The Impact of Non-agricultural Employment on Farmland Transfer and Investment in Agricultural Assets: Evidence from China

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Abstract.

This study aimed to determine the impact of non-agricultural employment of peasants on their farmland transfer and investment in agricultural assets by using theoretical models and empirical analysis. The Heckman two-step approach and ordinary least squares method of econometric estimation were used to analyze the questionnaire survey data collected from Jiangxi Province in China. Non-agricultural employment led to reduction of investment in agricultural assets and renting of land. The remittance flows from non-farm income were mainly used to improve the current quality of life, particularly housing condition, rather than to invest in agricultural assets. Migration of laborers caused farmers to rent out farmland, but the inflow of remittances from non-farm income, which increased the capital stock, did not increase the renting in of farmland.

1. Introduction

Since the reformation and modernization of China, non-agricultural employment of rural labor has become the marked feature, leading to consistent economic growth and rapid urbanization. Between 1978 and 2012, Chinese agricultural labor reduced from 283.18 million to 257.73 million, and the proportion of agricultural labor dropped from 70.53% to 33.6%. Although non-agricultural employment has beneficial effects, there are increasing concerns regarding the accompanying challenges.

One of the challenges is whether agriculture can be sustained even with less labor and whether the grain demand can be met? Will traditional agriculture transform into modern agriculture? In other words, will non-agricultural employment facilitate the replacement of labor by capital and expand agricultural operating scale? Another challenge concerns farmers: Even though non-agricultural employment could improve the household income over a short term, the effect in the long term will be restricted if the income from non-agricultural work does not improve the agricultural productivity or farm stock. These challenges can lead to the major economic concern: whether the non-agricultural employment of peasants has an impact on their farmland transfer and investment in agricultural assets[1]?

Current research on this topic is limited, and the outcomes of such research are conflicting. One opinion is that non-agricultural employment does not improve but remarkably restrains investment in agricultural assets and farmland of peasant households. Most non-farm income is thought to be used for daily consumption (Mines and Janvry 1982), housing construction, children's education (Adams and Alfredo 2010), and investment in non-agricultural businesses (Woodruff and Zenteno 2007), whereas investment in farmland and agricultural assets is minimal (Li et al 2008). Quisumbing and McNiven (2007) also addressed this issue and presented a similar viewpoint.

Some evidence from China supports the above-mentioned viewpoints. Brauw and Rozelle (2003) suggested that, in poorer areas, migration increases consumptive

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[1]Among all assets, agricultural assets represent agricultural tools (including traditional tools and machinery), irrigation equipment, livestock, animal labor, orchards, etc.

investment by nearly 20%, whereas there was no association between migration and productive investment. Wu and Meng (1997) showed that improvement in the proportion of non-farm income reduces the purchase of agricultural assets. Liu and Zhang (2002) conducted an empirical research in six towns of Jiangsu Province and reinforced that the proportion of non-agricultural employment has negative influences on peasant households. Liu and Ma (2006) proposed that both the proportions of non-agricultural employment and non-farm income have negative effects on agricultural assets and land investment. Zhao (2002) indicated that the return of migrated labor could boost agricultural investment, whereas increased migration might not have a similar effect.

However, some recent studies suggest that non-agricultural employment of rural labor is not associated with the above concerns. The first explanation is based on the distinction between investment and use of agricultural machinery. Ji and Zhong (2013) argued that agricultural machinery usage could compensate for the loss of agricultural labor and increase in non-agricultural employment, despite the slight improvement of investment in agricultural machinery. The second explanation concerns the level of division between household and region. Fang (2013) indicates that non-agricultural employment has positive effects on the regional level despite its negative impact at the individual level. The main reason is the interactive effect of non-agricultural employment among households. In other words, the negative impact at several households may be attributable to the fact that most households rent out their lands, whereas a few household rent in farmland. However, this means that, on a regional level, farmland usage is improved, and the average investment in agriculture is increased, which are the foundations of modern agriculture.

The other opinion is more positive. The researchers believe that non-agricultural employment has a positive impact on the investment in agricultural assets and land. A representative theory from New Economics of Labor Migration (Stark 1991; Stark and Bloom 1985) indicates that the remittance from non-agricultural employment could relieve the funds and risk constraints of peasant households in the long term, leading to the adoption of advanced technology and assets. Similarly, Lucas (1987) argues that

families with non-farm labor have more agricultural production due to the increased agricultural investment, as was revealed by studies in South Africa. Adams (1998) found that Pakistani peasant households that participated in international labor export purchased more land and employed more labor.

Many findings from China lead to similar conclusions. Zhong and Ji (2009) suggested that the improvement of non-farm labor opportunity encourages the transaction of land, which in turn increases the operating scale and thus promotes the profit from land; this not only improves agricultural investment, but also facilitates banks to provide loans to farmers. Cao and Zhou (2010) performed an empirical research on rice farmers in Jiangsu Province and showed that the households with more non-farm labor could easily purchase agricultural machines due to the subsidy policy.

There are three limitations in the findings of existing studies. The first is regarding the analytical framework. One common methodology is the distinction between agricultural assets and land on the basis of classification of productive factors. In fact, there is a strong relationship between the investment choice for agricultural assets and land, because they both depend on the allocation of funds. Considering this trade-off relationship is important. Another common method of land investment is the switching model (Carter and Yao 2002) that is based on three unrealistic assumptions: There is no household simultaneously possessing transfer-out and transfer-in lands, no remittance, and no idle land. The second limitation is with regard to the econometric approach. Existing research always neglects the self-selection problem, although the number of households with no investment in agricultural assets or land cannot be ignored. The third limitation is about time-lag. Adams (1998) emphasizes that many researchers use cross-sectional data obtained at a certain time point. However, the budget for the investing choice of peasant households is determined by the previous non-farm income.

To address the above-mentioned limitations and provide empirical evidence from China, we constructed two optimized models for agricultural asset investment and land transfer on the basis of capital allocation and land allocation perspectives by using the Heckman two-step approach and ordinary least squares method of econometric

estimation by conducting random sampling in Jiangxi Province. The article is structured as follows. Section two provides an analytical framework developed using the rational choice model and some hypotheses. Section three discusses data sources and sampling and introduces the basic descriptive statistics used for our data. Section four contains detailed evidence on the impact of non-farm income on investment in agricultural assets by using econometric estimation. Section five provides conclusions for the policy implications for China and other developing countries.

