

How Land Transfer Contracts Affect Farmers' Investment Behaviour-based on Survey Data of 991 Rural Households in five Provinces in China

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Abstract. As a product of rural economic development to a certain stage, land transfer plays a key role in the scale, intensification and modernization of agricultural business model, however, some of the transferring farmers in the long term due to the "free-rider" thinking and refused to invest in infrastructure, which is not conducive to the goal of sustainable development and the process of modernization of agriculture. Therefore, it is of great theoretical and practical significance to analyze the path and effect of land transfer contract on the investment behavior of farmers. Based on the survey data of 991 rural households in five provinces, namely Shaanxi, Hebei, Liaoning, Guangdong and Yunnan, this paper measures the effect of land transfer contract on farmers' long-term investment by using the propensity score matching (PSM) method from the three dimensions of profitability, stability and formality of the land transfer contract. It is found that paid, written, fixed-term land transfer contracts significantly increase the investment behaviour of farmers compared to unpaid, oral, non-fixed-term ones. Therefore, by optimizing the form and content of contracts, strengthening policy support and financial innovation and other measures, we can effectively stimulate farmers' enthusiasm for investment and promote the development of agriculture to a higher quality and higher efficiency.

Keywords: land transfer contract, farmers' long-term investment, propensity score matching method

1 Introduction

Land transfer as an important means of coordinating land resources, adjusting the scale of agriculture, is a hot spot of academic research in recent years^[1-2], and the contract form of land is undoubtedly the most influential factors of land transfer, directly determining the stability of the land transfer relationship^[3]. Only by establishing effective institutional safeguards, clarifying land use rights and regulating the situation of land contracts can we improve the enthusiasm of farmers, promote the benign development of land transfer, increase the income from land, and make the resource allocation of land more reasonable^[4].

In view of the above analysis, this paper takes the content of the land transfer contract as the entry point, subdividing it into three major characteristics: contract profitability, contract formality, and contract continuity; meanwhile, the research on the investment behavior of farmers focuses on long-term investment. Based on the survey data of 991 farm households in

five Chinese provinces, namely Shaanxi, Hebei, Liaoning, Guangdong and Yunnan, the quasi-natural experimental research method of propensity score matching (PSM) is used to investigate the effect of land transfer contracts on the investment behavior of farm households. This paper provides a theoretical basis for the study of land transfer and farmers' investment, as well as policy suggestions for broadening the path of farmers' income and accelerating the realization of rural revitalization.

2 Theoretical analyses and research hypotheses

With the continuous deepening of research, the study of land contract on the investment behaviour of farm households has also become an academic hot spot. The impact of the land transfer contract on the investment behaviour of farmers is divided into two aspects, for the aspect of the investment behaviour of farmers, Liu Rongmao^[5] et al. proposed that the primary task of increasing the agricultural investment of farmers is to increase the income of farmers, especially the agricultural income of farmers at the present time, and He Lingyun^[6] divided the investment of farmers into two categories: one category refers to the investment related to the land; the other category refers to the investment that is not connected to the land; for the aspect of the impact of the land transfer contract on the investment of farmers In terms of the impact of the land transfer contract on the investment behaviour of farmers, Besley^[7] proposes that the land transfer contract directly determines the stability of the land rights, and the more unstable the land rights will reduce the incentive for farmers to invest, while Jin Yinglan^[8] proposes that the short-term nature of farmers' investment determines that the investment behaviour of farmers will be affected by the land transfer contract to a certain extent.

In this paper, the land transfer contract is divided into three dimensions according to the difference of the contract content: profitability dimension is divided into paid and unpaid transfer, formality dimension is divided into written and oral contract, and stability dimension is divided into fixed-term contract and non-fixed-term contract; at the same time, investment behavior can be divided into short-term investment and long-term investment on the basis of the "relationship between the input factors and the change of yield". At the same time, the investment behavior can be divided into short-term investment and long-term investment based on "the relationship between input factors and yield changes". Considering that short-term investment (such as pesticides and fertilizers) is mainly affected by farmers' personal habits and consciousness, and is not very relevant to land transfer and contract content, this paper mainly investigates the impact of the differences between the three types of contracts on farmers' long-term investment behavior.

