

A Systems Dynamic Model of Farmers Income Long Term Growth as Human Capital Investment

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Abstract — To improve the long-term income of the farmers is a major issue in today's society which must be solved. This paper takes Chongqing as the empirical object, and studies the farmers long-term income influence factors using the System Dynamics (SD) method. The results show that investment in basic education and in occupation technical training can significantly improve farmers' prospects. But farmers desire to invest in health care prevents immediate increase in their income. On this basis, from three aspects of rural basic education, occupation technical training and medical insurance, we build a long-term effective mechanism of farmers' income under the perspective of human capital.

Keywords - human capital investment, farmers' income; long-term

I. INTRODUCTION

To improve the long-term income of farmers is the basic requirement of establishing a harmonious socialist society and the target point, and realize the co-construction or sharing of the well-off society [1]. Since the reform and opening, the Central Committee of the Communist Party of China has been committed to improving the farmers' income, so, how to increase farmers' income has become a major problem must solve in our society, which cause the further research of many scholars on the issue. Among them, the discussion of relationship between rural human capital and the farmers to farmers long-term income is the key of the research and hot spots.

Human capital refers to the workers investment of knowledge, skills, and physical health, after condensation on farmers capital which is the farmer training, education and health investment [2]. For the relationship between human capital and farmers' long-term income, Schultz pointed out that strengthening on rural education education and agricultural scientific research investment can effectively promote the farmers' income. Through his research, up to eighty percent of the farmers' income related to rural education and education industry after the Second World War. On this basis, Chen Wei [3] introduced the rural education divided into basic degree education and vocational training, and used the data of Hainan province to carry on the empirical research. The results show that both kinds of

This paper argues that related to the farmers' income of the rural human capital investment mainly includes the basic education, vocational and technical education investment and health investment from three aspects. In order to build a long-term mechanism to increase the income of farmers from the perspective of human capital investment under the relevant statistical data of 2005 to 2014 in Chongqing, we carry out the following analysis.

education mode has positive effect on farmers' long-term income, which occupation training promotes greater, and basic education investment promotes weaker. The literature of human capital investment has not considered the effect of long-term health investment on farmers' income, in order to solve the problem, uointegration method is adopted by Pan Wen-qing [4] to Guangdong farmers' human capital investment and the relationship of revenue has carried on the empirical analysis. The result shows that the farmers' health education investment and migration investment also drastically affects the fixed income of the farmers in addition to the education investment.

As the inland opening and the core of the economic growth, improving farmers' income on long-term measures in Chongqing city is of great significance for the other regions. In this background, this paper on the basis of existing research takes Chongqing city as the object of empirical to study the relationship between Chongqing farmers long-term income and investment in basic education, vocational and technical training investment and investment in health, and was constructed for the public to increase the long-term mechanism at the same time from the perspective of human capital investment.

II. STUDY ON THE METHOD OF BUILDING A LONG-TERM MECHANISM TO INCREASE THE INCOME OF FARMERS FROM THE PERSPECTIVE IN HUMAN CAPITAL INVESTMENT

Firstly, we use the unit root test (augmented Dickey Fuller - test, ADF) test stability between different variables, if the variable by the unit root test, is to carry on the Cointegration test (Johansen - Juselius, JJ), to test whether there is a Cointegration relationship between the variables, and then, there is a Cointegration relationship between each variable, on the basis of through the vector error correction model (the

vector error correction model, VECM) analysis of the long-term equilibrium relationship between variables.

Secondly, based on VECM model analysis for granger causality test, granger causality test, GCT), test whether there are different variables granger causality.

Thirdly, through the impulse response function (impulse response function, IRF) and variance decomposition (variance decomposition, VD) method for analyzing the model, the further research of the dynamic relationship between different variables.

Finally, by using system dynamics (SD - system dynamics) method, based on the system of the internal elements of causal feedback characteristic, from the internal structure of the system to find the root of the problem, build long-term increase in rural incomes system based on human capital investment theory model.