2. Conceptual Framework and Hypothesis

1.1. The impact of non-agricultural employment on investment in agricultural assets and farmland

According the rational choice model, the investment in agricultural assets and farmland is considered a result of allocation of capital. Thus, the peasant households' choice model is as follows:

$$\underset{K_a,K_n,T}{Max} \quad \pi(K_a,K_n,T) = P \cdot Q\big(K_a,T,L_0\big) + Y\big(K_n\big) \tag{1}$$

$$s.t. \quad r_a \cdot K_a + r_n \cdot K_n + r_t \cdot T = E_0 \tag{2}$$

Considering that one household has excessive amount of funds E_0 and labor L_0. The household allocates their funds for investment in agricultural assets K_a, non-agricultural assets K_n, and farmland T. The profit function $\pi(K_a,K_n,T)$ includes agricultural profit $P \cdot Q\big(K_a,T,L_0\big)$ and profit from non-farm investment $Y\big(K_n\big)$; these are second-order continuously differentiable concave functions. The agricultural production function and non-farm investment function have standard properties, i.e., $\partial Q/\partial K_a = Q_K > 0$, $\partial Q/\partial T = Q_T > 0$, $\partial Y/K_n = Y_N > 0$, $Q_{KT} > 0$, $Q_{TT} < 0$, and $Q_{KK} < 0$, $Y_{NN} < 0$. Other exogenous variables are prices of agricultural products P, agricultural assets r_a, non-agricultural assets r_n, and rent-in farmlands r_t.

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Existing literatures suggest that there are two remarkable direct effects of non-agricultural employment on agriculture: labor drain effect and income (or remittance) effect (Wang, 2012). In our model, the former effect could be expressed as the decline in L_0, and the latter could be described as the increase in E_0. Therefore, comparative static analyses were used to explore the impact of non-agricultural employment on the investment in agricultural assets and farmland.

1.1.1. The impact of non-agricultural employment on investment in agricultural assets

The Lagrange function in the above case is as follows ($\lambda \geq 0$):

$$L = \pi(K_a, K_n, T) + \lambda \left(E_0 - r_a \cdot K_a - r_n \cdot K_n - r_t \cdot T \right) \tag{3}$$

Thus, the first-order conditions (FOCs) are obtained as follows:

$$\partial L/\partial \lambda = F_1(K_a^*, K_n^*, T^*, \lambda) = E_0 - r_a \cdot K_a + r_n \cdot K_n - r_t \cdot T = 0 \tag{4a}$$

$$\partial L/\partial K_a = F_2(K_a, K_n, T, \lambda) = PQ_K(K_a, T, L_0) - r_a \cdot \lambda = 0 \tag{4b}$$

$$\partial L/\partial K_n = F_3(K_a, K_n, T, \lambda) = Y_N(K_n) - r_n \cdot \lambda = 0 \tag{4c}$$

$$\partial L/\partial T = F_4(K_a^*, K_n^*, T^*, \lambda) = PQ_T(K_a, T, L_0) - r_t \cdot \lambda = 0 \tag{4d}$$

The income effect

When equations (4a) to (4d) are differentiated while maintaining all exogenous variables except E_0 constant, the following equation set is obtained:

$$\begin{bmatrix} 0 & -r_a & -r_n & -r_t \\ -r_a & PQ_{KK} & 0 & PQ_{KT} \\ -r_n & 0 & Y_{NN} & 0 \\ -r_t & PQ_{KT} & 0 & PQ_{TT} \end{bmatrix} \cdot \begin{bmatrix} d\lambda/dE_0 \\ dK_a/dE_0 \\ dK_n/dE_0 \\ dT/dE_0 \end{bmatrix} = \begin{bmatrix} -1 \\ 0 \\ 0 \\ 0 \end{bmatrix} \tag{5}$$

where, J stands for the coefficient matrix of (5), which is also the Jacobi matrix of vector-valued function $F = (F_1, F_2, F_3, F_4)$. Thus, the determinant of J can be determined as follows:

$$|J| = -r_n^2 P^2 (Q_{KK} Q_{TT} - Q_{TK}^2) - Y_{NN} (2r_t r_a P Q_{TK} - r_t^2 P Q_{KK} - r_a^2 P Q_{TT}) \qquad (6)$$

According to the necessary second-order condition for the maximization of agricultural production function, $Q_{KK} Q_{TT} - Q_{TK}^2 \geq 0$, which indicated that $|J| < 0$. Thus, the expression of the income effect can be obtained using Cramer's rule in (5), where K_a^* represents the optimal investment in agricultural assets.

$$\frac{dK_a^*}{dE_0} = \frac{Y_{NN} (r_t P Q_{TK} - r_a P Q_{TT})}{-r_n^2 P^2 (Q_{KK} Q_{TT} - Q_{TK}^2) - Y_{NN} (2r_t r_a P Q_{TK} - r_t^2 P Q_{KK} - r_a^2 P Q_{TT})} \qquad (7)$$

$\dfrac{dK_a^*}{dE_0} > 0$ indicates that the income effect of non-agricultural employment has a positive effect on the peasant household investment in agricultural assets.

The labor drain effect

Similarly, considering the total differential from (4a) to (4d) while maintaining all exogenous variables except L_a constant, the following equation set is obtained:

$$\begin{bmatrix} 0 & -r_a & -r_n & -r_t \\ -r_a & PQ_{KK} & 0 & PQ_{KT} \\ -r_n & 0 & Y_{NN} & 0 \\ -r_t & PQ_{KT} & 0 & PQ_{TT} \end{bmatrix} \cdot \begin{bmatrix} d\lambda/dE_0 \\ dK_a/dE_0 \\ dK_n/dE_0 \\ dT/dE_0 \end{bmatrix} = \begin{bmatrix} 0 \\ -PQ_{KL} \\ 0 \\ -PQ_{TL} \end{bmatrix} \qquad (8)$$

Considering the determinant of coefficient matrix of (8), the expression for labor drain effect according to Cramer's rule is obtained as (9).

$$\frac{dK_a^*}{dL_0} = \frac{P^2 r_n^2 Q_{TT} Q_{KL} - P^2 r_n^2 Q_{TL} Q_{TK} + r_t Y_{NN} P (r_t Q_{KL} - r_a Q_{TL})}{-r_n^2 P^2 (Q_{KK} Q_{TT} - Q_{TK}^2) - Y_{NN} (2r_t r_a P Q_{TK} - r_t^2 P Q_{KK} - r_a^2 P Q_{TT})} \qquad (9)$$

The optimal solution for agricultural production can be indicated as $\dfrac{Q_K}{Q_T} = \dfrac{r_a}{r_t}$, i.e., the ratio of marginal production equals the ratio of a factor's price. Thus, simple transformation of this equations yields (10).

$$Q_K r_t = Q_T r_a \tag{10}$$

Subsequently, (11) is obtained by considering the partial derivatives of L_0 on both sides of (10).

$$r_t Q_{KL} = r_a Q_{TL} \tag{11}$$

Next, (12) is obtained by substituting (11) into (9).

$$\frac{dK_a^*}{dL_0} > 0 \tag{12}$$

Equation (12) suggests that the labor drain effect of non-agricultural employment has a negative effect on the investment of peasant households in agricultural assets.

