IMPACT OF PUBLIC EXPENDITURES ON AGRICULTURAL PRODUCTION INVESTMENT OF CHINESE RURAL HOUSEHOLDS

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We hereby recommend that the Project by Mr. YEUNG Sze Yuen entitled “Impact of public expenditures on agricultural production investment of Chinese rural households” be accepted in partial fulfillment of the requirements for the Bachelor of Social Sciences (Honours) Degree in China Studies in Economics.

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Abstract

Using national- and provincial-level panel data of year 1995 to 2011, this paper estimates the significance of rural public spending on productive investment of Chinese rural households across eastern, central, and western regions. The result reveals that not only the characteristics of rural households itself affect the behavior of rural households’ productive investment, but also the rural public investment such as transportation, telecommunication, electricity infrastructures and rural areas hydraulic engineering construction makes different. Yet, the effects vary among different regions. For example, public spending in transportation infrastructure – the third and fourth class highways has the most positive effect in western regions; development of telecommunication network has marginal positive effect in central and western regions; electricity infrastructure has significant positive effect in all three regions; rural areas hydraulic engineering construction has significant positive impact in eastern and western regions. It is suggested that the central government should keep investment in the rural infrastructure sector to strengthen the foundation for agriculture development, as well as to encourage productive investment of rural households.
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Introduction

With a rural population of 642 million in 2012, accounting for 47% of the national total (as shown in table 1), China is still a mainly rural country. Over the past 30 years, China has made a remarkable progress in economy development as well as agricultural growth. In support of various agriculture policies, China’s rural areas have undergone significant changes where rural households have received more tangible benefits than ever. Chinese rural economy continues to maintain a satisfactory growth.

TABLE 1 Urban and rural population of China from 2002-2012 (million)\(^1\)

In 2012, approximately 712 million people lived in urban regions and about

\(^1\) Source: National Bureau of Statistics of China
642 million people lived in rural regions of China.

**Rapid growth of rural households’ income**

In 2011, Chinese rural residents’ per capita net income was 6,977 Yuan, with an increase of 17.9% and 1,058 Yuan more than previous year.

Eliminating price factors, the actual growth was 11.4%, with 0.5% growth rate higher than the previous year.

Amid per capita net income of rural residents, the per capita of household operation income was 3,222 Yuan, with an increase of 13.7% and 390 Yuan more than the previous year. Meanwhile, the net income from primary industry was 2,520 Yuan, with an increase of 12.9%; net income from the secondary industry and tertiary industry was 702 Yuan, with an increase of 16.7%. What’s more, per capita wage and salary income of rural households was 2,963 Yuan, with an increase of 21.9%; Per capita property income was 229 Yuan which the growth rate was 13%; per capita transfer income was 563 Yuan, with an increase of 24.4%.

For Income structure, in 2011, the proportion of household operation
income, wage and salary income, property income and transfer income in per capita net income of rural residents were 46.2%, 42.5%, 3.3% and 8.0% respectively. For the structure of income growth in 2011, the proportion of household operation income, wage and salary income, property income and transfer income in the share of contribution to the growth of per capita net income of rural households were 36.9%, 50.3%, 2.4% and 10.4% respectively.

It is noticeable that the wage and salary income contributed the most in the growth of rural households' income. Wage and salary income growth was mainly due to the rise of the wages level for migrant workers. In 2011, 25 provinces, autonomous regions and municipalities have increased the minimum wage by roughly 20%. Income from household operation contributed the second large, where the good harvests and high prices of agricultural products were the main reason for the net income of primary industry to maintain a rapid growth. Even so, the proportion of household operation income in per capita net income of rural households was still dropped 1.7% compared to the previous year. At last, affected by the new rural social pension and insurance policies, transfer income of rural
households enjoyed rapid growth, which was 10.6 % higher than the previous year.

**Policies in agricultural sector**

The central government has attached great importance in “three rural” issues since the last decade. Every year, the central government would issue its first policy document (No. 1 Central document) which addresses the future of the country’s agricultural sector. As presented in table 2, the Chinese government has broadened the scope of rural policy over time. Public expenditure for rural areas has been increasing since the reforms in agriculture. In 2011, the government spending in “three rural” issues were more than 1 trillion Yuan, with an increase of 183.9 billion Yuan and growth rate of 17.9% over the year 2010. In 2012, the central government invested 1228.7 billion in the construction of "three rural", which was 186.8 billion Yuan more than in 2011.