In view of the fact that farmers need to have a certain amount of start-up capital for investment, the transfer with compensation can increase farmers' long-term investment compared with the transfer without compensation. Considering the risk-averse nature of investment, written contracts are more standardized and stable than verbal contracts, thus written contracts increase farmers' long-term investment compared to verbal contracts. Similarly, agreed termination time of the contract compared to the contract does not agree on the termination time of the contract will avoid a certain amount of risk, and thus a fixed-term contract compared to non-fixed-term contract will increase the long-term investment of farmers, and on the basis of a fixed term, the longer the contract period, the lower the

investment risk of farmers, the higher the protection, the choice of the purchase of agricultural machinery, water conservancy facilities, greenhouses and production and construction of buildings and other assets of the willingness to be stronger, which is conducive to increasing long-term investment. favoring greater long-term investment.

The following research hypotheses are proposed:

Hypothesis 1: Paid transfer significantly increases farmers' long-term investment compared to unpaid transfer.

Hypothesis 2: Written contract significantly increases farmers' long-term investment compared to verbal contract

Hypothesis 3: Fixed-term contracts significantly increase the long-term investment of farmers compared to non-fixed-term contracts.

After analysis, the path of influence of land transfer contract on the impact of investment behavior of farmers is shown in Figure 1.

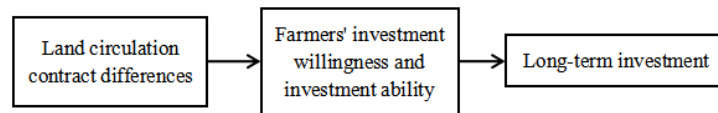


Figure 1 Path of land transfer contracts on farmers' investment behaviour

3 Empirical design and descriptive analysis

3.1 Regression modelling

This paper focuses on the impact of land transfer contract on the investment behavior of farmers, and the following issues should be considered in the research process. First, farmers signing land transfer contracts is a "self-selection" rather than a random occurrence, and its behavior is affected by the comprehensive impact of farmers' own conditions, and the endogeneity of the model caused by this sample self-selection problem will lead to the bias of the results of the traditional measurement model; second, the long-term investment behavior of farmers who have signed profitable, formal and stable land transfer contracts can be observed through the research data, but the long-term investment behavior of farmers before signing the contract is not clear. Secondly, the research data can observe the long-term investment behavior of farmers who have signed profitable, formal and stable land transfer contracts, but the long-term investment behavior of farmers before signing the contract cannot be observed, and this "missing data" problem will make the sample used a non-random sample of the whole, and bring the endogeneity problem of the model, which will lead to bias in the estimation results. Therefore, this paper uses the Propensity Score Matching (PSM) method based on the Counterfactual Framework to estimate the factors influencing the investment behavior of farm households.

The first step is to construct a decision model that influences farmers to sign a written contract (taking the formality of land transfer contracts as an example, the process of profitability and stability is the same). This was used to estimate the likelihood of having a written contract, i.e.,

the "propensity score", to match farmers with similar characteristics to those with a written contract (experimental group) to those with an oral contract (control group).

The propensity score (PS_i) was estimated by a Logit model with a more flexible form.

$$PS_i = Prob(O_i = 1|C_i) = E(O_i = 1|C_i) = \frac{e^{\alpha C_i}}{1 + e^{\alpha C_i}} \quad (1)$$

Where i represents different farmers, and $O_i = 1$ represents farmers signing a written contract, and $O_i = 0$ represents farmers signing a verbal contract, and C_i represents the control variable, and $\frac{e^{\alpha C_i}}{1 + e^{\alpha C_i}}$ represents the cumulative distribution function.

