

The Relationship of Government Agricultural Public Goods Investment and Rural Households' Input

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Abstract-This paper modified the classic household utility model by introduce two new variables, which were government agricultural public investment and rural households' farmland input. It analyzed the relationship of government agricultural public investment and rural households' investment in recent 15 years. The conclusion is that there is a Long-run equilibrium relationship between government agricultural public investment and rural households' investment; government agricultural public investment drive the rural households' farmland input; Urbanization caused huge gap between marginal benefit of agricultural production and non-agricultural and lower efficiency of farm land use. As a result government should increase the agricultural public investment to drive rural households' farmland input, and increase the output efficiency of farmland and ensure national food security.

Keywords-Government; Agricultural public investment; rural households' input; ECM

I. INTRODUCTION

China is a large agricultural country, to create a harmonious society, we must first focus on rural development [1], rural development is inseparable from the daily production and business activities of farmers, farmers are the main agricultural production, micro-economic, farmers invest directly related to agricultural land the potential for agricultural development, related to the output efficiency of agricultural land, to the country's food security. Currently, agricultural inputs to farmers academic conduct fruitful research. Early studies mainly engaged in agricultural input factors farmer characteristics and changes in the description[2], subsequent studies will gradually shift to productive investment factors affecting farmers in the discussion, affecting farmers into agricultural land area of the main factors and the social environment [3], the rural tax reform and policy support [4,5,6].

Household income and household characteristics [7,8,9], farmers farmland scale [10,11], but also scholars from rural public utilities perspective of its impact on farm inputs [12], through his numerous regression model affecting farmers farmland investment factors were analyzed, obtained rural public utilities and farmers agricultural inputs were positively correlated conclusions, but he was doing regression model before and did not examine the variables cointegration relationship, the result may be spurious regression the situation is not convincing. Most of these scholars analyzed using a standardized description and quantitative analysis, there is no established theoretical interpretation affects farmers from agricultural land into

universal model. In the context of tax reform through the establishment of local farmers to invest utility model analysis Fiscal Expenditure on household investment Crowding and crowding-out effect, the somewhat more convincing conclusions, but the model established in the agricultural sector and the non-agricultural part of the elements of market competition and the farmers on the basis of consumer decision-making stage, not a very good response behavior of the farmer's production and local fiscal expenditure on agriculture between. This article will be based on the behavior of farmers in agricultural production on the basis of the farmers utility model starting from the theoretical and empirical aspects of this are discussed, revealing the relationship between the two, trying to perfect the relevant government support for agriculture and rural policies provide the basis for new.

II. THEORETICAL DERIVATION ON RELATIONS OF THE AGRICULTURAL PUBLIC INPUT INTO AGRICULTURAL LAND BETWEEN GOVERNMENT AND FARMERS

In the process of economic development, development economists gradually from keen to discuss macroeconomic, development strategy and other issues in the steering behavior of farmers, farmers behavior is an economics research bonanza. Becker, Gary (Gary Becker) first proposed the household production model, then economists have carried out in-depth deduction, which Sien (Singh), Squire (Squire) and Strasser (Strauss) of farmers utility model is the most influential farmer behavior model. In this model, farmers production, time and cash income as a constraint, expressed under conditions of farmers Farmers utility maximization of consumption from own production of agricultural products and commodities purchased the free market, as well as farmers on the requirements of the higher of leisure time relationships. The basic assumption is: farmers are utility maximization suitors, farmers utility by household income, production efficiency and farmers leisure and other factors, farmers' decision-making behavior by farmers in cash, labor and technology and resource constraints. For a production cycle, the household utility model can be expressed as follows [13]:

$$\text{Max}U = U(X_a, X_m, X_L) \quad (1)$$

This model is not the farmer's variable inputs divided

into private investment and the government's public investment, investment in rural public goods does not reflect its impact on private investment and its effectiveness. In order to analyze government investment in rural public goods production for farmers and consumer behavior, farmers in the above utility function based on the introduction of rural public goods government input variables (XG) and farmers, private input variables (XP), the improvement of the farmers utility model is as follows :

$$\text{Max}U = U(X_a, X_p, X_g, X_L) \quad (2)$$

$$S.t. \quad Q = Q(A, L, G, P)$$

$$\begin{aligned} T &= X_L + T_f \\ P_p X_p &= P_a (Q - X_a) - W(L - T_f) + P_g X_g \end{aligned} \quad (3)$$

The above equation, U is the utility function of farmers, Xa consume agricultural products for farmers, Xp private agricultural land for farmers to invest, XG for government investment in rural public goods, XL for farmers demand for leisure time, Q is the total households production volume, A is the area of land cultivated farmers (assumed to be invariant), L is the total labor time farmer's production inputs (including the freedom to hire labor time and labor time), T is the total time of labor reserves, T_f for farmers for production time, (Q-Xa) is for the sale of agricultural products market volume, Pa, Pm, Pv, PG are the prices of agricultural products, the market price of purchased goods, material input prices and government rural public product prices, W is the price of labor, (L- T_f) was used to engage in wage-earning labor time (negative values indicate hired into the working hours, a time when it means employed out of hours).