<table>
<thead>
<tr>
<th>Year</th>
<th>No.1 Central document (theme)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>Enhancement of farmers’ income</td>
</tr>
<tr>
<td>2005</td>
<td>Improvement of overall agricultural</td>
</tr>
<tr>
<td>Year</td>
<td>Objective</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
</tr>
<tr>
<td>2006</td>
<td>Building a new socialist countryside</td>
</tr>
<tr>
<td>2007</td>
<td>Development of modern agriculture</td>
</tr>
<tr>
<td>2008</td>
<td>Strengthening the agricultural infrastructure to enhance development of agriculture and farmers' income</td>
</tr>
<tr>
<td>2009</td>
<td>To establish steady growth of agriculture and increase farmers’ income</td>
</tr>
<tr>
<td>2010</td>
<td>Consolidation of the basis of agriculture and rural development</td>
</tr>
<tr>
<td>2011</td>
<td>Acceleration of the development of water conservancy projects</td>
</tr>
</tbody>
</table>

(The No.1 Central document of 2011 is the 8th document since 2004 on issues of “Agriculture, Rural Area and Farmers”.)

Wen Jiabao, Premier of the State Council, has mentioned in the “Report on the Work of Government 2013” that "three rural” issues was the most important task where the focus should be on enrichment of rural households’ income and consolidation of current growth momentum in agricultural
sector. Some key points are highlighted as follows

- Increased central government spending on agriculture, rural areas and farmers, which totaled 4.47 trillion Yuan for the past five years and rose by an average annual rate of 23.5%.

- Carried out agricultural modernization while deepening industrialization, application of information and communication technologies (ICT), and urbanization

- Built more water conservancy projects, improved rural land, developed high-grade farmland, and kept the country's total area of farmland over 121.3 million hectares.

- Strengthened rural infrastructure such as roads and water, power supply capacity. 1.465 million kilometers of rural roads, renovated run-down houses were built or upgraded for 10.33 million rural households, safe drinking water was provided for an additional 300 million plus rural residents, and electricity was delivered to 4.45 million people in areas without power supply.

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Established a sound system for subsidizing grain farmers and a sound mechanism for subsidizing major grain-producing areas, broadened the coverage of the subsidies, and raised them every year, from 63.9 billion Yuan in 2007 to 192.3 billion Yuan in 2012.

TABLE 3 National financial fund for agriculture 2005-2010

The government has diverse forms of agricultural subsidies such as general subsidies for purchasing agricultural supplies and subsidies for purchasing superior crop varieties and agricultural machinery and tools. As shown in table 3, national financial fund for agriculture in 2010 reached

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818.3 billion Yuan with an average annual growth of 22.4% from 2005 to 2010.

Public expenditure is always one of the most significant policy implements for the government. It is also a very important factor in the economic growth. For the sake of sustainable economic development, there is an increase demand for public services and necessity of investment in infrastructure. This would definitely place pressure under government which have to increase public expenses.

It has long been a heat discussion on how public spending and economic growth are closely related to each other. In the research article by Barro (1990) of Harvard University, he argued that the governmental expenditure which the public currently favored is consumption expenditure (non-productive expenditure) and, along with the increase in such spending, it would undermine the economic growth. People would have less incentive to invest as their returns from investment would be smaller due to the high tax rate. Consequently, the economy is likely to grow at a lower rate. Nonetheless, the productivity of the private sector would be improved if the government put more focus on productive expenditure such as infrastructure
investment. Aschauer (1990) has also added the importance of public investment in infrastructure such as roads, bridges, electric power, sewers, etc. to the motivation of private sector for productivity and investment. Besides, lots of Chinese scholars have conducted researches in the relations between public investment and rural households’ private productive investment, for example, Yang and Zhou (2007) stated that diverse public investment in different regions had positive or negative impact on rural households’ productive investment; Liu, Zhang and Fan (2002) found that, by using panel data of 300 rural households in Jiangsu province from 1993 to 1999, factors such as household characteristics, rural infrastructure and public services had a significant effect on the decision of rural households’ agricultural production investment.

