



Research Article

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## An empirical analysis of boosting from agricultural modernization on urbanization of Northern Anhui Province

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### ABSTRACT

Through referring to relevant data over years about Northern Anhui Province, this article uses Malmquist Index method to measure TFP growth rate of scientific and technological progress on agricultural modernization in Northern Anhui Province, analyzes TFP time series and estimates inputs of relevant elements of agricultural modernization and impact of other factors to urbanization rate. The empirical analysis results show that agricultural modernization will significantly facilitate the development and propulsion of urbanization in Northern Anhui Province. Finally, the paper throws out a suggestion that it should combine the actual situation in Northern Areas during the actual process, strengthen the leading position of agricultural sector, constantly improve the level of agricultural modernization, require the government to increase financial support through multiple channels and, to complete agricultural modernization, in order to promote urbanization and urban-rural integration in Northern region.

**Keywords:** Northern Anhui Province; Agricultural Modernization; Agriculture TFP; Malmquist Index Method

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### INTRODUCTION

For a long time, various socio-economic development indicators lag behind the provincial average in Northern Anhui Province (herein, refers specifically to Bozhou, Suzhou, Fuyang and 17 counties, cities and districts within this jurisdiction, as well as Wuhe, Guzhen, Huaiyuan, Fengyang, Shouxian, Huoqiu along the Huaihe River), also rural and agricultural development within this area always falls behind the development of cities and other industrial sectors. Although migrant workers output and undertaking industry transfer in recent years promotes economic development in this region, the dualistic urban-rural structure has been improved obviously, problems arose in the process of agricultural modernization and impact from agricultural modernization on urbanization needs further study and discussion.

Models from foreign scholars, Ranis - Fei (1961) and Todaro (1969), have emphasized on improving the productivity and maintaining its own development of the agricultural sector, but not blindly stressed rural labor transfer. Rural labor transfer shall be carried out simultaneously with the advance of industrialization, urbanization and agricultural modernization. Some domestic scholars describe and analyze the relationship between the progress of agricultural modernization and the progress of urbanization from theoretical level in China. For instance Encheng Ma (1995) considers that rural industrialization, urbanization have to drive agricultural modernization and it is important to avoid agricultural atrophy, rural depression and farmer's poverty. With the changing meaning of agricultural modernization, scholars have begun to study agricultural modernization from the quantitative perspective. Fangquan Mei (1999), Heping Jiang (2005), Libin Zeng (2012) and other scholars have made a multi-level index table that is for evaluating agricultural modernization using index from corresponding weighted indicators [1]. Fuxiao Dan (2012) analyzes the impact of investment on rural farmers' income and economic growth, and reaches the conclusion that investment in human capital in rural areas has strong effect on economic growth,

while fixed asset investment has a certain hysteresis effect.

Some scholars have also noted the important role of agricultural modernization for urbanization, such as Ruofeng Niu (2001), he considers agricultural modernization as the evolution process from traditional productive sectors to modern industry, as implementing integrated development plan for countryside and development strategy for urban-rural integration, which changes urban-rural dual economic structure.

This paper, based on the agricultural development of Northern Anhui Province, uses TFP measurement and panel econometric model to inspect selecting variables, analyzes the degree of development and explains the role and impact on urbanization of agricultural modernization, finally puts forward corresponding policy recommendations.

### MODLE AND VARIABLE SELECTION

From Table 1, Average Urbanization Rate measured by the proportion of non-agricultural population and Average Agricultural Added Value shows a synchronous increasing trend in Northern Anhui Province.

**Table 1 Statistical table of Average Urbanization Rate and Average Agricultural Added Value of Northern Anhui**

Year	Average Urbanization Rate of Northern Anhui	Average Agricultural Added Value (Billion)
2003	17.1%	5.19
2004	17.9%	6.37
2005	19.1%	6.62
2006	20.3%	7.81
2007	21.6%	9.12
2008	22.9%	10.97
2009	25.4%	12.99
2010	27.6%	15.98
2011	29.8%	20.19
2012	32.1%	25.91

An average growth rate of urbanizations is 1.5% in Anhui Province, in which the fastest growing is 2.1% form 2007 to 2012, this period is also the fastest stage in China's urbanization process. 2003-2012 of Anhui Province agriculture value added growth is slightly undulating, and average growth rate also reached 7.6%. Effectiveness while also facing a household contract system of incentives made agricultural growth bottlenecks, agricultural productivity is also much lower. Visible, rapid growth in Northern of Anhui agricultural and agricultural modernization are inextricably linked, uniform pace of urbanization and agricultural growth also shows the modernization of agriculture and urbanization are closely linked[2].