III. ANALYSIS OF CONSTRUCTION OF THE FARMERS' LONG-TERM MECHANISM FROM THE PERSPECTIVE IN HUMAN CAPITAL INCOME INVESTMENT

Stationarity and Cointegration Relationship between the Variables. Investment expenditure of basic education, vocational and technical education investment, health care investment expenditure and per capita net income of four variables through the unit root test method. It is found that the level of value are not stable, but with a more stable of first-order difference scores. The Cointegration test for these variables, found that basic education investment expenditure and investment occupation technology education expenditure, health care expenditure and per capita net income Cointegration relationship exists. In this regard, the establishment of the vector error correction model (vector error the correction model, VECM):

$$\Delta y_t = \beta_0 + \alpha ecm_{t-1} + \sum_{i=1}^p \Gamma_i \Delta y_{t-i} + \varepsilon_t \quad (1)$$

Where $y_t = (LNM \ LNE \ LNH \ LNY)^T$, Δ expresses first order differential; $ecm_{t-1} = \beta'$; y_{t-1} expresses as the lag order number; showing the error correction term and reflect the long-term equilibrium relationship between variables; α expresses the adjustment variable to the speed of adjustment to equilibrium; Γ_i expresses different variables of short-term changes to be explained the influence of short-term changes in the variables of representation.

According to the VEC model to estimate parameter values, it is concluded that the income of the farmers' and farmers in the basic education, vocational and technical education and health care investment there is a long-term equilibrium relationship, including investments in basic education and vocational and technical training investment to improve the income of farmers, and farmers in the medical care investment on the income of the farmers is the negative direction.

The Grant Causal Relationship between the Variables. In this paper, we test the Grant causality based on the VEC model. Error correction model:

$$\Delta Y_t = \sum_{i=1}^p [\alpha_i \Delta X_{t-i} + \beta_i \Delta X_{t-i} + \dots + \gamma_i \Delta X_{t-i} + \delta_i \Delta Y_{t-i}] + \lambda ecm_{t-1} + \varepsilon_t \quad (2)$$

In based on VEC model, the Wald test regression coefficient, results show that, in the long-term relationship between Lattice Lange, the variables are long-term Grant causality. In the short run price Lange, rural basic education investment and not the income of the farmers, investment in health care and vocational and technical education investment Granger reasons. This shows that farmers' education investment based on a time lag to the farmer occupation technical education investment, health care investment and the income of the farmers there. Occupation technology education to basic education investment in the direction of the causal relationship between Grainger also has the same problem.

The Equilibrium rRelationship between the Variables. The result of the impulse response function and variance decomposition as shown in Figure 1-2.