Government spending, especially in rural areas of China, plays an important role in boosting local economy and alleviating poverty. Apart from providing subsidies for the agricultural sector, another factor which can boost economic growth is the self-motivation of rural households’ private agricultural production investment. Therefore, this paper would give a detailed analysis on the effect of public expenditure to productive
investment behavior of rural households across different regions in China.

The rest of this paper is organized as follows: Section 2 describes data and measures; Section 3 explains the empirical model for the purpose of our analysis; Section 4 discusses our estimated results; last but not least we have conclusion and suggestions in Section 5.
Data and Measurement

Data

To establish the credibility of the study, panel data sets of 30 provinces\(^4\), municipalities and autonomous regions in China\(^5\) are used to examine the empirical model. The data used in this study are from 1995 to 2011 and are obtained from China Statistical Yearbooks, China Rural Statistical Yearbooks as well as China Infobank online.

<table>
<thead>
<tr>
<th>TABLE 4 Description of National summary statistics</th>
</tr>
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<tbody>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>PI</td>
</tr>
<tr>
<td>ANI</td>
</tr>
<tr>
<td>PFA</td>
</tr>
<tr>
<td>IACA</td>
</tr>
<tr>
<td>SAVDO</td>
</tr>
<tr>
<td>PCELECON</td>
</tr>
<tr>
<td>CELLTEL</td>
</tr>
<tr>
<td>THIRDFORTHCH</td>
</tr>
</tbody>
</table>

\(^4\) Tibet is excluded due to insufficient data.

\(^5\) HKSAR, Macau SAR and Taiwan are excluded in the study.
Measurement

(A) Dependent Variable:

Productive investment (PI). It refers to rural residents’ real per capita annual productive investment in Yuan.\(^6\)

(B) Independent Variables:

Net income (ANI). It is the real per capita annual net income of rural residents in Yuan, which refers to the total income of rural residents from all sources minus all corresponding expenses. The equation\(^7\) is as follows:

\[
\text{Net income of rural residents} = \text{total income} - \text{household operation expenses} - \text{taxes and fees} - \text{depreciation of fixed assets for production} - \text{gifts to rural relatives}.
\]

In this study, ANI is expected to have a positive coefficient as people would be more willing to invest with higher income.

Productive fixed assets. (PFA) It is the original value of productive fixed assets per household in Yuan. People would be likely to invest more with advanced assets. Therefore, the expected sign of coefficient should be positive.

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\(^6\) Data on PI, ANI, PFA and SAVDO are deflated.

\(^7\) China Statistical Yearbook 1995-2011
Saving Deposit (SAVDO). It refers to rural residents’ real per capita balance of saving deposit in Yuan. With higher saving deposit, rural residents should be eager to increase their amount of productive investment. As a result, the coefficient should be positive.

Irrigated Area to cultivated area ratio (IACA). Effective irrigated area refers to the agricultural area where there are water sources or complete sets of irrigation facilities to lift and move adequate water for irrigation purpose under normal condition. Cultivated land is the sum of arable land and the land under permanent crops. In this study, the ratio of irrigated area to cultivated area indicates a measure of the importance of irrigation in agriculture and the expected sign of coefficient is positive.

Electricity consumption (PCELECCON). As one of the important characteristics of public spending, it measures rural residents’ per capita electricity consumption (kwh) in rural area. It shall have a positive coefficient.

Mobile telephone (CELLTEL). It is the number of mobile telephone owned (unit) per 100 rural households. The expected sign of coefficient is positive.

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8 Arable land refers to the land under temporary crops. The abandoned land resulting from shifting cultivation is not included; Land under permanent crops is the land cultivated with crops that occupy the land for long periods and need not to be replanted after each harvest. Source: FAO. 2011. AQUASTAT online database, http://www.fao.org/nr/aquastat. Accessed 25 March 2013.
Length of highways (THIRDFORTHCH). It gives the actual length of third and fourth class highways (1000km) in rural area and it is expected to have a positive coefficient.