After estimating the propensity score, it is necessary to match the farmers who signed a written contract with those who signed a verbal contract according to the estimated matching volume. In this paper, we choose the more popular nearest neighbor matching method to do the matching. The effect of the formality of the land transfer contract on farmers' long-term investment can be estimated by using the average treatment effect of farmers' long-term investment in the experimental group (ATT) is estimated.

$$ATT = E(B_{1i}|O_i = 1) - E(B_{0i}|O_i = 1) = E(B_{1i} - B_{0i}|O_i = 1) \quad (2)$$

Where B_{1i} is the long term investment of farmers with written contracts and B_{0i} is the long term investment of farmers in the hypothetical experimental group with verbal contracts obtained through matching. $E(B_{1i}|O_i = 1)$ can be directly observed. $E(B_{0i}|O_i = 1)$ need to construct corresponding proxy indicators by using propensity score matching.

3.2 Data sources

The statistical data used in this paper come from field surveys in a total of five provinces: Shaanxi, Hebei, Liaoning, Guangdong and Yunnan. These provinces are in the process of advancing from a large agricultural province to a strong agricultural province, attaching great importance to rural land transfer, and land transfer has a certain scale and orderly development^[9]. However, while making certain achievements, due to the influence of various subjective and objective factors, these provinces generally have the problem of farmers' low initiative in land transfer, the land transfer market is not sound, the transfer process is not standardized and other issues that need urgent attention, which gives this paper a certain degree of practical significance.

This research is mainly carried out in the form of visiting and distributing questionnaires, and a total of 1130 questionnaires were distributed in the household research, and 991 valid questionnaires were recovered, with the validity rate of the questionnaires being 87.7%.

3.3 Selection of variables and descriptive statistics

In this study, the long-term investment behavior of farmers is regarded as the dependent variable, and the amount of change in long-term investment is used as the indicator. The variable assignment descriptions and descriptive statistics are shown in Table 1.

Table 1 Variable assignment descriptions and descriptive statistics

| Variable type | Variant | Variable assignment | Average value | (statistics) Standard deviation |
|----------------------------|--|--|---------------|---------------------------------|
| Implicit variable | Y:Amount of change in long-term investments of farm households | Million Yuan/acre | 44512.714 | 17511.621 |
| Core independent variables | X1:Profitability of land transfer contracts | Paid contract = 0 , Unpaid contract = 1 | 0.879 | 0.326 |
| | X2:Formality of land transfer contracts | Oral contract = 0, Written contract = 1 | 0.748 | 0.435 |
| | X3:Stability of the land transfer contracts | Non-fixed-term contract= 0 , Fixed-term contract= 1 | 0.859 | 0.348 |
| Control variable | X4:educational attainment | No schooling = 1, Elementary school = 2, Middle school = 3, High school = 4, College and above = 5 | 3.02 | 1.18 |
| | X5:Number of family laborers | 1 person = 1, 2 persons = 2, 3 persons = 3, 4 persons = 4, 5 or more persons = 5 | 2.658 | 1.415 |
| | X6:land subdivision | 1piece=1,2pieces=2,3pieces=3,4pieces=4,5 or more pieces=5 | 3.03 | 1.205 |
| | X7:soil fertility | Very poor = 1, Poor = 2, Medium = 3, Good = 4, Very good = 5 | 2.835 | 1.298 |

4 Analysis of empirical results

4.1 Common support domains and equilibrium tests

Common support domain. As can be seen from Table 2, there is no sample loss in the treatment group during the process of performing propensity score matching, indicating good matching results.

Table 2 Matching Basic Information Table

| Explore | Term (in a mathematical formula) | Basic information |
|--|--------------------------------------|-------------------|
| Contractual profitability -- long-term investments | Number of matches to be made | 991 |
| | Number of successful matches | 991 |
| | Proportion of successful matches (%) | 100 |
| Contractual formality -- long-term investments | Number of matches to be made | 991 |
| | Number of successful matches | 991 |
| | Proportion of successful matches (%) | 100 |
| Contractual stability - long-term investment | Number of matches to be made | 991 |
| | Number of successful matches | 991 |
| | Proportion of successful matches (%) | 100 |

Balance test. In order to ensure the reliability of the propensity score matching results, it is necessary to verify the balance of the control variables to ensure that there is no systematic difference in the control variables between the control group and the experimental group of farmers, except for the differences in the formality, profitability and stability of the land transfer contract.