Non-agricultural employment simultaneously increases remittance and reduces the household agricultural labor. Interestingly, the former change has a positive impact, whereas the latter has a negative impact. Therefore, the aggregate impact of non-agricultural employment depends on the difference between the two effects. Since, in our survey area, most remittance was used for consumption but not for investment, the labor effect was thought to be stronger than the income effect. On the basis of the above discussion, we propose the first hypothesis as follows.

Hypothesis 1: Non-agricultural employment of peasants has a negative impact on their investment in agricultural assets.

1.1.2. The impact of non-agricultural employment on investment in farmland

The income effect

Similarly, equation (5) and Cramer's rule can be used to obtain the expression of income effect for farmland as (13), where T^* represents the optimal investment in farmland.

$$\frac{dT^*}{dE_0} = \frac{Y_{NN}r_a PQ_{TK} - Y_{NN}r_t PQ_{KK}}{-r_n^2 P^2 (Q_{KK}Q_{TT} - Q_{TK}^2) - Y_{NN}(2r_t r_a PQ_{TK} - r_t^2 PQ_{KK} - r_a^2 PQ_{TT})} \tag{13}$$

Generally, $Y_{NN}r_a PQ_{TK} - Y_{NN}r_t PQ_{KK} < 0$. Thus, $\frac{dT^*}{dE_0} > 0$, suggesting that the income effect is positive for investment in farmland.

The labor drain effect

Equation set (8) can be used to obtain the expression of the labor drain effect as (14).

$$\frac{dT^*}{dL_0} = \frac{r_n^2 P^2 Q_{KK}Q_{TL} - r_n^2 P^2 Q_{KL}Q_{TK} + r_a PY_{NN}(r_a Q_{TL} - r_t Q_{KL})}{-r_n^2 P^2 (Q_{KK}Q_{TT} - Q_{TK}^2) - Y_{NN}(2r_t r_a PQ_{TK} - r_t^2 PQ_{KK} - r_a^2 PQ_{TT})} \tag{14}$$

After substituting condition (11) into (14), $\frac{dT^*}{dL_0} > 0$, suggesting that the labor drain effect is negative for investment in farmland.

Therefore, the aggregate impact of non-farm income on the investment in farmland is the sum of the positive income effect and negative labor drain effect. Considering the limitation of income effect, we propose the second hypothesis as follows.

Hypothesis 2: Non-agricultural employment of peasants has a negative impact on their investment in farmland.

Moreover, differences in regional development might influence the conclusion on the relationship between farmers involved in migrant work and household asset investment; however, previous studies rarely considered this factor. The remarkable difference in rural development in China among different villages is reflected in not only affluent extent but also opportunities for participating in non-farm activities. In an area with relatively good economic development, farmers might have more employment

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opportunities to earn non-agricultural wage, considering the relatively inefficient agricultural production and the relative shortage of laborers. This might have forced farmers to discontinue agricultural production, leading to the decline of investment in agricultural assets. On the other hand, in relatively poor areas, off-farm employment opportunities are rather rare, and farmers depend more on agricultural production and likely invest more in agriculture in order to improve their output capacity. Therefore, the differences in the level of economic development across villages might have a potential influence on the relationship between farmers undertaking migrant work and investment in agricultural assets. That is, in richer villages, migrant work by family members might reduce agricultural asset investment, whereas, in poorer villages, migrant labor might promote investment in agricultural assets.

1.2. The impact of non-agricultural employment on the renting of farmland

Consider a household that allocates their land for three purposes: idle, self-planting, and rent-out fields. Previous studies generally considered consumption as a unique direct source of utility. However, in this study, idle fields were considered as another direct source of income, which can be considered as "leisure" in the labor supply choice model. This is because Chinese farmers treat their idle fields as a kind of protection for income risk. Thus, a simple model was constructed as follows.

$$\underset{LD_s, LD_r, LD_n}{Max} \quad U = U(C, LD_n) \tag{15}$$

$$s.t. \quad LD_s + LD_r + LD_n = \overline{LD} \tag{16}$$

$$p \cdot C = \delta \cdot Y = \delta \cdot (Y_s + Y_a) \tag{17}$$

$$Y_s = LD_s \cdot (Q_a - C_a) \tag{18}$$

$$Q_a = f(L_a(M), K_a(M)) \tag{19}$$

$$Y_r = LD_r \cdot (R_r(M) - TC_r(M))$$

(20)

where the utility function $U(C, LD_n)$ is a second-order continuously differentiable concave function. There are three endogenous variables: self-planting land LD_s, rent-out land LD_r, and idle land LD_n, which are restricted by the possession of household land $\overline{LD}$. The price of agricultural products is considered to be one, whereas that of consumption is considered to be p. The consumption C is determined on the basis of propensity of consumption δ and disposable income Y, which includes agricultural income Y_s and rent-out income Y_r. Q_a, C_a, R_r, and TC_r, stand for agricultural products, cost of agricultural production, rental of rent-out land, and transaction cost of land transfer per unit area, respectively. M represents the extent of non-agricultural employment.

Clearly, the first-order conditions are the equality of marginal utility of the idle MU_n, self-planting MU_s, and rent-out MU_r. Next, the comparative static influence of non-agricultural employment on the decision of land rent-out is discussed. First, the preference of peasant households for idle land is considered to be constant, which means $\frac{dMU_n}{dM} = 0$.

Second, the expression of MU_s is obtained as (21) by using the Chain rule.

$$\begin{aligned} MU_s &= \frac{dU}{dLD_s} = \frac{dU}{dLD_n} \cdot \frac{dLD_n}{dLD_s} + \frac{dU}{dC} \cdot \frac{dC}{dY} \cdot \left(\frac{dY_s}{dLD_s} + \frac{dY_r}{dLD_s} \right) \\ &= -U_1 + U_2 \cdot \frac{\delta}{p} \cdot (Q_a - C_a + TC_r - R_r) \end{aligned}$$

(21)

Next, expression (22) is obtained, which suggests that the signal of $\frac{dMU_s}{dM}$ depends on the difference between marginal effect of non-agricultural employment on actual agricultural products and net income of land rent per unit area.

$$\frac{dMU_s}{dM} = U_2 \cdot \frac{\delta}{p} \cdot \frac{d(Q_a - (R_r - TC_r))}{dM} = U_2 \cdot \frac{\delta}{p} \cdot (\frac{df}{dL_a} \cdot \frac{dL_a}{dM} + \frac{df}{dK_a} \cdot \frac{dK_a}{dM} - (\frac{dR_r}{dM} - \frac{dTC_r}{dM})) \qquad (22)$$

For one side, assuming that the rural labor market is imperfect, the labor drain effect of non-agricultural employment means $\frac{dL_a}{dM} < 0$. Further, $\frac{dK_a}{dM} < 0$ according to our hypothesis I. For the other side, $\frac{dR_r}{dM} > 0$ is assumed, because non-agricultural employment could improve the rental per unit area by increasing the expected land revenue (Zhong and Ji, 2009). Besides, the extent of non-agricultural employment indicates that the households have more land for renting out. This will increase the demand for land and thus reduce the transaction cost for the peasant households. Hence, $\frac{dTC_r}{dM} < 0$. The above analyses suggest that $\frac{dMU_s}{dM} < 0$, and thus $\frac{dMU_r}{dM} > 0$, because $\frac{dMU_r}{dM} = -\frac{dMU_s}{dM}$.