#### (1) Agricultural TFP estimation based on Malmquist index method

TFP estimates source: ① agricultural added value, avoiding the risen value of intermediate inputs that are contained in. ② arable land, better reflects the actual land usage. ③ labour inputs, the article using the weighted share of agricultural output in gross farming, forestry, animal husbandry, the Deputy and fishing. ④ intermediate consumption in agriculture, refers to the agricultural production value of goods and services consumed in the process. ⑤ original value of productive fixed assets in agriculture, rural family-owned agricultural productive fixed assets original value multiplied by the number of households are in rural areas.

#### (2) Establishment of regression model and variable selection

Connotation of agricultural modernization is defined as elements of modernization and progress of agricultural technology and investment in agriculture. Modernization of agriculture inputs including machinery equipment use, rural electrification, agricultural materials and the use of irrigation and water conservancy, which can greatly increase agricultural productivity. Level of agricultural science and technology progress will be derived from the empirical part of agricultural TFP measures. Set index evaluation system of agricultural modernization based on past as well as the goal of this study, the regression model is set as follows:

$$U_{rit} = \alpha_i + \beta_{tftpit} + \beta_{machit} + \beta_{eleit} + \beta_{ferit} + \beta_{irrit} + \beta_{finit} + \beta_{inincomeit} + \beta_{landit} + \beta_{pgdpit} + \varepsilon_{it}$$

Among which, "i" and "t" represent the individual counties in Anhui Province and period, explanatory variables representative of Ur urbanization rate, proportion of non-agricultural population measure. Explanatory variables are: "tftp" level of agricultural science and technology, using empirical part getting agricultural TFP timing measure; "mach" said the mechanization of agriculture by a mechanical measure of total power; "ele" said the rural electrification, agricultural consumption of electricity measurement; "fer" said use of agricultural materials, measuring in fertilizer use; "irr" represents the irrigation and Water Conservancy in order to measure effective

irrigation area. Other influencing factors are: “fin” financial inputs for agriculture, government input to peasant life, health guarantee, and support for agricultural production and construction; Income per capita net income of rural residents to measure farmers' living standards; Land that rural per capita management cultivated area, measuring the sustainability of urban development; “pgdp” represents per capita GDP in 4 provinces, representing overall levels of socio-economic development.

## RESULTS

(1) An Empirical Analysis of agricultural TFP in Table 1 for the use of data envelopment analysis DEA, obtained 3 Cities and six counties in Northern in Malmquist index. we can see a total of five years 2003-2007, the average annual growth rate of TFP in Suzhou City of agriculture up to 1.1% followed by 0.9% in Fuyang, Bozhou third is 0.81%, and finally the six counties in Northern is -0.1%. In addition to the average TFP growth rate of six counties is negative, the other three city agricultural productivity to maintain a certain growth rate. Suzhou City as a traditional agricultural city in four areas, first industry accounted for the highest proportion of GDP in 2010 to 14.1% in Suzhou, Fuyang City, 13.9%, 14.2% in Bozhou, in Northern six counties of 13.15%. As we can see, the six counties in Northern agricultural TFP growth rate is low, while a high proportion of agricultural added value. On the one hand, due to the development of the three cities and six counties in northern Anhui relatively backward rural areas, there are still a lot of labors, resulting in a huge agricultural base relatively slow supporting infrastructure; hand, with a large agricultural population transfer to the province developed regions, caused by abandoned arable land, poor management, and agricultural fields resistance to natural disasters weakened[3]. In addition, six counties in Northern agricultural structure adjustment than other three cities, most areas are still in traditional agriculture, farmers do not get enough income from agricultural production, it is difficult to mobilize the enthusiasm for production.