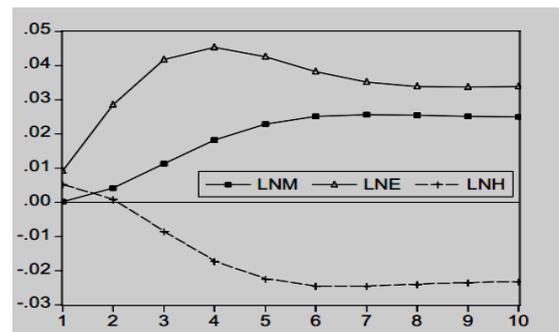


Figure 1. LNY of LNM, LNE, LNH impact response

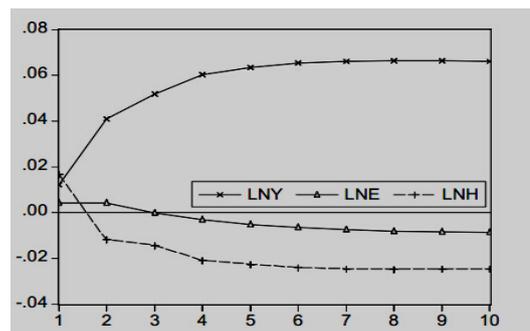


Figure 2. LNM to LNY, LNE, LNH impact response

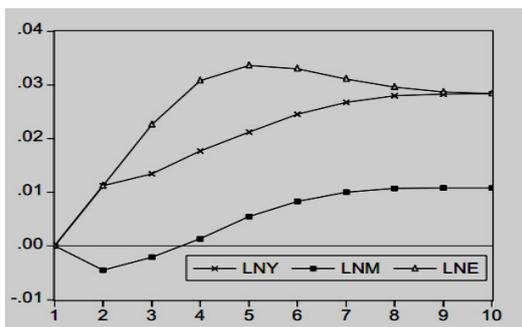


Figure 3. LNE to LNY, LNM, LNH impact response

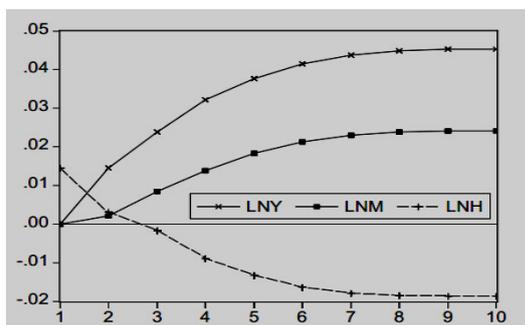


Figure 4. LNH of LNY, LNM, LNE impact response

The Kinetic Model of Long-term Income System. Considering foundation education investment, vocational training and health investment influence on farmers' long-term income, adopt the method of system dynamics [5], build system of rural human capital investment and farmers long-term income feedback structure model.

As shown in Figure 3, basic education investment and vocational and technical training for farmers, two factors are: the feedback chain farmers' basic education investment (or farmers vocational and technical training investment) - amount of intellectual capital (+) - (+) peasant quality - labor productivity (+) - (+) the first, second or third industry revenue - farmers' income in (+) - (+) farmers' basic education investment (or farmers vocational and technical training investment) and farmers' health care investment feedback chain for farmers' health care investment - (-) based investment education and vocational training farmers investment - amount of intellectual capital (-) - (-) farmers' quality and labor productivity (-) - (-) first, second or third industry income - the income of farmers (-) - (+) farmers' health investment.

That means farmers basic education investment and vocational training are able to promote the farmers' income. But farmers health care investment has inhibitory effect to the farmers' income, this is due to the current farmers' health investment is mainly used to treat disease, rather than used to improve the labor productivity. Under the condition of the farmers' income level is not high, in order to treat disease have to increase health investment, reducing investment in basic education and vocational training, eventually reduce the farmers' income results. Based on the above analysis, rural

human capital investment and long-term income of farmers is shown in Figure 4.

IV. CONCLUSIONS AND SUGGESTIONS

The study shows that the farmers' income and long-term related basic education investment, occupation technical training and health care investment. Among them, the investments in basic education and vocational and technical training investment can promote the increase of farmers' income, but due to the farmers' in Chongqing in the health care investment and not to improve labor productivity, so farmers in the farmer's medical treatment and health care investment will suppress farmers' income. On this basis, the paper studies occupation technical training and medical insurance construction mechanism of farmers' long-term income from three aspects of basic education.

Farmers Vocational and Technical Training. Innovation fund input mechanism can expand vocational and technical training of the financing channels, and strengthen fund management two aspects.

Expand farmers vocational and technical training funds source channel, realize the diversification of capital. At present, the peasants' vocational technical training funds mainly comes from government fiscal spending. Since farmers vocational and technical training is not belong to public goods, therefore only by the government of a single input obviously cannot achieve the optimal. Should be on the basis of the government investment, attract investment in the social power of enterprise, individual and give full play to the synergy between different funds. Governments at all levels should strengthen the government investment, at the same time, through the preferential policy, fully arouse folk investment strength, gradually establish relies on the government investment, the social from all walks of life of diversified financing channels. At the same time, but also broaden the government investment funds. (2) Strengthening the management of funds, improve the service efficiency of funds. Agricultural vocational and technical training is more than a complex project, including the functions, capital chain is longer, more must strengthen fund management, increasing the service efficiency of funds. First of all, to clear service range of funds. At present, in some places in China, the use of farmers' vocational technical training funds exist the phenomenon of investment in other projects, severely reduces their efficiency. Therefore, in order to prevent use of funds, must be clearly stipulated farmers vocational and technical training funds, the scope of application of the each capital expenditures have according to the can depend on.

Intensive Training Incentive Mechanism. Strengthen the training incentive mechanism, including incentive for participating farmers, the teachers and the training of the incentive mechanism of incentive.