The changes in optimal solutions when the exogenous variable M increases can be suggested as follows: MU_n remains the same, MU_s declines, and MU_r increases. Therefore, rationally, the peasant households will change their income allocation to a new equilibrium by renting out more land. Thus, we propose the third hypothesis.

Hypothesis 3: Non-agricultural employment of peasants has a positive impact on the rent out of their farmland.

3. Data and Descriptive Statistics

3.1. Introduction for the sampling

In this study, the questionnaire survey data collected from Jiangxi Province in 2011 were evaluated using econometric analysis, and a follow-up survey was conducted in the same region to further analyze and verify the econometric results. Jiangxi is a large labor-exporting province with perennial migrant workers of 6.6 million and ranked fourth in China, accounting for 39.3% of the total rural labor force. Further, it has a larger

proportion of agriculture industry, and agriculture plays an important role in the national economy of the province. At the end of 2011, agricultural gross domestic product (GDP) accounted for 12% of the total GDP, which was 2% higher than the national average of 10%.

A multi-stage random sampling method was used to access the research samples. First, four counties—Taihe County, Yushan County, Poyang County, and Yifeng County—were randomly selected from the 80 counties of the province (county-level cities). Next, two townships from each county and two administrative villages from each township were randomly selected. Finally, from each village, 16 households were randomly selected for a questionnaire survey. Further, the government and administrative village committees of each of the selected townships were interviewed.

Taihe County, Yushan County, Poyang County, and Yifeng County have a per capita GDP of 8,920 yuan; 7,594 yuan; 3,454 yuan; and 10,714 yuan, respectively. Compared with the provincial average of 9,069 yuan, these four counties have moderate, poorer, and better economic development levels. These four counties accurately represent the general situation of Jiangxi Province both in terms of geographical location and economic development. Of the four counties, Taihe County lies in the north central part of Jiangxi Province and has an area of 2,666 km^2. At the end of 2011, the registered population of the county was 526,000, of which rural population accounted for 436,000, and a total of 102,000 people were migrant workers. Yushan County is located in the northeastern part of Jiangxi Province and has an area of 1,728 km^2. At the end of 2011, the registered population of the county was 574,000, of which rural population accounted for 461,000, and a total of 200,000 individuals were migrant laborers. Poyang County, which is located in the north part, is the second largest county of Jiangxi Province, with an area of 4,215 km^2; the registered population of the county was 1,493,000 at the end of 2011, with rural population of 1,295,000 and nearly 400,000 migrant laborers. Yifeng County lies in the south part of Nine Ridge Mountains, which are located in the northwestern part of Jiangxi Province; it has an area of 1,935 km^2 and, at the end of 2011, the registered

population of the county was 180,000, of which rural population accounted for 182,000, and labor forces were about 60,000.

3.2. Description of the sample

3.2.1. Basic situation of family characteristics

According to sampling principles, a total of 256 household members who had not migrated with the whole family were interviewed, and 230 valid samples were eventually obtained. The basic family characteristics of the sample households are shown in Table 1. The data from Table 1 suggest that households with whole family migration might be relatively younger, and these households have very small farmland per capita.

In this study, migrant workers are defined as members of the family who have agricultural households and who left their home in 2010 to work outside for more than 6 months, or live with family members but have been working in local non-farm sectors for more than 6 months. In all, 158 out of 230 households have migrant workers. Of the 158 households, 70 and 65 have one or two migrant workers, respectively, accounting for more than 85% of the total migrant households. The largest number of migrant workers in the migrant households was up to six (Table 2).

Migrant workers brought remittance inflows. In all the 158 migrant households, the average household remittance inflow was 5,880 yuan. Of these 158 households, 37 had migrant workers who received an average remittance of 14,389 yuan, which is considerably more than the 3,278 yuan earned by members of the remaining 121 migrant households, indicating that peasant households with members working outside rely more on remittance.

3.2.2. Basic situation of investment

According to per capita income statistics obtained from village committees in 2010, villages with an income lower than the sample mean value were defined as poor villages and those with an income higher than the sample mean value as more affluent villages. Table 3 shows the differences in household investments between the two types of villages

between 2002 and 2010; the economic development level of villages was found to have certain correlations with the investment of farmers in various assets. In the relatively poor villages, the investment and total investment amount in agricultural assets, housing, and consumer durables was relatively greater. This could be due to the limited initial stock of assets before 2002. The amount invested between the two types of villages was remarkably different between agricultural assets and housing assets.

Since the impact of migrant working by farmers on asset investment behavior has a time-lag effect, the relationship between migrant work by farmers and asset accumulation was investigated before 2010. Although our data are not panel data, interviews regarding migrant working situation of farmers in 2002 and 2005 were conducted during our research[2]. Table 4 shows the division of household samples according to whether they included migrant workers in 2002 and 2005 and provides the mean value and participation rate of each investment made from 2002 to 2010.

The data suggest that the total amount of investments made by migrant households (in either 2002 or 2005) is considerably higher than that made by non-migrant households. Both the participation rate and total amount of money invested in agricultural assets by migrant households were lower than those by non-migrant households. In contrast, migrant households invested frequently and in higher amounts in non-agricultural assets.

Regarding consumption asset investment, migrant households invested, on average, considerably more money and at higher rates in housing construction; they invested about 50% more than non-migrant households. There was no considerable difference between migrant households and non-migrant households with regard to investment in consumer durables. About 80% of investments were made in consumer durables by both kinds of households; however, in 2005, the investment amount of migrant households was considerably greater than that of non-migrant households.