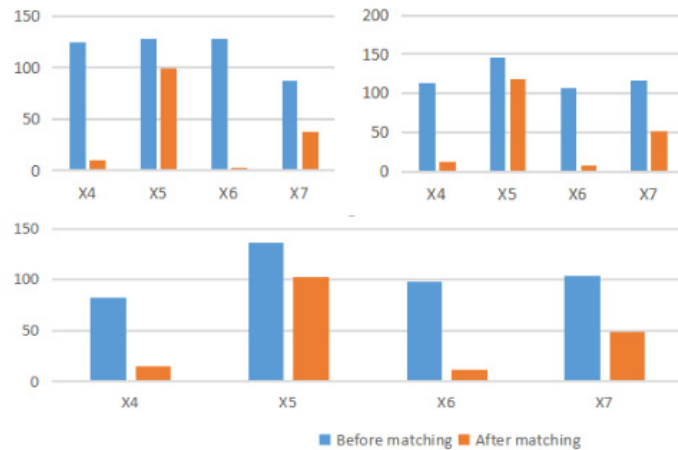


Figure 2 Profitability/Formality/Stability- Long-term investments

As can be seen from Figure 2, the propensity score matching is successful.

4.2 Analysis of the effect of agro-industrial organisations on the adoption of safe production behaviours by farmers

This paper measured the effect of land transfer deeds on the investment behavior of farmers using the propensity score matching (PSM) method. As can be seen from Table 3, the results of the analysis found that, after the estimation of the propensity score matching (PSM) method, the effect of signing a written land transfer contract on the long-term investment of farmers is 16612.36, which proves that signing a written contract compared with a verbal contract will significantly increase the long-term investment of farmers by 16612.36 yuan, excluding the influence of other factors, so hypothesis H1 is proved; the effect of signing a contract with a fixed period of time on farmers' long-term investment is 16925.37, which proves that signing a contract with a fixed term will significantly increase farmers' long-term investment by \$16925.37 compared with no fixed term under the exclusion of other factors, so hypothesis H2 is proved; the effect of signing a contract with a compensated transfer on farmers' long-term investment is 16357.06, which proves that signing a contract with a compensated transfer will significantly increase farmers' long-term investment by \$16612.36 compared with a verbal contract under the exclusion of other factors. deed of paid transfer will significantly increase the long-term investment of farmers by 16357.06 dollars compared to unpaid transfer, so hypothesis H3 is proved.

Table 3 Benefits of Land Transfer Contracts on Farmers' Investment Behavior

| Variate | State | Experimental group | Control group | ATT | T |
|---------------|--------------------|--------------------|---------------|--------------|-------|
| Formality | Before matchmaking | 50546.69 | 26628.00 | 23918.694*** | 23.19 |
| | After matching | 50546.69 | 33934.33 | 16612.360*** | 20.94 |
| Stability | Before matchmaking | 47586.49 | 25828.57 | 21757.915*** | 15.11 |
| | After matching | 47586.49 | 30661.11 | 16925.372*** | 20.82 |
| Profitability | Before matchmaking | 47442.14 | 23250.00 | 24192.135*** | 15.89 |
| | After matching | 47442.14 | 31085.08 | 16357.058*** | 20.93 |

5 Conclusions and policy recommendations

5.1 Conclusion

As an important mechanism to promote farmers' investment behavior, land transfer contracts needs to be valued and supported by the government and all sectors of society. Paid, written, fixed-term land transfer contracts significantly increase the investment behaviour of farmers compared to unpaid, oral, non-fixed-term ones. By optimizing the form and content of contracts, strengthening policy support and financial innovation and other measures, we can effectively stimulate farmers' enthusiasm for investment and promote the development of agriculture to a higher quality and higher efficiency.

5.2 Policy recommendations

- (1) Formulate a unified model land transfer contract, clarify the rights and obligations of both parties, and ensure that the contract has legal effect.
- (2) Strengthen the supervision of land transfer contracts to prevent irregularities. At the same time, focus on the profitability and stability of contracts, and encourage farmers to sign paid, fixed-term ones.
- (3) Improve the rural financial service system, design special financial products for land transfer and long-term agricultural investments, and solve the difficulties faced by farmers in the financing process.

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