A. The Incentive for Participating Farmers.

As the object of occupation technical training, the enthusiasm of farmers to participate in the occupation training directly determines the effect and progress of training. To improve the enthusiasm of farmers participating in the

training can be from two aspects: first, grant funds. Most farmers are not willing to participate in the occupation technical training, training is mainly due to higher costs, and to participate in the training for normal work, which led to the loss of income. So, you can through the issuance of training grants and subsidies for workers, reduce the cost of farmers concerns. Secondly, provide preferential policies. Give some preferential policies for farmers to participate in the training, such as preferential loans and subsidies, improve the enthusiasm of farmers to participate in training. (2) The training of teachers incentive. First of all, teachers need to clear occupation technical training standards, encourage teachers to consciously improve their own quality. On the one hand, teachers should respect the farmer training. When the farmers with their friends from the heart, sincerely communicate sincerely with farmers, help farmers solve problems, create a good relationship between teachers and students. On the other hand, training teachers should fully understand deeply the life of the peasants, farmers really need to grasp what skills. Secondly, the rich reward, to improve the working enthusiasm of the teachers. The material and spiritual incentives to fully combine high enthusiasm, service to the farmers occupation technology training is popular among farmers and remarkable achievements of training teachers promote the recognition, foster advanced models. At the same time, to strengthen the study and education of teachers, excellent teachers give further opportunity to further improve the professional quality of teachers. (3) The training of the incentive mechanism. On the training of the incentive mechanism is mainly carried out by the way of preferential tax policies. The participation of farmers occupation technical training enterprises, due to lower tax rates or occupation training costs for farmers to reduce the level of tax cost. To make outstanding achievements in farmers' occupation technical training in the field of enterprise, give other preferential policies.

Improve the Operation and Management Mechanism. Training operations and improve the mechanism of operation management refers to the innovation mechanism; strengthen the training management mechanism and a clear relationship between power and responsibility.

B. Operating Mechanism for the Training of Innovation.

The current farmer's vocational and technical training is designated training pattern. This training operation mechanism, provide the space for the indemnification, easy to breed corruption, then the quality of the training. To this, need training in traditional order mode introduced in the market mechanism. Every year for training institutions for training quality evaluation, backward training institutions, form the competition mechanism. (2) Strengthen the training management mechanism. First of all, to effectively integrate vocational technical training resources, make give priority to with vestibule school, vocational and technical schools and farmers' education of science and technology training center is complementary, supplement with the social from all walks of life force farmers vocational and technical training network. Second, create farmers vocational and technical training of

the network information platform. In the information technology rapid development of modern society, the introduction of information technology in the farmers' vocational and technical training, can greatly improve the efficiency of the farmers vocational and technical training and pertinence. (3) The relation between responsibilities clear subject. At present, our country peasant training project implementation is the contract. But through the field investigation found that due to the relationship between the contract subject is not clear, so most of the binding contract is smaller. So, the operation and management system of the farmers vocational and technical training, also need to clearly the responsibilities of the contract.

C. Farmers' Health Care.

Establish a mechanism for the integration of urban and rural medical insurance. With the acceleration of urbanization, urban and rural residents in different medical insurance system has seriously hindered the social justice and a sustainable development, obviously can not meet the needs of the development of modern, and the establishment of medical insurance of urban and rural integration mechanism is the inevitable trend of the development of the times.

(1) Led by the government, the integration of all kinds of social insurance agencies. The integration of the medical insurance management resources, establish a unified agency is the inevitable trend of the development of medical insurance system, and the integration of the medical insurance by the Department of leadership is needed through the test of practice can be determined. In practical terms, after the integration of the medical insurance by the Department of leadership has no obvious influence. Many provinces and cities in China, each local situation may not be completely consistent, so for the management of medical insurance, not using the unified model, the conditions must be based on specific cases. (2) Security resources into medical security in rural areas, narrowing the gap between urban and rural areas. From the development of medical insurance system in developed countries, to promote fair allocation of medical insurance information between different regions is the only way which must be passed the construction of a unified health care system. At present, the distribution of health resources in our country between city and countryside is extremely unbalanced. So, to build the integration mechanism of medical insurance should increase the rural medical insurance resources, narrowing the gap between urban and rural areas. In addition, in order to improve the rural residents medical insurance level, to ensure that rural residents to timely medical treatment, can draw lessons from Japan's "barefoot doctors" system. By the local government funded the establishment of a Medical University, medical personnel training for the students in the remote village, time costs borne by the government, but the students after graduation to rural service in recent years.

The construction of rural medical security mechanism of investment efficiency. Rural medical insurance investment in China is facing in the serious problem the inefficient and influenced the whole topic of China's rural medical insurance

construction [6]. To this, to take some measures to improve the efficiency of rural health, safeguard mechanism construction of rural health investment efficiency.