The above analysis revealed that migrant working by farmers is related with various investment behaviors, but this relationship is rather complex. It is positively related with

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[2] The year 2005 was selected because, in that year, the fifth Plenary meeting of the 16th CPC Central Committee proposed the goal of constructing a new socialist countryside, and agricultural taxes and fees were comprehensively abolished in Jiangxi Province.

agricultural asset investment and negatively related with non-agricultural asset investment; further, it has a significant positive relationship with consumption investments such as housing and consumer durable investment. The main reason for households to have migrant workers is to improve the current living standards and, most importantly, the housing quality. The large amount of total investment for migrant households is mainly because of the excessive housing costs, which is associated with the belief that migration work and earning money is important to build a house and get married.

Since agriculture has relatively low comparative benefits and the scale of households' operation is small, the expected rate of return is not high. In contrast, the improvement of current living conditions can have more benefits. Therefore, migrant households might first meet the demands of housing and consumer durables when they receive remittance. However, when there are no non-agricultural investment opportunities, they might use the remaining funds to invest in agricultural production. The analysis results of this issue by using sample data are presented below.

3.2.3. Basic situation of farmland rent-in and rent-out

Of all the 230 valid samples, 36 households had rented out farmland during the investigation period, accounting for 15.7% of the total; the minimum transfer area was 0.3 mu and the maximum was 10 mu, with an average value of 2.8 mu. Further, 118 households had rented in farmland, accounting for 51.3% of the total; the minimum transfer area was 0.5 mu and maximum was 95 mu, width an average of 6.1 mu. This included 8 households who had both rented in and rented out farmland; the average transferred area was 3.6 mu, which is considerably larger than the average area of 2.1 mu. Only 15.6% of the sample households had rented out farmland, indicating that households with whole family migration are the major suppliers in farmland transfer market.

Most farmlands were transferred through interpersonal channels, a few through market-oriented transaction channels such as contracts, and some via collective village or

other intermediary organizations; the scope of farmland transfer was limited within the village. Most farmlands were transferred for free (refer to Table 5). Only 14 households with rented-out farmland and 57 with rented-in farmland had paid land transfer transaction. The average price for renting in is 136 yuan per mu, whereas that for renting out is 345 yuan per mu. This was because more than half of the 14 households were located in Shuangming Town of Yushan County; in this region, farmlands are generally rented to wild rice stem-growing farmers, and the price is relatively high (about 500 yuan per mu).

Table 6 shows division of households by migrant working status and describes farmland transfer participation and scale. Of the 72 non-migrant households, a total of 50 were involved in farmland transfer, of which 9 rented out farmland and the remaining 41 rented in; the median value of transfer area for both was 2 mu. Of the 158 migrant households, a total of 104 participated in the transfer of agricultural land, of which 27 rented out and 77 rented in; the median value for renting in was 2 mu, whereas that for renting out was 2.8 mu. As is evident, migrant families were more involved in farmland rent out and non-migrant households were more involved in farmland rent in, although the difference between the two was not significant at the 5% confidence level.

In the following sections, we divided the samples into two parts according to infrastructure investments such as farmland water conservancy of the collective village. The participation rate of land transfer in villages with relatively poor infrastructure was lower than that in villages with good infrastructure (Table 7). Further, there were differences in transfer area between the village types: villages with relatively poor infrastructure had a smaller transfer scale.

In villages with rather poor infrastructure, only 30.6% of the total households paid rents for rented-in farmland, and the average price paid was 114 yuan per mu. In villages with rather good infrastructure, 60.9% of the total households paid rent for the rented farmland, and the average price paid was 144 yuan per mu. Thus, the better the infrastructure for collective agriculture, the higher the degree of farmland transfer market and higher the transfer price.

4. Empirical Analysis and Results

According to the aforementioned analytical framework, this empirical study is divided into two parts: "impact of non-agricultural employment on investment in agricultural assets" and "impact of non-agricultural employment on farmland transfer."

4.1. Impact of non-agricultural employment on investment in agricultural assets

4.1.1. Model settings

According to previous studies on theoretical model derivation of investment issues of farmers (Deininger et al 2003), family agricultural production asset stock is the function of the initial stock of those assets, laborers' migrant working, and many other family and community characteristics. This study establishes the following simplified empirical model:

$$W_t = \alpha + \rho W_{t-1} + \beta_M M_{t-1} + \beta_R R_{t-1} + \beta_Z Z_t + \varepsilon_t \tag{23}$$

Among the variables, the dependent variable W_t means the agricultural asset stock at time t. W_{t-1} is the initial stock of agricultural asset stock at a previous time point t - 1, which is known to affect the investment decisions of farmers. The influence of farmers' migrant work on agricultural asset investment is determined by including two lagged variables in the model, i.e., migrant work situation of households M_{t-1} and laborers' reflux situation R_{t-1}. Z_t is a group of family and community characteristics that might influence agricultural asset investment of households, and ε_t is the error term.

Since the investment decisions of farmers might be affected by many observable or unobservable factors, and the survey data cannot measure all the factors, a first-order difference in time for equation (23) was conducted:

$$W_t - W_{t-1} = \rho(W_{t-1} - W_{t-2}) + \beta_M (M_{t-1} - M_{t-2}) + \beta_R (R_{t-1} - R_{t-2})$$

$$+ \beta_Z (Z_t - Z_{t-1}) + (\varepsilon_t - \varepsilon_{t-1}) \tag{24}$$

$W_t - W_{t-1}$ and $W_{t-1} - W_{t-2}$ are the total amount of agricultural investments for households at two time periods. Since the sample data have only the description for all variables for 2002, 2005, and 2010, three time points were set as t, $t-1$, and $t-2$; thus, equation (24) can be written as follows:

$$I_{50} = \rho I_{25} + \beta_M (M_{2005} - M_{2002}) + \beta_R (M_{2005} - M_{2002}) + \beta(M_{2005} - M_{2002}) + \varepsilon \quad (25)$$

Here, I_{50} and I_{25} represent the amount of money farmers invested in agricultural assets from 2005 to 2010 and from 2002 to 2005, respectively. M_{2005} and M_{2002} represent the amount of migrant workers for households in 2005 and 2002, respectively. R_{2005} and R_{2002} represent the number of refluxed migrant workers in 2005 and 2002, respectively. The time difference can eliminate the influence of some factors that will not change with time by using the control variable Z_t. According to data availability and previous studies, the total number of family laborers and experience of householder were selected as control variables that do not change with time in equation (25). The definition for dependent and independent variables and the mean value of samples are shown in Table 8.

4.1.2. Results and interpretation

The impact of regional economic development level on the relationship between farmers' migrant work and households' agricultural asset investment was investigated by dividing villages into two parts according to the wealth of villagers and by using the OLS model to run regression for equation (24). The results are shown in Table 9.