The above three constraints can be combined to obtain the following equation:

$$\begin{aligned} P_p X_p + P_a X_a + W X_L &= W(T - L) \\ &+ P_a Q + P_g X_g \end{aligned} \quad (4)$$

LHS is equal to the total expenditure of household items, including private investment expenditure households (P_pX_p), household consumption spending their own products (P_aX_a) and farmers spending leisure time consuming (WX_L). RHS is the farmer all revenue items, including household wage income (W × (TL)), farmers to sell agricultural income (PaQ), and government investment in rural public goods (P_gX_g).

As the market is imperfect, for the farmers, the situation of information asymmetry, farmers can't sell its products, or purchase its consumption or production of all the goods required. Therefore, it assumes that the production, consumption of households and labor supply decisions affect each other [14]. According to the above constraints and build utility function Lagrange function extremum problem solving Lagrange conditions:

$$\begin{aligned} \max_{\substack{X_a, X_p, X_g, X_L \\ Q, P, G, L}} I &= U(X_a, X_p, X_g, X_L) \\ &+ \lambda [(P_p X_p + P_a X_a + W X_L \\ &- W(T - L) + P_a Q + P_g X_g)] \\ &+ \mu Q(A, L, G, P) \end{aligned} \quad (5)$$

For each variable seeking a first derivative to zero, solving the farmers utility maximization conditions.

$$\mu = P_g / Q_g = W / Q_L = P_p / Q_p \quad (6)$$

Therefore

$$P_g Q_p = P_p Q_g \quad (7)$$

Assuming private households and public goods investment goods price ratio remained unchanged, that is both the replacement rate constant, when the quantity of inputs QG public goods increases, farmers will be with private investment goods increased QP; otherwise reverse. Above analysis shows that: Government in stabilizing the prices of agricultural production, based on the increase in agricultural public goods investment will lead farmers to increase investment in agricultural land.

III. EMPIRICAL STUDY ON RELATIONSHIP OF THE GOVERNMENT AGRICULTURAL PUBLIC INPUT INTO AGRICULTURAL LAND AND FARMERS

A. Data

Affecting farmers into agricultural land there are many factors, some scholars were divided into household characteristics of household wealth, the price factor, credit variables and community infrastructure and other four types^[15], on farmers' production behavior directly impact government rural public goods for the production of public goods. In this article, the government adopted the rural public input data "China Rural Statistical Yearbook" on government support for agricultural production in 1985-2010 expenditures. Government support for agricultural production expenditure is the state's financial support of the rural collectives and farmers production expenditures, including in rural areas organized small-scale irrigation and sprinkler irrigation and other subsidies for rural water and soil conservation measures, subsidies for rural small organized hydropower subsidies, large drought subsidies, rural agricultural extension and plant protection subsidies, protection of rural pastures and livestock subsidies, rural afforestation and forest conservation subsidies, subsidies for rural aquaculture, development of food production and other special funds. Farmers agricultural inputs data using the "China Rural Statistical Yearbook" 1985-2010 farmers on agricultural production expenditures.

B. Empirical Study

Cointegration test and error correction model (Error

Correction Mechanism) is used to detect whether the two time series variables long-run equilibrium relationship and to determine whether a causal relationship between the general method. This method has been widely used, such as is used in China's savings rate and investment relationship between the rate, the real estate industry and national economic growth empirical studies and so on.

1) Unit root test

Since the non-stationary series will produce fallacy regression (Phenomenon of Spurious Regression), resulting in no economic sense analysis results, so first of all to the time series stationary test.

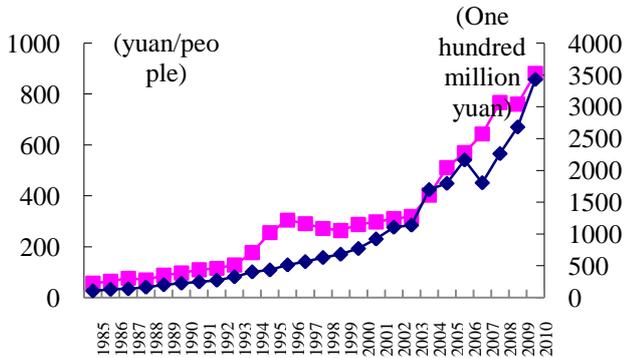


Figure 1. 1985-2010 Agricultural Public Investment in Agricultural Inputs and Farmers Changing Trends.

Data Source: China Rural Statistical Yearbook

As can be seen from Figure 1, the government and farmers agricultural public investment in agricultural inputs changing exhibits a clear upward trend, intuitively indicates that two sequences are not stationary, hence the need for stationary test. In order to eliminate heteroskedasticity variable sequence of variable sequences natural logarithm, that government agricultural public input and farmers into agricultural land, using the method of ADF test sequences for two variables stationary test, and the results are shown in

TABLE I. EACH INDEX TIME SERIES STATIONARY TEST RESULTS

Index	ADF Statistics	5% Significance level	Conclusion
LnFPI	-2.421210	0.3596	Non-stationary
dLnFPI	-3.261234	0.0297	stationary
LnGCI	-2.857455	0.1972	Non-stationary
dLnGCI	-7.277171	0.0000	stationary

As can be seen from Table 1, government agricultural public input ($LnGCI$) and farmers agricultural inputs ($LnFPI$) are integrated of order one.

