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A Study on the Restraining Effect of Urban House Price Rising on the Increase of Agricultural Total Factor Productivity in the Perspective of Rural Revitalization

Shanwen Tan[a], Wenzhe Zheng[b], Yehui Wang[c]

Shandong University of Finance and Economics, Jinan 250014, China
[a]3039787427@qq.com, [b]648040213@qq.com, [c]20172152@sdufe.edu.cn

ABSTRACT. China's urbanization has made rapid development in the past few decades, but with the rapid development of cities and the increasing gap between urban and rural areas, how to achieve rural revitalization and rural modernization has become an urgent problem. This paper takes the provincial panel data of China's 2009-2017 urban house price and agricultural production related indicators as the research object, uses the fixed reference SBM model of the Malmquist index window to measure the agricultural total factor productivity, and uses the tool variable method to study the inhibition effect of urban house price rise on the growth of agricultural total factor productivity from the perspective of urbanization. The results show that the rising housing prices distort the allocation of agricultural production factors, affect the rural development and frustrate the development momentum of agricultural total factor productivity by influencing the citizenization of migrant workers and the "crowding out effect" on the transfer of rural surplus labor. Further research shows that the area of commercial housing has a significant impact on urban housing prices, so we should coordinate the urbanization process and the mechanism of housing price rise, take the road of urban development, and solve the problem of rapid housing price rise by fully providing residential land.

KEYWORDS: Rising house price, Total factor productivity of agriculture, Dea malmquist index

1. Introduction

After 20 years of vigorous development, China's real estate industry has become an indispensable expenditure industry in the rapid development of urbanization. It not only plays an important role in the sustained and high-speed growth of the national economy, but also greatly promotes the process of urbanization. However, with the rapid growth of the urban economy, some problems are gradually being exposed. The overheated real estate investment, the rapid rise of house prices and the high ratio of house price to income have become the hot issues in today's society. To a certain extent, many cities have presented the situation that the growth rate of house prices is not balanced with the level of urban economic development; that the growth rate of house price is too fast and the income level of urban residents is not coordinated.

From the research situation of the existing literature, generally through the data envelopment analysis (DEA) and stochastic frontier analysis (SFA) and other methods to study the impact of production technology, factor input or factor allocation on the change of agricultural total factor productivity (TFA). Farrell [1] used DEA model to evaluate the agricultural production efficiency in England. Shafiq [2] used DEA method to measure cotton production in some parts of Pakistan, and found that there are a large number of inefficient farms.

However, in the current literature, both input factors and output are compared to estimate the impact of technological progress and technological efficiency on the growth of agricultural TFP. The significance of previous studies is that production factors do constitute the reasons for the change of agricultural TFP, but they do not further consider urbanization and city The increase of housing price may distort the proportion of various agricultural production factors, which makes the total factor productivity of agriculture decline.

In terms of the impact of housing prices on agricultural and rural areas, most of the current studies are focused on the flow of agricultural labor. Zhang [3] studied the phenomenon of "rural diseases" from the perspective of the separation of the non-agricultural transfer population and the citizenization. Zhang [3] demonstrated the pull and resistance effect of house price on migrant labor through the comparison of house price growth and wage growth.

Based on the existing research, this paper studies the inhibition of agricultural TFP growth from the perspective of rising house prices for the first time, which provides a new perspective for realizing agricultural modernization, promoting

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urban-rural integration and promoting the improvement of agricultural TFP, and makes up for the existing research gaps in this field.

2. Theoretical Mechanism of the Influence of House Price on Agricultural Tfp

The high urban housing price will cause the separation of the non-agricultural and the citizenization of migrant workers. In 2018, the urbanization rate of permanent residence in China is 54.77%, but the urbanization rate of household registration is only 36.70%. The difference between the two is about 18 percentage points, involving nearly 250 million people. For the children of migrant workers and their families, one of the main obstacles to their citizenization is housing. Due to the rise of housing price, only a few migrant workers can buy houses and settle down, which is not conducive to the citizenization of agricultural transfer population.

It will reduce the efficiency of agricultural production if the population transferred from agriculture cannot be citizenized. There is an inverted U-shaped relationship between house prices and employment opportunities, that is, between the arrival of the inflection point of house prices, the rise of house prices promotes the process of urbanization, increases urban employment opportunities, and attracts the agricultural population to move to the city [3]. However, when the house prices reach the inflection point, the rise of house prices will increase the cost of living and promote the large-scale return of migrant workers. At this stage, because the rising house price has already exceeded the inflection point, coupled with the coastal economic downturn and many other factors, the permanent migration of agricultural labor force is difficult to achieve. On the one hand, the rise of urban housing price makes the relevant industries attract rural labor force to the city with a profit rate several times higher than that of agricultural production, which leads to the stagnation of the elderly, women and children in rural areas, and forms many social problems such as “left behind children” and “left behind elderly”. And, it leads to serious abandonment of farmland in some areas, which wastes the land resources of our country to a large extent.