The estimation results of this model indicate that, in villages with different levels of economic development, the influence of households' migrant work on agricultural asset investment largely varies; however, in general, households did not use migrant remittance to invest in agriculture and improve output capacity. In relatively rich villages, farmers remarkably reduced agricultural asset investment by using labor outflow. On the other hand, in poorer villages, migrant working forced farmers to increase their investment in agriculture, although the investment was not significant at the 10% confidence level.

Migrant labor reflux does not have a significant influence on agricultural asset investment; however, in villages with different economic development levels, the coefficient of this variable varied.

The empirical results shown in Table 9 suggest that hypothesis I is applicable in richer villages. In relatively rich regions, there are more non-farm work opportunities, and decentralized small-scale agricultural production is not competitive. Remittance inflows from migrant workers have increased the non-agricultural income of the families, and hence, the households will not marginalize agricultural production and reduce their investment with extensive operation. On the other hand, in relatively poor areas, non-farm employment opportunities are rare, and farmers' daily life and family development somewhat rely on agricultural income; therefore, households in these areas tend to invest in agricultural production and increase their output capacity. Further, migrant remittances in these areas will be used to expand agricultural production after the housing and consumption demands are met.

This suggests that, with economic growth, industrialization, urbanization, and rural labor transfer, the development of agriculture will not increase simultaneously; it will decline instead. This might be due to the small farming practices in China. Various rural markets are not well developed, and agricultural production scale is ultra-small. The comparative effectiveness of agricultural production is extremely low; therefore, farmers attempt to become rich by ensuring agriculture development. Our follow-up survey in this region in 2012 suggested that increasing number of households' farmlands remained uncultivated; in 2011, about 5% of all migrant households left the farmlands uncultivated completely, and 20% of the households left their farmland uncultivated partly. With the continued transfer of agricultural labor force, increasing number of families have only elderly individuals3, and these families continuously reduce their acreage because of the serious agricultural labor shortage, which results in abandoned or seasonally abandoned

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3 "Left-behind elderly" in this paper means old people above 55 years old and all their children are working outside the county. In follow-up survey, we arranged a questionnaire interview for left-behind elderly specially.

farmlands. According to the survey, only an average of 61% of the land was cultivated for such families, and the remaining 39% of the arable land was left barren.

4.2. Impact of non-agricultural employment on farmland transfer

4.2.1. Model settings

This section describes econometric models to study the impact of farmers' migrant work on farmland transfer by using empirical analysis. Since not all farmers were involved in farmland transfer, separately studying the participation rate and scale is important. Farmland transfer is mainly affected by migrant labor, family characteristics, and community characteristics; therefore, our model can be expressed as follows:

$$Y_i = \alpha + \beta M + \delta Z + \varepsilon_i \qquad (26)$$

where the dependent variable Y_i denotes the participation rate of farmland transfer (if a household is involved in farmland transfer, the value is 1; it is 0 otherwise) and transfer scale (the area of farmland transfer). Of the independent variables, M represents households' migrant working situation, Z is some characteristic variable for community and family characteristics, and ε_i is the error term.

Since migrant working is associated with labor loss and increased capital mobility, selecting explanatory variables that can represent these factors is important; these factors will be identified by the number of migrant workers and the amount of remittance. In addition, different types of migrant work have been shown to have different impacts on agricultural production; these types also need to be distinguished. Therefore, three patterns of migrant work are considered: local (within the county) migrant workers, non-local (outside the county) migrant workers (both are indicated by the number of migrant workers), and the third type is where householders work as migrant workers (this is a dummy variable; if the householder works as a migrant worker, the value is 1; otherwise it is 0).

The influence of infrastructure of collective agriculture on farmland transfer was investigated by including a dummy variable to represent the village agricultural infrastructure conditions in the model (1 for good infrastructure and 0 otherwise). Considering previous research findings and depending on the availability of data, other household characteristic variables include factors such as number of reflux migrant labors, family size, whether village cadres or not, family, education level and age of householders, area of family-owned farmland, and agricultural asset inventory. These variables can be interpreted in the following model:

$$Y_i = \alpha + \beta_1 M_1 + \beta_2 M_2 + \beta_3 M_3 + \beta_4 \operatorname{Re}m + \delta_1 \operatorname{Re}t + \delta_2 Pop + \delta_3 Cadres$$

$$+ \delta_4 Edu + \delta_5 Age + \delta_6 Land + \delta_7 Asset + \delta_8 Infra + \varepsilon_i \qquad (27)$$

The definition and values of various variables are described in Table 10.

Table 10 indicates that, on average, each household has 0.26 and 0.96 labor force engaged in local and non-local migrant working; the number of local migrant workers is significantly less, which is consistent with the fact that Jiangxi Province is a large labor-exporting province. About 0.44 family members (not migrant workers when the survey was conducted) have migrant working experience. The average family size for households is 4.28 individuals. Each household has an average of 4.57 mu contracted farmland. The average agricultural asset inventory for each household is 3,996 yuan.

4.2.2. Results and interpretation

household participation of farmland transfer

Whether households are involved in agricultural land transfer or not is a 0:1 variable; therefore, the binary choice model needs to be used to perform regression; herein, the Probit model was used. According to previous analysis, there are differences in households' farmland rent-in and rent-out; this needs to be considered separately. Table 11 shows the Probit regression results (coefficients listed are the marginal effects for each variable at the level of mean value. For dummy variables, they are the calculated

marginal effect of this variable when changed from 0 to 1, whereas the other variables are their mean values).

Migrant working significantly affected the participation of farmers in farmland transfer, irrespective of whether rent-in or rent-out. Interestingly, the impact of the labor drain effect of not-agricultural work was asymmetrical: negative for farmland rent in, whereas positive for farmland rent out. The amount of migrant remittance had no influence on farmers' involvement in farmland transfer, suggesting that, although remittances can increase the liquidity of funds, they will not affect the total scale of farmers' agricultural production. Therefore, hypotheses II and III hold true with regard to the participation of farmers in land transfer.

Local migrant working significantly decreased farmers' tendency to rent in farmland. For each additional local migrant working family member, households' probability to rent in farmland declined by 17.7%. Non-local migrant working and householder working as a migrant worker had no significant influence on the probability of farmers' farmland rent in. Migrant working and non-migrant working both significantly increased households' farmland rent out probability. For each additional number of worker in these two types of working situations, the probability for household to rent in farmland increased by 10% and 6%, respectively, indicating that, when family labor force work as migrant workers, the proportion of labor and land changed because of the reduction of households' labor resources, since agricultural practices were not yet modernized. This decreased farmers' willingness to expand agricultural production and resulted in their tendency to transfer parts of their farmland to others. The difference between local migrant working and non-local migrant working on households' farmland transfer probability might be attributed to the fact that the cost for local migrant working is relatively low and is more stable with higher expected return; thus, households are more inclined to leave the low-efficient agricultural production.