**Tablet 2: Three cities in Northern six counties along the Huaihe River Malmquist Index, 2003-2012**

year	Bozhou	Fuyang	Suzhou	Six counties
2003	0.0976	0.0977	0.0979	-0.0124
2004	0.0978	0.0978	0.0988	-0.0024
2005	0.0978	0.0986	0.0993	0.0909
2006	0.0979	0.0989	0.0979	0.0925
2007	0.1012	0.1038	0.1041	0.0937
2008	0.0978	0.1024	0.1023	0.0946
2009	0.1013	0.1043	0.1034	0.0964
2010	0.1014	0.1054	0.1045	0.0987
2011	0.1025	0.1075	0.1098	0.0979
2012	0.1031	0.1121	0.1145	0.0979

The overall upward trend in total factor productivity as a description of the extent of agricultural modernization to achieve the continuous improvement of conditions in the modernization of agriculture and thus theoretically can bring both positive and negative affect. One is to increase agricultural TFP will release a lot of the agricultural population, non-agricultural employment structure directly contributing to the population to urban migration and concentration, promote urbanization. Second, the degree of modernization of agriculture TFP represents the continuous improvement will increase the net income of rural residents, expanding the scale of production agriculture, enhancing the absorptive capacity of agriculture for employment, making this part of farmers' income increase and do not want to relocate cities, thus slowing down the pace of urbanization, eased the pressure of urbanization blind.

(2) The empirical analysis of the effects of modern agriculture on urbanization process According to the panel datum used in Anhui northern, which test the value of F before estimating the regression equation, determine the existence of the individual effects of the selected panel datum and exclude the applicability of the mixed regression model. Therefore, using FE and RE regresses the regression equation. After the results of the two regression models were “Hausman” test, it turns out to be the null hypothesis significantly. That's why to chose the fixed effect model. Most explanatory variable's regression coefficient is significantly good, the significance level of only two at the 10% being not significant (see Table 2). The datum for each explanatory variable indicators mean of Anhui northern areas in 1993~2010 are shown in Table 3. The following results can be drew from Table 2 and Table 3. (1) On the whole, it's obvious that modern agriculture promotes the development of urbanization. And the technological level, the level of electrification and the use of agricultural materials have a significant positive impact on urbanization in the selected agricultural modernization measure. In addition, the per capita GDP increased by 1 million and an increase of 8% level of urbanization, show the improvement of people's living standards in whole region will greatly promote the level of urbanization. The empirical results of Northern Anhui areas demonstrate the synchronized level of urbanization and development per capita GDP guarantee a certain level of economic growth which can promote the development of urbanization. (2) The average data of each province for all indicators in 2003~2012 listed in Table

3 as a reference which shows each doubling of agricultural TFP growth can increase the rate of urbanization by up to 6.53%. Thus, from the perspective of agricultural TFP, the space to achieve the development of urbanization is great in Anhui northern region.

**Table 3 the regression results of the impact of Anhui northern modern agricultural on urbanization**

Projects	Variable name	FE regression coefficients	T statistics	RE regression coefficients	T statistics
TFP Timing	tfp	0.0643***	3.33	0.1562	2.42
MachineryPower	machinery	0.00079	0.83	-0.0120	-9.07
Rural electricity	electricity	0.0112	6.97	0.0072	1.72
Fertilizer use	fertilizer	0.0908	4.99	0.3847	8.66
Effective irrigation area	irrigation	-0.0131	-2.56	-0.3351	-9.37
Per capita net income	income	-0.0011	-3.45	-0.0121	-1.38
Financial investment	finance	-0.0126	-2.52	-0.0306	-1.89
Per capita arable land(mu)	land	-0.3979	-0.144	31.416	6.38
GDP per capita	pgdp	0.00079	6.57	0.0021	11.98
Intercept		42.464	4.55	13.334	1.78
Hausman test			326.67	prob>chi2=0.0000	

**Table 4 2003-2012 each explanatory variable index data mean in Anhui northern areas**

Index	Bozhou	Fuyang	Suzhou	Six counties along the Huaihe River
TFP Timing	3	4.2	5.3	-1.6
Machinery power (kWh)	73789678	6975641	8075961	8375231
Ruralelectricityconsumption(ten thousand kWh)	68358	106365	71488	82789
Fertilizer use (tons)	300955	381386	335391	412376
Effective irrigation area (onethousand areas)	322.13	376.86	371.39	456.21
Per capita net income	5510	5430	5720	5240
Financial investment ( billion yuan)	45.3	56.5	48.5	50.6
Per capita arable land (mu)	1.53	1.24	1.37	2.11
GDP per capita	10038.2	9025	11358	9899.7

(3)With rural electricity consumption for each additional one billion kilowatts hours and fertilizer use increased by 10 million tons, the level of urbanization will increase to approximately 0.11% and 0.91% respectively, and mechanization indicators show a positive relationship, but the regression coefficient is not significant. On the one hand ,Anhui northern agriculture from extensive to intensive growth is reflected in TFP, on the other hand, it is reflected in the modernization of factor inputs.

