles of contemporary people, many investors are willing to Poor and remote mountainous areas develop eco-tourism. However, there are many complex mountainous terrain, so many tourists are easily bitten by other insects or other injuries. Many unexpected events cannot be effectively solved because of the limited by local medical conditions, and finally the number of tourists is gradually decreasing in eco-tourism areas. Most tourists are willing to choose to travel near the city or stay in the city directly so that it results in a decline in the income of the eco-tourism area, which cannot promote the prosperity of the local economy, nor can it support the huge cost of rural medical infrastructure construction. So it is difficult to promote the optimization of industrial structure and the upgrading of agricultural industrial structure. (3) Reducing a large number of relevant jobs and failing to guide farmers to achieve part-time development. If the construction of rural medical infrastructure is increased, for example, the construction of rural health stations requires workers, which will enable more farmers to obtain part-time opportunities, make full use of rural human capital, and also increase the income level of a large number of farmers. In the end, it will increase their consumption levels. It has promoted the development of various retail and commodity trades in the local and neighboring villages. The comprehensive development of the economy has promoted the construction of transportation infrastructure in the region. At the same time, it has accelerated the circulation of various

production factors and greatly expanded the industrial circulation and industrial structure. The optimized spatial spillover effect has also effectively promoted the upgrading of the agricultural industrial structure.

#### 4. Indicator Selection and Model Construction

##### 4.1. Selection of indicators and data sources

This paper selects the panel data of 31 provinces in China from 2007 to 2016. The relevant raw data comes from «China Statistical Yearbook», «China Agricultural Statistical Yearbook» and «China Environmental Statistics Yearbook». In order to empirically study the impact of rural medical infrastructure on the upgrading of agricultural industrial structure, the following indicators are selected:

(1) The explained variable. The upgrading of agricultural industrial structure measures the degree of optimization of industrial structure. This paper refers to the calculation method of Kuang Peiyuan<sup>[9]</sup> and uses the Theil index (TL) to measure the industrial structure upgrade. The calculation formula is as follows:

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

Among them,  $Y_i$  indicates the total output value of each industry,  $L_i$  indicates the number of employees in various industries,  $Y_i/Y$  indicates the output structure, and  $Y/L$  stands for production efficiency. Since the number of employees in various industries such as agriculture, forestry, animal husbandry and fishery cannot be obtained at present, this paper uses The ratio of added value to intermediate consumption of each industry indicates production efficiency.

(2) Core explanatory variable. Rural medical infrastructure represents the overall level of rural medical conditions. There are no formal hospitals in most remote areas of China, so the number of rural village clinics (RCN) is chosen to represent the level of rural medical infrastructure. In order to reduce the empirical error, the total number of roads (HMT), the number of rural cultural stations (RCS), the urbanization rate (UR) and the gross domestic product (GDP) are selected as control variables.

##### 4.2. Model establishment

To empirically study the impact of rural medical infrastructure construction on agricultural industrial structure and regional differences, the following measurement models are established:

$$TL_{it} = K_0 + \beta_1 RCN_{it} + \beta_2 HMT_{it} + \beta_3 RCS_{it} + \beta_4 UR_{it} + \beta_5 GDP_{it} + \varepsilon_{it} \quad (2)$$

Among them,  $TL_{it}$  represents the agricultural industrial structure upgrading coefficient,  $RCN_{it}$  represents the rural medical infrastructure,  $HMT_{it}$ ,  $RCS_{it}$ ,  $UR_{it}$  and  $GDP_{it}$  respectively indicate the total mileage of roads, the number of rural cultural stations, urbanization rate and the level of economic development.  $K_0$ ,  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$ ,  $\beta_4$ , and  $\beta_5$  are parameters,  $\varepsilon_{it}$  represents a random disturbance term,  $i$  represents each region number ( $i=1, 2, \dots, 31$ ), and  $t$  represents the year ( $t=2007, 2008, \dots, 2016$ ), in order to avoid the error caused by the heteroscedasticity, All indicator data are tracked by logarithm.

##### 4.3 Descriptive statistics of each indicator

Statistical analysis was performed on each indicator using the stata15 software. The analysis results are shown in Table 1.

Table 1. variable description statistics

| Variable | Name                             | Minimum | Maximum  | Average   | Standard deviation |
|----------|----------------------------------|---------|----------|-----------|--------------------|
| TL       | industry structure upgrade       | -0.25   | 0.32     | 0.09      | 0.09               |
| RCN      | number of rural village clinics  | 1218    | 66389    | 20638.36  | 17141.56           |
| HMT      | Total mileage of roads           | 11163   | 324138   | 134259.75 | 72441.28           |
| RCS      | township Cultural Station Number | 108     | 14349    | 1126.99   | 1066.38            |
| UR       | urbanization rate                | 21.5    | 89.6     | 52.59     | 14.33              |
| GDP      | gross domestic product           | 341.43  | 80854.91 | 17213.04  | 14972.02           |