Collective agricultural infrastructure investment has significant positive influence on households' farmland transfer. This is mainly because the fragmentation and decentralization of agricultural land and insufficient investment in agricultural

infrastructure involves unnecessary costs, leading to the decline in demand for rented-out farmland and no appropriate supply for farmers who want to rent-in farmland. In other words, farm planning, road repairs in fields, improvement of irrigation facilities by village committees can greatly help farmers, reduce the labor demand in production, increase the expected return, and greatly improve farmers' willingness to transfer farmland.

farmland transfer scale

Since some farmers were not engaged in agricultural land transfer, the observed value for circulation area was 0. Applying the OLS regression model to equation (5) or only to those samples without an observed value of 0 will result in selection bias. Therefore, the above-mentioned Probit regression results were used to calculate the Inverse Mills Ratio for households' farmland rent in and rent out; as the rent-in and rent-out rate was considered as an additional independent variable in the model (Amemiya 1974). Table 12 shows the regression results for factors that influenced households' farmland transfer area.

The number of migrant workers and remittances had no significant impact on farmers' farmland transfer scale. The number of migrant workers significantly influenced farmland rent-out area. For each additional local migrant worker, the average rent-in farmland increased by 0.43 mu, whereas for each additional non-local migrant worker, the average rent-in farmland increased by 0.26 mu. Further, if the head of the house works as a migrant worker, farmers will transfer more than 0.6 mu farmland on average. Since the different patterns of migrant working result in different degrees of labor loss and different levels of expected non-agricultural return, the above results indicate that the constrain of family labor force and farmers' expectation on the stability of non-agricultural income are the two major factors that influence households' farmland rent-out area. Therefore, hypotheses II and III were proved in the case of farmland transfer area.

The above results suggest that migrant working results in farmland renting out; however, the inflow of remittances and enrichment of capital strength do not lead to farmland rent-in. This is because under the situation of Chinese small-scale operation and

decentralization of agricultural land, the comparative advantage of agriculture operation is extremely low; therefore, households with more income resources are reluctant to invest in agriculture. Theoretically, the expansion of land area can more effectively influence other production factors and thus improve resource returns (Wan and Cheng 2001); farmers are expected to improve the situation of farmland fragmentation by increasing farmland rent-in. However, households' farmland operation scale is extremely small and highly fragmented. In our survey, an average household had a little more than 4 mu farmland, but this was divided into 4 or 5 pieces. Therefore, renting in farmland that is connected with their plots of agricultural land is difficult for farmers, and the transaction costs will be very high (Wang and Zhong 2008). This has led to a serious shortage of agricultural land in flow demand and reduced the price for farmland release. Our follow-up survey in 2012 suggested that, in the sample area, rent for farmland was 100 to 300 yuan annually, which is equivalent to the wage for migrant workers for 1 to 3 days; thus, some households preferred to leave their land uncultivated rather than rent them.

However, if the government or village communities can provide appropriate support to reduce farmland transfer transaction costs and improve operation efficiency, farmland transfer and scale operation might improve. Studies have shown that collective village investment in agricultural infrastructure has a significant effect on farmland transfer scale. In villages with good irrigation infrastructure, the average transfer area is 3.9 mu, which is greater than that in villages with a poor irrigation infrastructure. Therefore, if villages collectively invest in agricultural infrastructure and farmland distribution is well planned, the effective demand will be greatly increased.

5. Summary and Conclusions

Households' investment in agriculture assets is an inherent requirement for improving agriculture productivity; this will lead to the realization of modernized and productive agriculture. The mass flow of rural laborers to cities has provided the basis for this change. Therefore, the relationship between migrant working and households' agricultural asset accumulation was investigated using sample data, and agricultural

assets were divided into general agricultural assets and farmland assets and discussed separately.

Generally, remittances brought by migrant workers are mainly used to improve the current quality of life, particularly housing quality. In relatively rich villages, there are more off-farm working opportunities, and migrant working has strengthened households' labor constraints and further improved non-farm income, resulting in the reduction of agricultural asset investment. On the other hand, in relatively poor villages, off-farm work opportunities are rare, and farmers rely more on agricultural production. However, because the comparative return of agriculture production is low, the investment return from agriculture production is extremely low; thus, farmers first consume remittances obtained from migrant working. They might use the remaining remittances to expand agricultural production provided the demands for housing and consumption are met.

Migrant working has resulted in the renting out of farmland by households. However, remittance inflow and enhanced capital strength have not led to the renting in of farmland. Since farmland operation scale is extremely small and farmland is highly fragmented, renting in farmland by households might be very difficult and the transaction costs will be exceedingly high, leading to a serious shortage of farmland inflow demand and considerably reducing the price for farmland renting. Thus, some migrant families prefer to leave their land abandoned rather than rent them.

Therefore, under the traditional mode of agriculture operation and ultra-small scale of farmers' agricultural land condition, which is extremely difficult to change, the realization of modernization of agriculture is difficult or the advancement of industrialization, urbanization, and rural labor force transfer might even decline. However, if the government or village can provide the appropriate support, scale operation of agricultural land and agricultural modernization can be better advanced.

Tables and Figures

Table 1. Basic family characteristics of the sample households

	Total population	Number of workforce	Number of school-going children	Age of household members	Average age of workforce	Education years of household members	Amount of contracted farmland per capita (mu)
Mean	4.28	3.11	0.67	50.81	41.34	6.33	1.20
SD	1.54	1.13	0.86	9.73	9.18	3.57	1.02

Table 2. Number of migrant workers in household samples

	0 migrant worker	1 migrant worker	2 migrant workers	3 migrant workers	4 and above migrant workers	Total
Number of households	72	70	65	15	8	230
Percentage (%)	31.3	30.44	28.26	6.52	3.48	100

Table 3. Household investment across different types of villages

	Households in relatively rich villages (number of samples: 138)		Households in relatively poor villages (number of samples: 92)	
	Investment amount (yuan)	Participation rate (%)	Investment amount (yuan)	Participation rate (%)
Agricultural assets	2,687	80.4	3,976	68.5
Non-agricultural assets	3,358	8.7	3,521	13.0
Consumer durables	4,528	81.2	5,044	89.1
Housing assets	24,960	42.0	30,473	44.6
Total investment	35,534	97.1	43,014	96.7

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Table 4. Investment difference between migrant households and non-migrant households