**Empirical Model**

In Aschauer’s (1990) work “Public Investment and Private Sector Growth”, he said that the potential importance to the macro-economy of trends in infrastructure spending can be expressed in labor-intensive form, to show that private sector output is a function of both private capital and public infrastructure capital:

\[ y = f(k, k^g) \]

where \( y \) = private sector output, \( k \) = private capital, 

\( k^g \) = public infrastructure capital

(all expressed per unit of labor employed)

An increase in public capital expense would be expected to directly
raise the level of private sector output of goods and services, i.e. with a good infrastructure, private production would be much less costly. Thus, the connection between infrastructure and the economy is simple: the stock of public highways, bridges, electric power and other infrastructure capital is crucial to the profitable and efficient production and distribution of private sector goods and services.

Generally speaking, rural households’ productive investment is directly affected by market value of agricultural products and other non-market value factors. In this study, we would focus on non-market factors, i.e. the importance of rural public investment to rural households’ investment in agricultural production. The variables affecting productive investment of rural households would be divided into two categories: characteristics of rural households and rural public spending.

To identify the characteristics of rural households, variables such as per capita annual net income, fixed assets, saving deposits and number of mobile telephone owned would be used. For rural public spending, otherwise, variables like per capita electricity consumption, length of rural
level 3- and 4-class highways, proportion of irrigation land to cultivated land would be used. (Assume unit cost of public goods and services are equal in all regions.) Therefore, the relations between rural households’ productive investment (PI) and the variables (x) is:

\[ PI = f(x_1, x_2, ...) \]

As the objective of this study is to estimate the influence of rural public investment on the decision of rural households to invest in agricultural production investment across different provinces. There is regional disparity of development and economic conditions across national, hence, instead of ordinary least squares (OLS) model, panel data of fixed-effects model is adopted. The regression equation is:

\[
PI_{it} = \beta_0 + \beta_1 ANI_{it} + \beta_2 PFA_{it} + \beta_3 IACA_{it} + \beta_4 SAVDO_{it} + \beta_5 PCELECCON_{it} + \beta_6 CELTEL_{it} + \beta_7 THIRDFORTHCH_{it} + \delta_3 DC_{it} + \delta_3 DC_{it} + \cdots + \delta_{N} DC_{it} + \epsilon_{it}
\]

Where \( DC_{it} = 1 \) for the i-th province, otherwise = 0, \( i = 2, 3, \ldots, 30; \)

\( t = 1995, 1996, \ldots, 2011; \)

\( (DC_{it} \) is the dummy variable that assigned to denote different provinces).
Results

Details of the regression results are present in Table 3. Most of the coefficients in the model are statistically significant. In reference to the explanatory power of the rural public spending in each region, we find the adjusted $R^2$ with satisfactory results of 85.6% for national, together with 90.6%, 85.5% and 88.3% for eastern, central and western regions respectively.

**TABLE 5 Regression results**

<table>
<thead>
<tr>
<th></th>
<th>Eastern</th>
<th>Central</th>
<th>Western</th>
<th>National</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-47.171</td>
<td>23.611</td>
<td>-16.433</td>
<td>-5.276</td>
</tr>
<tr>
<td></td>
<td>(-3.03)</td>
<td>(1.444)</td>
<td>(-0.967)</td>
<td>(-0.541)</td>
</tr>
<tr>
<td>ANI</td>
<td>0.008</td>
<td>-0.006</td>
<td>0.005</td>
<td>0.003</td>
</tr>
<tr>
<td></td>
<td>(2.591)</td>
<td>(-1.033)</td>
<td>(0.663)</td>
<td>(1.471)</td>
</tr>
<tr>
<td>PFA</td>
<td>0.029</td>
<td>0.008</td>
<td>0.019</td>
<td>0.023</td>
</tr>
<tr>
<td>IACA</td>
<td>0.748</td>
<td>0.453</td>
<td>0.029</td>
<td>1.250</td>
</tr>
</tbody>
</table>
For the characteristics of rural households, as expected, it is found that productive fixed assets have significant positive effect on the behavior of rural households' agricultural production investment. Each percent increase in productive fixed assets is associated with .029, .008, .019 percent increase in productive investment of rural households. It implies that people with higher fixed assets of production would be likely to invest more so as
to make use of their own advantage and expect a higher return from the investment. Saving deposit, on the other hand, is found to be negatively associated with productive investment of rural households, although most insignificant. This suggests that saving deposit is not benefiting the agricultural production investment. It could be explained that, due to regional disparity in economic situation, farmers would probably make investment other than agriculture sector or save the money for health care.