On the other hand, because migrant workers cannot settle down in the city for a long time, and can’t enjoy the public services that urban residents should have, migrant workers can only keep the homestead in the countryside, and even meet the housing needs of families by expanding or building new houses. This has resulted in the decrease of rural population but the increase of rural residential land instead of the decrease. The reservation or increase of rural residential land will occupy the cultivated land resources, resulting in the decrease of agricultural land area and the distortion of market allocation of agricultural production factors from both land and labor.This leads to the uneven allocation of agricultural production factors, thus inhibiting the increase of agricultural total factor productivity [4].

Because the price of housing will distort the allocation of agricultural production factors, such as land, labor, and so on, which will affect the total factor productivity of agriculture, which represents the change of agricultural aggregate. Based on the above analysis, this paper comes to hypothesis one.

Hypothesis 1: the increase of house price restrains the growth of agricultural TFP by distorting the allocation of agricultural production factors.

The research of Huang [5] clearly shows that although the change of TFP is similar at the national level, the spatial difference between different provinces is very obvious. For example, during the period of reform and opening up, the annual growth rate of total factor productivity of wheat in Hebei and Shandong was 3% to 4%, while that in Sichuan and Shanxi was less than 1.5%.

Compared with the inland areas, the economy of the coastal areas is more dependent on overseas trade. They do not take agriculture as their economic pillar, so the rise of house prices can not destroy their economic framework, so the impact on agricultural TFP is limited. However, the inland areas are more likely to have the phenomenon of agricultural labor flow back and agricultural land occupation, which distorts the factors of agricultural production to a certain extent, leading to a greater decline in total factor productivity of agriculture. So this paper gets another hypothesis:

Hypothesis 2: there is a significant regional difference in the impact of rising house prices on agricultural total factor productivity: compared with the eastern coastal open areas, rising house prices may cause an extra impact on the agricultural production efficiency of inland provinces, and significantly reduce the agricultural total factor productivity of the region.

3. Agricultural Tep Calculation

Data envelopment analysis (DEA) is to simulate an effective production frontier, according to the input-output indicators, and judge whether the sample points are most efficient according to whether the DMU (Data Management Unit) is on the production frontier, or the distance from the production frontier. DEA is essentially to establish a non-parametric

optimization model to study the differences of agricultural production technology in different provinces.

In the past, researchers have been more inclined to use the radial DEA model in the calculation of agricultural TFP, that is, to expand or reduce the proportion of all inputs and outputs to achieve the purpose of improving the ineffective DMU. The radial distance function is the most basic distance function in DEA, including the CCR (constant returns to scale) model - which evaluates the technical unit on the assumption that the scale reward is constant - and the BBC (variable returns to scale) model, which decomposes the scale reward variable energy into pure technical efficiency and scale efficiency. However, researchers often ignore that in reality, factors of production are not increased or decreased in equal proportion, and even in order to achieve the best frontier improvement, factors of production can be increased or decreased in different directions, such as the study of unexpected output [6]. However, in this paper, we do not study the unexpected output, but measure and decompose the agricultural TFP based on the distorted allocation of some production factors in the theoretical mechanism, which is bound to break the assumption of the traditional DEA model. Therefore, this paper uses the SBM model [7], which estimates the ineffectiveness of decision-making units from both input and output, and estimates the efficiency by minimizing the farthest distance from the decision-making unit to the front. This non oriented model puts relaxation variables directly into the objective function, avoiding the problem of "relaxation" or "crowding" of production factors caused by fixed radial and angle.

However, in the initial analysis of the DEA model, it is found that multiple DMUs are evaluated as effective, that is, the efficiency value of multiple provinces is 1 and cannot be distinguished. We find that the maximum efficiency value of the general DEA model is 1, which cannot make a further comparative estimation on the effective provinces, which hinders us in judging the efficiency. Later, in order to solve this problem, we adopted the super efficiency model [8]. The core of the super efficiency model is to remove the evaluated decision-making units from the reference set, and evaluate the efficiency of the effective DMU by referring to the frontier composed of other DMUs. Therefore, the previous effective DMU will be greater than 1, which is convenient for us to distinguish them.