	Migrant households in 2002 (number of samples: 127)		Non-migrant households in 2002 (number of samples: 103)		Migrant households in 2005 (number of samples: 143)		Non-migrant households in 2005 (number of samples: 87)	
	Investment amount (yuan)	Participation rate (%)	Investment amount (yuan)	Participation rate (%)	Investment amount (yuan)	Participation rate (%)	Investment amount (yuan)	Participation rate (%)
Agricultural assets	1,465	69.3	5,345	83.5	2,009	73.4	5,165	79.3
Non-agricultural assets	4,127	11.8	2,555	8.7	2,630	12.6	4,726	6.9
Consumer durables	4,903	80.3	4,525	89.3	5,260	86.0	3,871	81.6
Housing assets	31,122	44.9	22,286	40.8	31,836	49.7	19,489	32.2
Total investment	41,618	96.9	34,713	97.1	41,735	97.9	33,250	95.4

Table 5. Household farmland transfer situation

	Rent out	Rent in
Number of participating households	36	118
Transfer area (mu)	2.8	6.1
Number of households involved in paid transfer	14	57
Transfer price (yuan/mu)	345	136

Table 6. Farmland transfer difference between migrant households and non-migrant households

	Non-migrant households (number of samples: 72)		Migrant households (number of samples: 158)	
	Participation rate (%)	Area (mu)	Participation rate (%)	Area (mu)
Rent out	12.5%	2	17.1%	2
Rent in	56.9%	2	48.7%	2.8

Note: Since farmland transfer area for a few households is extremely large, we used median value rather than the mean value to describe households' farmland transfer area.

Table 7. Region difference of farmland transfer

		Relatively poor in infrastructure (number of samples: 103)	Relatively rich in infrastructure (number of samples: 127)
Farmland rent in	Participation rate (%)	47.6	54.3
	Area (mu)	1.5	5.8
	Paid rate (%)	30.6	60.9
	Price (yuan/mu)	114	144
Farmland rent out	Participation rate (%)	9.7	20.5
	Area (mu)	2	2.2
	Paid rate (%)	0	53.8
	Price (yuan/mu)	0	345

Note: Here, median value rather than mean value is used to describe sample households' farmland transfer area.

Table 8. Definition of variables and statistical description for the model

Variables	Meaning	Mean value
I_{50}	Amount of agricultural investment from 2005 to 2010	2033.08
I_{25}	Amount of agricultural investment from 2002 to 2005	1169.76
dM	Number of migrant workers in 2005 minus those in 2002	0.09
dR	Number of returning migrant workers in 2005 minus those in 2002	0.11
dL	Total number of laborers in 2005 minus those in 2002	0.07
$dEXP^2$	Square of experience in 2005 minus that in 2002	329.86

Table 9. Regression results of the impact of farmers' migrant work on investment in agricultural assets

	Model	
	Households in relatively rich villages (number of samples: 138)	Households in relatively poor villages (number of samples: 92)
I_{25}	1.14*** (0.18)	2.34*** (0.07)
dM	-314.95* (192.33)	170.72 (663.58)
dR	-1439.63 (1528.96)	966.14 (1294.89)
dL	876.18 (1032.85)	-48.47 (784.44)
$dEXP^2$	1.20 (1.38)	-1.36 (1.36)
R^2 (adj.)	0.24	0.92

Note: standard errors are shown in parentheses,* represents significance at 10% confidence level; ** represents significance at 5% confidence level, and *** represents significance at 1% confidence level.

Table 10. Definition of variables and statistical description

Variables	Symbol	Definition	Mean value
Local migrant workers	M1	Number of migrant workers working within the county in households	0.26
Non-local migrant workers	M2	Number of migrant workers working outside the county in households	0.96
Householder works as a migrant worker	M3	Dummy variable; Householder works as a migrant worker = 1, otherwise = 0	0.16
Remittance from migrant workers	Rem	Cash brought or sent home by migrant workers (1,000 yuan)	4.04
Reflux of labors	Ret	Number of reflux laborers who have migrant working experience	0.44
Family size	Pop	Total population of a family	4.28
Village cadre family	Cadres	Dummy variable; have village cadres in a family = 1, otherwise = 0	0.06
Education level of householders	Edu	Householder's education years (year)	6.33
Age of householders	Age	Householder's age	50.82
Family-owned land	Land	Area of intact land for households (mu)	4.57
Stock of agricultural production assets	Asset	Total value of various agricultural assets (1,000 yuan)	3.99
Infrastructure investment	Infra	Dummy variable; with rather good infrastructure = 1, otherwise = 0	0.56

Table 11. Probit regression results for factors that influence households' participation probability in farmland transfer

	Rent in		Rent out	
	Coefficient	Standard deviation	Coefficient	Standard deviation
Local migrant workers	-0.177**	0.083	0.101**	0.040
Non-local migrant workers	-0.007	0.051	0.059**	0.030
Householders work as migrant workers	-0.106	0.139	0.144	0.111
Remittance from migrant workers	0.004	0.006	-0.004	0.004
Reflux of laborers	0.002	0.054	0.070**	0.031
Family size	-0.008	0.032	-0.046**	0.019
Village cadre family	-0.016	0.163	0.146	0.144
Education level of householders	0.014	0.011	-0.001	0.007
Age of householders	0.004	0.004	0.001	0.003
Family-owned land	-0.045***	0.013	0.015**	0.006
Stock of agricultural production assets	0.016**	0.008	-0.010*	0.007
Infrastructure investment	0.120*	0.063	0.083*	0.043
Log likelihood	-142.08		-84.41	
R^2 (adj.)	0.108		0.154	

Note:* represents significance at 10% confidence level; ** represents significance at 5% confidence level, and *** represents significance at 1% confidence level. Coefficient is the marginal effect of sample mean value for independent variables.

Table 12. Regression results for factors that influenced households' farmland transfer area

	Rent in		Rent out	
	Coefficient	Standard deviation	Coefficient	Standard deviation
Local migrant workers	-1.030	1.023	0.434***	0.134
Non-local migrant workers	0.514	0.684	0.263***	0.090
Householders working as migrant workers	-2.065	1.891	0.597**	0.248
Remittance from migrant workers	-0.053	0.086	-0.015	0.011
Reflux of laborers	-0.245	0.728	0.243**	0.095
Family size	-0.055	0.435	-0.109*	0.057
Village cadre family	0.923	2.107	1.311***	0.276
Education level of householders	0.026	0.152	0.009	0.020
Age of householders	-0.032	0.061	0.016*	0.008
Family-owned land	-0.061	0.154	0.085***	0.020
Stock of agricultural production assets	0.315***	0.033	0.002	0.004
Infrastructure for collective agriculture investment	3.894***	0.998	0.144	0.131
Constant term	2.094	3.995	-1.003**	0.524
Inverse Mills Ratio	2.999***		1.462***	
R^2 (adj.)	0.378		0.586	
Number of samples		230		

Note:* represents significance at 10% confidence level; ** represents significance at 5% confidence level, and *** represents significance at 1% confidence level.

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