## 5. Analysis of Empirical Results

### 5.1 National regression results

The regression results of the impact of rural medical infrastructure on the upgrading of agricultural industrial structure are shown in Table 2. From a national perspective, the construction of rural medical infrastructure has not effectively promoted the optimization and upgrading of the agricultural industrial structure. The coefficient between the rural medical infrastructure and the agricul-

tural industrial structure upgrading coefficient is -0.00134. It indicates that the degree of agricultural industrial structure optimization will be reduced by 0.00134 percent, if each rural medical infrastructure is increased one percent. At the same time, the effect is not significant. The reason is that the level of rural economic development is generally low in China and the development speed of industry and service industry is very slow. Due to the outflow of agricultural labor, agricultural production has also been stagnant and backward. Most

of China's "hollow villages" are everywhere. The local government is unable to support the huge cost of rural medical facilities construction. At the same time, the shortage of rural medical staff and the poor equipment have led to a decline in the number of medical treatment in rural village clinics. This has further led to a decline in the investment willingness of a large number of local industrial and tourism investors. The rapid development of industrial and service industries are not driven by modern agriculture. It is difficult to implement for changing industrial structure optimization plans. In addition, the transportation infrastructure and communication equipment are relatively backward, which cannot provide good development conditions for the construction of rural medical infrastructure in most rural areas of China. As a result, the introduction of medical talents and the import of medical equipment will encounter great obstacles. The rural Internet infrastructure is also very backward, which brings great troubles for the timely transfer and treatment of patients, which has prompted many farmers to settle in towns and cities. Thus it cannot effectively promote the upgrading of agricultural industrial structure.

## 5.2. Regression results by region

The impact of rural medical infrastructure on the optimization and upgrading of agricultural industrial structure presents significant regional differences. The regression results of each region are shown in Table 2. The rural medical infrastructure has a significant negative impact on the optimization and upgrading of the agricultural industrial structure in the eastern region. The eastern region has a relatively strong industrial base. Other than this, it concentrated relatively human resources and rapid economic development. Agriculture accounts for a low proportion of the entire economy and accounts for the secondary and tertiary industries. The proportion is large, and most of the land has been occupied by industrial production in the region. Leading to the transition is not high of agriculture to the secondary and tertiary industries. In addition, the large cities are relatively dense in the region and the transportation infrastructure is relatively perfect. Most people will choose to go to the big cities. Seeking medical treatment has led to limited access to medical practitioners in rural areas and a reduction in the supply of medical infrastructure, which ultimately led to a small effect on the optimization of agricultural industrial infrastructure in rural medical infrastructure. The coefficient between the rural medical infrastructure and the upgrading of the agricultural industrial structure is -0.0155 in the central region, which means that the agricultural industrial structure optimization will be reduced by 0.0155 percent when the rural medical infrastructure investment increase one percent. Although there are important food

production bases, agricultural production and management models, and arable land use efficiency have improved significantly in the central region, the development of industry and service industry in the region is worse than that in the eastern region. The international trade and regional innovation efforts need to be improved in the region. It is unable to quickly promote the development of the local economy and the transformation of the industrial structure. The backwardness of the overall economic strength can not effectively improve the construction of local medical infrastructure. The backward rural medical infrastructure is difficult to expand the spatial spillover effect of medical assistance, but also it is difficult to attract Entrepreneurial investors in important industrial production and service industries. It will eventually lead to a vertical breakthrough in the transformation of agriculture into secondary and tertiary industries. There are important differences between the western region and the eastern and central regions. The rural medical infrastructure has a positive impact on the optimization and upgrading of the agricultural industrial structure in the western region, but it is not significant, which it is mainly due to the complex terrain and relatively scattered personnel in the western region. There are many mountains and hilly areas in the region, and the rural economic development is relatively backward compared with the eastern and central regions. In recent years, the concentration of migrant workers has increased, and the existence of a large number of "hollow villages" has led to the west. there are no medical institutions such as village clinics, and only a few villages with relatively concentrated people have corresponding medical infrastructure in most rural areas. In recent years, with the effective implementation of the "Rural Revitalization" strategy and the "Western Development" strategy, various regions have begun to promote the transfer of cultivated land and vigorously develop the rural tourism service industry in the west. As the transportation infrastructure is very backward in the western regions, and many medical personnel are involved. Many people will Choose the nearest village clinic for medical treatment, which will promote the development of local medical infrastructure gradually. The rapid development of rural medical infrastructure will promote the rapid development of the local secondary and tertiary industries, which will promote the optimization of industrial structure and the circulation of production factors. At the same time, it will promote the development of basic education and cultivate a large number of medical personnel for the construction of rural medical infrastructure. It provides excellent scientific and technological innovation talents for agricultural modern production too, and then it will promote the optimization and upgrading of agricultural industrial structure.