The super efficiency model of SBM listed by us is as follows:

$$\min \rho_{AG} = \frac{1+\frac{1}{m}\sum_{i=1}^{m} s_i^- / x_{ik}}{1-\frac{1}{w}\sum_{r=1}^{w} s_r^+ / y_{rk}} \quad s.t. \quad \sum_{i=1 j\neq k}^{n} y_{rj}\lambda_j + s_r^+ \geqslant y_{rk} \qquad (1)$$

In the equation (1), ρAG is the value of agricultural production efficiency to be measured; m and W respectively represent the number of input and output indicators of agricultural production factors, s+ and s- respectively represent the relaxation of agricultural output and agricultural input, and ρAG is strictly monotonous decreasing with respect to s+ and s-. xik are yrk specific values of agricultural input and output indicators respectively. λ is the weight vector. We take the VRS (variable returns to scale) model with variable returns of scale into full consideration to solve the problem of in-feasible solutions to the super efficiency model. We will not go into too much detail here.

For the calculation of Malmquist productivity index, we construct the window fixed reference productivity index model. t and t+1 are two adjacent periods.

$$MPI_W(x^t, y^t; x^{t+1}, y^{t+1}) = \frac{D_W^{fixed}(x^{t+1}, y^{t+1})}{D_W^{fixed}(x^t, y^t)}$$

$$= \frac{D_W^{t+1}(x^{t+1}, y^{t+1})}{D_W^t(x^t, y^t)} \times \left\{ \frac{D_W^{fixed}(x^{t+1}, y^{t+1})}{D_W^{fixed}(x^t, y^t)} \times \frac{D_W^t(x^t, y^t)}{D_W^{t+1}(x^{t+1}, y^{t+1})} \right\} \qquad (2)$$

$$= TEC_W(x^{t+1}, y^{t+1}; x^t, y^t) \times TP_W(x^{t+1}, y^{t+1}; x^t, y^t)$$

In the equation(2), MPI is the change index of total factor productivity of each province, which represents the change of agricultural economic efficiency across years. It refers to the distance function of two adjacent DMU with fixed window based on the first year. TEC is the change index of technological progress in each province, TP is the change index of agricultural technological efficiency in each province. Technical efficiency can be divided into pure technical efficiency and scale efficiency.

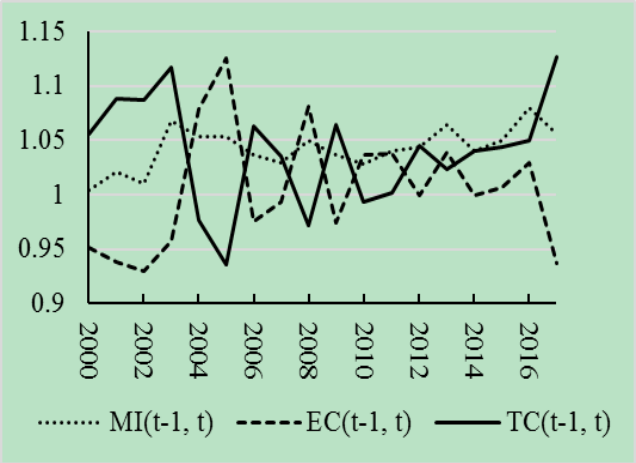

Fig.1 Malmquist Index in Shandong Province

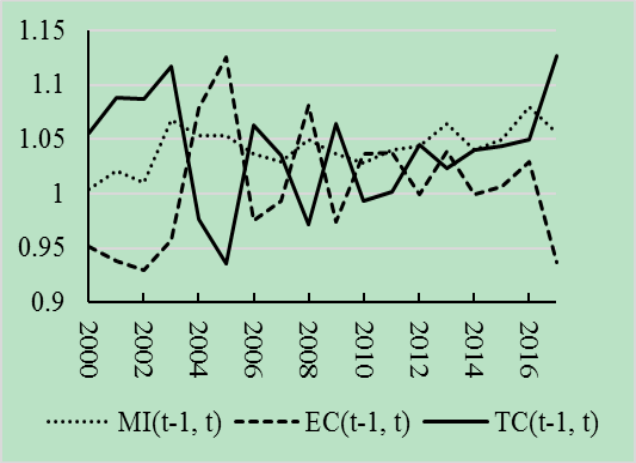

Fig.2 Malmquist Index in Gansu Province

We selected Shandong and Gansu to show the results of the Malmquist index. By observing Fig. 1 and Fig. 2, we can find that the total factor productivity of agriculture has a long-term upward trend. But at the same time, we can also observe that the technical progress index and technical efficiency progress index of agricultural TFP have obvious fluctuations, and the fluctuations between them are often the opposite trend. Both of them affect the change of TFP.

4. Conclusion

This paper focuses on the inhibition of urban housing price increase on the growth of agricultural total factor productivity, and seeks a new explanation for the slow growth of agricultural total factor productivity from the perspective of urban housing price increase. Because macroeconomic policies always lag behind, this paper uses the macroeconomic data of 23 provinces in China from 2009 to 2017 to empirically analyze the impact of housing prices on agricultural TFP. The results show that the increase of house price can significantly restrain the growth of agricultural TFP by affecting the flow of agricultural surplus labor and the transfer of agricultural land.

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