(4) Irrigation index regression coefficient is significantly negative. Since this indicator of the effective irrigation area, to some extent, reflects the scarcity of land. With each increasing 100,000 hectares, the urbanization level will be decreased by 1.32%. Thus, as soon as each region accelerates urbanization, it not simply makes the agricultural population migrate to the cities in order to improve urbanization rate, but should pay attention to the irrigation efficiency, infrastructure and so on to promote the modernization of agriculture. thus freeing the rich agricultural population[4].

(5) The per capita net income, the per capita arable land area of operations, the increment of agricultural development and finance's investment and the development of urbanization, showed a negative relationship. when the per capita income is increased by 1,000 yuan each year, the urbanization rate is down 1%; while the regression coefficients of the per capita arable land area of operations indicators is not significant. With each added one acre, the urbanization rate is decreased by 39.78%; with agricultural financial investment added 100 million yuan, the level of city is dropped 1.27 percent. The two indicators of the per capita net income and the per capita arable land area of operations commonly reflect that the indicators of living standard of the rural population have the negative effects on urbanization.

## CONCLUSION

If we overemphasize the city's development while ignore the agricultural modernization, we will bring disadvantages to urbanization, therefore, the key point to solve these problems is to achieve urban and rural development as a whole. Following I will give my advices based on abovementioned conclusions:

Firstly, to accelerate the development of agricultural modernization, the north of Anhui province should contribute more to the scientific research, encourage creativity, phase out the extensive mode of production and phase in intensive mode of production. To increase efficiency of agricultural production and promote mechanization, electrification and irrigation, the improvement of the agricultural material utilization rate is

necessary[5].In addition,the area should also complete its produce,agricultural resource market and strengthen the bond with agricultural division and other social division,as well as the developed areas. Every area of the northern part of Anhui province should take their conditions of agricultural modernization development,and increase the input to make up for the disadvantage to increase productivity,thus promoting the development of the urbanization of the northern area of Anhui Province.

Secondly,improve the living standard of farmers and promote urbanization development.According to the model and model, improving the living standard of farmers helps to improve the process of urbanization and prevent the phenomena like unemployment resulting from the unbalance between transferred surplus rural labours and the demand of urban industrial sectors,the environmental pollution due to the expansion of urban sectors,the disorder of the distribution of the urban and industrial patterns,the low rate of land usage and other resulted issues. Meanwhile,urbanization needs to safeguard the basic eating and food issues of the new coming and long residential citizens.Therefore,improving the living standard of farmers plays a crucial part in guarantee the grain safety of the whole nation.

Thirdly ,to design a reasonable land circulation mechanism and enliven rural land economy.In the course of the urbanization,we should make an applicable plan that help to enliven rural-land circulation policies from a wide perspective,and the most important thing is to centralize the dealing in scale of land and nation's reasonable exchange,it is also important to accept leases of farmers'lands,which help to gain ransom as personal security fund from society,to relieve government's financial burden and make rural residents a easy life[6].

Finally,to enhance and improve rural financial devotion.The development of urbanization can be accelerated by improving farmer's living expenses, enhancing fundamental establishment of agriculture and increasing the devotion of agriculture and technology.At the same time,the pressure that urbanization brings can be eased by developing rural economy and enlarge fundamental construction.To fasten the urbanization,improve the soft environment is also necessary.

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#### **REFERENCES**

- [1]Zeng Li Bin; *Journal of Anhui Agricultural Sciences* , **2012**, 129(11): 325-330
- [2]Guo Jianxiong; *Journal of economic issues*,**2011**, 28 (4): 25-31.
- [3]Shen Ling ; Tian Guoqiang ; *Journal of Economic Research* ,**2009** , 218 (39): 251-153.
- [4]Ma en Cheng ; *Journal of Southern economy* ,**2005** 134 (7): 1135-1140
- [5]Jiang peace ; de Lin Huang ; *Journal of research of Agricultural Modernization*,**2010**, 46(3): 78-81.
- [6]Han Xiaoyan , Zhai yin li *Journal of agricultural technology economy*,**2011**,12 (4): 21-24.