Table 2. Empirical regression results

| Variable     | National                | eastern regions        | central regions         | western regions       |
|--------------|-------------------------|------------------------|-------------------------|-----------------------|
| RCN          | -0.00134<br>-0.00122    | -0.0102***<br>-0.00129 | -0.0155***<br>-0.00258  | 0.00635<br>-0.00624   |
| HMT          | -0.0013<br>-0.00141     | -0.00247<br>-0.00221   | -0.00597***<br>-0.00207 | -6.61E-05<br>-0.00452 |
| RCS          | 0.00262**<br>-0.00104   | 0.0320***<br>-0.00382  | 0.0340***<br>-0.00287   | -0.00032<br>-0.00191  |
| UR           | -0.00444***<br>-0.00109 | -0.00251<br>-0.00191   | -0.0062<br>-0.00381     | 0.00772<br>-0.00673   |
| GDP          | 0.00397***<br>-0.00116  | 0.00392***<br>-0.00118 | 0.00654**<br>-0.00317   | -0.00219<br>-0.0116   |
| Constant     | 0.00814***<br>-0.000733 | 0.0125***<br>-0.0014   | 0.0119***<br>-0.00134   | 0.0130***<br>-0.00426 |
| Observations | 310                     | 100                    | 70                      | 90                    |
| R-squared    | 0.109                   | 0.789                  | 0.707                   | 0.064                 |

## 6. Conclusions and Recommendations

This paper analyzes the impact mechanism of rural medical infrastructure on agricultural industrial structure optimization and measures the agricultural industrial structure upgrading coefficient of 31 provinces in China from 2007 to 2016. In the end, we empirically analyzes the impact of rural medical infrastructure on agricultural industrial structure upgrading. The results show that rural medical infrastructure has an impact on the optimization of agricultural industrial structure, but it has significant regional differences. From a national perspective, rural medical infrastructure has not effectively promoted the optimization and upgrading of the agricultural industrial structure. In terms of regions, the impact of rural medical infrastructure on the optimization of agricultural industrial structure is negative and significant in the eastern and central regions. Rural medical infrastructure can promote the optimization and upgrading of agricultural industrial structure but it is not significant in the western region. In this regard, the following recommendations are given:

(1) Improve the rural medical system and strengthen the construction of rural medical infrastructure. The improvement of the rural medical system is the key to developing the strategy of “revitalizing the countryside”. It is also the focus of solving the three rural issues. The local government can conduct a questionnaire survey on the majority of farmers, listen to the suggestions of local people and combine the relevant national policies to implement the rural medical system. The government should vigorously support the operation of private medical institutions and form a competition and cooperation with national medical institutions, which promote jointly the improvement and improvement of the quality of rural medical services. We will introduce vigorously high-tech medical equipment and experience medical personnel to improve the overall medical level of the locality. We should organize and train professional medical personnel in a timely manner and conduct regular assessments to strengthen the construction and maintenance of rural village clinics for creating a good medical environment for

the majority of farmers. The government should reward some areas where medical infrastructure is well-established, and promote advanced management and excellent case treatment nationwide. It can affect a large number of light industry and service industry investors through good medical infrastructure construction, which can increase the proportion of employment in the secondary and tertiary industries and promote the upgrading of the agricultural industrial structure.

(2) Strengthen agricultural science and technology innovation and boost the return of rural labor. The slow development of rural economy directly affects the construction of rural medical infrastructure and the optimization of agricultural industrial structure. Therefore, it is necessary to strengthen agricultural science and technology innovation and cultivate new professional farmers. Thus it can mechanize modernization operators and guide farmers to carry out arable land transfer. Then we can expand agricultural land scale production and improve agriculture. Production efficiency and arable land use efficiency can activate local land trading market and increase farmers' income level. Thus it could boost the return of a large number of rural laborers and create a new rural agricultural production and management model, which will help develop vigorously tourism through the natural scenery of poor mountainous areas. The prosperity of the local economy provides strong support for the construction of rural medical infrastructure. The effective improvement of rural medical conditions will attract more investors and farmers to invest and produce. It can promote industrial structure optimization and the development of the economic and form a kind of a continuous virtuous cycle.

(3) Accelerate the construction of big data platform and improve comprehensively the efficiency of industrial structure optimization. In recent years, the government is making every effort to build a big data platform in China. Many investors can use the big data system to monitor and supervise the production development of various industries in real time. The local government can build a rural medical big data platform and pass medical treat-

ment to each rural village clinic. It can also analysis and accurate raw data extraction through the screening and sorting of various raw data into the big data platform. We can avoid excessive import of various medical equipment and investors can various business data are analyzed to determine the scale of investment by updating regularly all relevant data. The agricultural producers can also predict agricultural production and disasters in a timely manner through the agricultural big data platform, which can achieve precise investment in various animal husbandry and agricultural production.

### 7. Found Project:

National Social Science Foundation Project "Evaluation of Sustainable Development of Agricultural Land from the Perspective of Eco-elasticity" (16BJL070)

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