Regarding the rural public investment of the model that includes irrigation variable, as table 5 shows, we find that government expenditures in rural areas hydraulic engineering construction has significant positive impact on the behavior of rural households in productive investment among eastern and western regions, as well as in national perspective. For eastern regions, one percent increase in agricultural public spending of irrigation is associated with .748 percent increase in the productive investment of rural households. While for western regions, one percent increase in public spending of irrigation rises the productive investment of rural household by .029 percent. The figure tells that the government investment in rural areas hydraulic engineering construction has improved the environment of
agricultural production to a certain extent, which encourages rural households to invest more in production. For the result of central regions, the coefficient is statistically insignificant that public spending on hydraulic engineering does not alter the behavior of rural households on productive investment. It could be explained by the superior geographic location and sufficient annual precipitation of central region that makes rural households have less incentive to invest in related agricultural production.

For electricity consumption, it is found that the coefficients in the model are all statistically significant across eastern, central, western regions and the nation as a whole. The result indicates that public investment in rural electricity infrastructure has marginal positive effect on rural households’ productive investment. Meanwhile, it affected the most in western regions, followed by central regions. The least effect is eastern regions. Each percent increase in rural electricity investment is associated with .361, .081 and .022 increase in rural households’ productive investment in western, central and eastern regions respectively. It is believed that with the rapid growth of electricity generating capacity and consumption, together with the prevalence of power grid in rural area, farmers could
utilize agricultural machinery to increase their production efficiently. Thus, it raises the interest of rural households to make more investment in agricultural production.

For the third- and fourth-class highways in rural areas, it shows that the public investment in rural transportation has significant positive effect in western regions and national perspective. The coefficient is .074 and .059 correspondingly. It implies that public expenditures on infrastructure such as rural roads would reduce the transportation and transaction costs of farmers for buying raw materials and selling agricultural products. The convenience that highway brings to farmers makes them more willing to invest in agricultural production. In contrast, especially for eastern regions, the public expenditure in rural transportation is found to be negatively associated with rural households’ productive investment, though the coefficients are statistically insignificant.

Concerning the number of mobile telephone owned per 100 households in rural areas, the results shows that public investment in rural regions’ telecommunication network has substantial positive effect in farmer’s
productive investment across different regions, with the exception of the eastern regions. For central regions, the effect is the most significant with coefficient of .588, followed by western regions with coefficient of .34. For eastern regions, however, the estimated coefficient of –(.033) is not statistically significant. The marginal negative impact could be explained by: with the advanced telecommunication network and prevalence of mobile telephone among rural areas, households are able to interact with people easily and have more opportunities to seek for non-agricultural employment. With the increase of their non-agriculture income, they might reduce their investment in agricultural production.

Conclusion

In this paper, we use panel data set of 30 provinces, municipalities and autonomous regions in China to analyze the effect of rural public spending on productive investment of rural households across eastern, central and western regions. The regression results show that the decision of rural
households in production investment is affected by public spending in rural infrastructure among different regions: transportation has the most positive effect in western regions with coefficient of .074; development of telecommunication network has marginal positive effect in central and western regions with coefficients of .588 and .34 respectively; electricity infrastructure has significant positive effect in all three regions with coefficients of .022, .081 and .361 for eastern, central and western regions respectively; rural areas hydraulic engineering has significant positive impact in eastern and western regions where the coefficients are .748 and .029 correspondingly.

Based on the results, in order to have a sustainable economic growth in agricultural productivity, we suggest that the central government should maintain its current rural expenditures; meanwhile, increase its amount of investment in rural infrastructure in the future. Strengthen transportation, electrification, irrigation facilities, telecommunication as well as basic public services, all of which greatly improve agricultural production environment in rural areas. With a steady improvement in rural productivity
and quality of life, people would be more aggressive to increase their expanse in agricultural productive investment.

There are a few areas that further study on the topic can be addressed. First of all, the unit cost of public goods and services is assumed the same in all areas of national. In fact, this assumption is unrealistic that the unit cost would be different according to regional disparity. Secondly, the taxes and administrative costs associated with public spending is not taken into account, which may result in deadweight loss and, as a result, reduce the returns to public spending.
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