2) Cointegration

Farmers agricultural land into variable ($LnFPI$) and government agricultural public investment ($LnGCI$) are integrated of order one, you can cointegration test. Because only consider two variables cointegration test, it can be a simple two-step test method. Farmers agricultural land into variable ($LnFPI$) and government agricultural public investment ($LnGCI$) relational equation is as follows:

$$LnFPI_t = \beta_1 + \beta_2 LnGPI_t + u_t \quad (8)$$

For transposition deformation equations obtained:

$$u_t = LnFPI_t - \beta_1 - \beta_2 LnGPI_t \quad (9)$$

U_t on stationary test sequence, if U_t stable, it indicates the presence of cointegration between $LnFPI$ and $LnGCI$. Upon examination, an order ADF statistic -9.221227, limiting the level of 0.0000, a 1% significance test, and there is an order of cointegration between $LnFPI$ and $LnGCI$ that the long-run equilibrium relationship exists between $LnFPI$ and $LnGCI$

3) ECM model.

Equilibrium error correction model can be used to analyze the relationship between the two groups have co-integration relationship between variables. As with the cointegration relationship exists between, so you can create the following equilibrium error correction model:

$$\Delta LnFPI_t = \alpha_0 + \alpha_1 \Delta LnGCI_t + \alpha_2 \Delta LnFPI_{t-1} + \alpha_3 u_{t-1} + \varepsilon_t \quad (10)$$

The following statistical properties of the optimal relationship, by Eviews software trial,:

$$\begin{aligned} \Delta LnFPI_t = & 0.375162 \Delta LnGCI_t + 0.489841 \Delta LnFPI_{t-1} \\ & (2.478906^*) \quad (3.124538^{**}) \\ & -0.343483 u_{t-1} \\ & (-2.635924^*) \end{aligned} \quad (11)$$

Equation (11) where: error correction coefficient is -0.343483, indicating that long-term equilibrium fluctuations have little effect on short-term and short-term equilibrium relationship exists, and short-term elasticity of 0.375162, ie short term government investment in agricultural public investment in agricultural land to farmers have positive effect. This indicates that farmers agricultural land into agricultural public investment in the government response to the phenomenon of no delay. In order to reveal the long-term equilibrium relationship between the (2.4) Chinese expansion, the following optimal relationship:

$$\begin{aligned} \Delta LnFPI_t = & 0.326861 \Delta LnGCI_t + 0.431682 \Delta LnFPI_{t-1} \\ & (1.521200) \quad (2.197212^*) \\ & -0.298564 LnFPI_{t-1} + 0.257600 LnGCI_{t-1} \\ & (-2.323319^*) \quad (2.380013^*) \end{aligned} \quad (12)$$

Transforming it into error correction model is as follows:

$$\begin{aligned} \Delta LnFPI_t = & 0.326861 \Delta LnGCI_t + 0.431682 \Delta LnFPI_{t-1} \\ & -0.298564 (LnFPI_{t-1} - 0.862796 LnGCI_{t-1}) \end{aligned} \quad (13)$$

Equation (13) explains the long-term equilibrium

relationship with long-term elasticity of 0.862796; error correction coefficient is 0.298564, and short-term error correction coefficient less, proved the long-term equilibrium relationship with stability. Through the analysis of the error correction model, you can get government agricultural public investment (*FPI*) agricultural inputs to farmers (*GCI*) has a positive influence that public investment in agriculture can increase government led farmers to increase investment in agricultural land.

IV. CONCLUSION

This paper introduces the government and farmers in rural public goods into private investment in two variables, for a typical household utility model is improved by building a lagrangian function extremum problem solving, and thus, in theory, be drawn: in the government and farmers in rural public goods agricultural input price ratio remained unchanged, the government and farmers in rural public goods into private investment showed a positive correlation between increased government investment in rural public goods will drive farmers to increase investment in agricultural land. And use the 1985-2008 government agricultural public investment expenditures in agricultural production and farmers sequence data, using Eviews software, public investment and government agricultural farmers into agricultural land cointegration analysis and error correction, empirical results obtained are as follows: The Government Agriculture public investment in agricultural production inputs to farmers has a positive role in promoting.

These findings can give us the following revelation: urbanization has led to agricultural production in the marginal benefit and marginal benefit a huge gap between farm production, farmers reduced agricultural land use efficiency under realistic conditions, the government must increase investment in agricultural production, while accelerating public goods on rural health care, education, social security, household and other institutional reforms, rural areas and farmers to increase efforts to support [18], in order to bring farmers on agricultural inputs to improve the output efficiency of agricultural land to ensure national food safety.

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