(1) Innovation investment way, change the budget for the government to purchase of investment. In fact, most areas in China is not lack of health care institutions, but the lack of effective guidance. Can be found from years of practice, the government through the budget into arranged all medical institutions to provide health insurance services, has brought such as lack of health supervision, because there is no sense of competition and lead to low efficiency of medical service and so on. And if the government to change the previous way of budget, to face the common and private service providers to implement strategic purchasing, goal-directed clear service purchase contract, will drastically improve the efficiency of the rural health system. (2) Perfect the new farming and internal operating mechanism. New farming and is the important part of rural medical insurance system, but at present, the new farmers and guarantee the effect is not obvious, mainly because of its internal operational mechanism imperfect. First, you need to improve the subsidy standards. The allowances for farmers to raise new is prerequisite to promote its effective operation. Second, improve the level of new farming and compensation. New farming in our country's ability to dissolve the risk of a serious illness is still relatively low, it is necessary to improve the compensation. Also, gradually expand the coverage of new farmers. Really affect farmers' health is common disease and frequently-occurring disease, and many serious illness is a common disease and frequently encountered disease due to not get timely treatment. Finally, improve farmers ginseng protect mechanism. Now the most common way of ginseng is a top-down model of government leading, namely through the government propaganda, organize farmers ginseng. This model, not only the financing cost and management cost is higher, and hard to ensure that farmers ginseng protect enthusiasm, can consider to devolution to the village two committees, from the village two committees autonomous organization is responsible for collecting the farmers ginseng protect costs.

D. Rural Basic Education.

The construction of rural basic education investment guarantee mechanism. To promote the increase of farmers' long-term income, must constantly improve the rural basic education investment system, to build effective safeguard mechanism for rural basic education, can work from the following three aspects:

(1) Widen financing channels, increased investment in rural basic education. On the one hand, continue to increase investment in education funding, and new funds tilt to rural areas. On the other hand, we propose financing methods. For example, you can issue education lottery, or from the current lottery to extract a certain amount of money for education career. In addition, you can for various forms of education in the whole society fundraiser. (2) The improvement measures for the use of education funds, improve the service efficiency of funds. First of all, the security of rural education fund

special fund is special. Governments at all levels of the rural education funds, account must enter education funds, used for the construction of rural basic education and rural education resolutely put an end to intercept or misappropriate funds. Secondly, for the central issue of rural education special funds, allow the education departments at all levels have a certain degree of overall arrangement, on the whole to join each other to make the education funds, improve the efficient use of funds. Finally, integrate the rural education resources; optimize the resource configuration, reasonable divergence. To speed up the rural reform of the personnel system, reduce the education exceed personnel, gradually substitute teacher, repel and reduce because the personnel salary higher spending and use the phenomenon of rural education funds. (3) Strengthen the supervision over the use of education funds and implement mechanism. Establish and improve the rural education funds under special supervision and audit mechanism. Local governments need to rural education funds of the budget and the usage as the individual content, in the annual report to you on the people's congress representative works and review by the organizer. For education funding the growth requirements did not meet the budget, the conference will not be through. If you examine the existing illegal funds, at the same time of punish according to law, the illegal funds used for the field of education. If there is no reason to take up, retaining education funds, should increase the intensity of punishment, such as the main leadership can implement administrative overruled make a ticket.

The construction of rural basic education quality guarantee mechanism. The level of the quality of education is directly related to the quality of farmers of the wide field of view and quality, only guarantee the good quality of education in order to achieve an increase in the income of the farmers, we must develop multiple security subject and to create a good cultural atmosphere of two pronged.

(1) Development of multiple security subjects. At present, in China's education quality assurance system, education administrative department has the absolute authority of the position, and the school's own plays a subordinate to and serve the role, and external security of society was not able to fully utility. In order to improve the overall quality of education must improve the administrative department of education "thriving" situation, gradually set up by the administrative departments of education, schools and social diversified education quality guarantee system. (2) Create a good cultural atmosphere quality. The key to create a good cultural atmosphere of quality lies in creating a good campus culture. Campus culture includes the campus material and spiritual wealth, has an important effect on the healthy growth of students. The construction of campus culture is for the healthy growth of the students provides a good environment, and promotes the formation of healthy personality, to improve the quality.

ACKNOWLEDGEMENTS

The work described in this paper is supported by the Chongqing City Board of Education Science and Technology Research Projects (No. KJ1503206).

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