

# **Rural Land Transfer and Financial Impact: Evidence from China**

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# **Rural Land Transfer and Financial Impact: Evidence from China**

## **Abstract**

Land is the most valuable capital that farmers own. Land transfer can improve income of farmers through an optimal allocation of factors of production. The land transfer is not only transferring of the ownership but also transferring of the management rights. Chinese rural land system has its unique characteristics: ownership, contract, and management rights. Ownership rights are owned by collectives, farmers have contract management rights which are divided into management transfer rights and contract rights. Since 2008, farmers are provided with both land contract rights and land management transfer rights. This reform has provided farmers with financial opportunities to obtain revenues using different channels. Transferring-in land needs additional capital thereby causing demand effects, but transferring-out land allows farmers to earn income thereby causing supply effects. Land transfer also changes farmer's agricultural investment and insurance behavior. This paper uses 2014 data from nine Chinese provinces to test farmers' financial behavior change between land management rights transfer-out and transfer-in. Results from doubly-robust estimator with inverse probability weighting estimator, regression-adjustment, and propensity score matching indicate a significant difference of financial selection between land transfer-in farmers and land transfer-out farmers. Land market gives an unblocked transmission channel to rural financial market through mechanism innovation.

*Key words:* doubly-robust estimator, financial impact, land management right, land transfer-in, land transfer-out

**JEL Classification: C01, Q15**

# **Rural Land Transfer and Financial Impact: Evidence from China**

## **1. Introduction**

Developing countries, especially in Africa and Asia, are implementing rural land reform for economic transformation, structural change, and farmers' well-being. Confirming land rights and creating land market are the most important goals of land reform. Flexible land transfer, as an objective of the land market, ensures land transfer to efficient farmers, lets farmers without interest in farming engage in nonagricultural sector, reduces land idling, makes rural land qualified as collateral, and allows farmers gain economies of scale. Literature gives us cognitions that land transfer has positive impact on farmers, rural areas and the agriculture sector as it increases productivity, ensures equality and reduces poverty, but it has no bearing on women empowerment and social services (Jacoby et al., 2002, Deininger et al., 2013, Mendola and Simtowe, 2015, Deininger and Ali, 2008, Ali et al., 2015). Land transfer is known to provide stronger property rights to men than women in the beneficiary families (Mueller et al., 2014).

There is a paucity of studies on the financial impact of land transfer. From a theoretical perspective, the relationship between land transfer and finance is multifaceted. First, land transfer causes land tradability to increase, which encourages farmers to use rural land as collateral when applying for credit. If land can be used as collateral, farmers are likely to change credit sources from informal and semi-formal sources to a formal source. Second, farmers' behavior of borrowing and lending through

financial and non-financial channels change. Farmers who transfer land out could see increased income and saving. They can then get saving deposited in financial institutions or lend to others through an informal channel. Farmers who transfer-in land seek fund either through formal or informal sources. Third, land transfer also changes farmers' agricultural investment and insurance behavior. This paper investigates these questions based on the data from nine provinces of China collected in 2014. We explain land transfer innovation mechanism by connecting land and rural financial market.

Chinese land system shows that rural lands are owned by collectives. Farmers have contract rights (that generally lasts for 30 years), and management rights and these two rights can be operated in parallel. Farmers have rights to retain land contract rights and transfer land management rights at the same time. We focus on the empirical study of financial impact of land management right transfer.

Results from propensity matching score models show that land transfer changes farmers' financial behavior. Land transfer-out makes farmer increase deposit, lend more fund to private sources, and reduce agricultural investment. Land transfer-in makes farmers borrow more from informal financial sources, especially from friends and relatives, increase agricultural investment, and insurance.

The remainder of this paper is structured as follows. Section 2 briefly introduces Chinese rural land transfer system. Section 3 provides literature on the impact of land transfer in Africa and Asia, which provides the foundation for studying the financial implications of land transfer. Section 4 provides details of propensity score matching model used in the paper. Section 5 presents results on the effects of land

transfer-in and land transfer-out on financial variables. Section 6 concludes.

## **2. Chinese rural land transfer system**

Chinese rural land transfer system can be explained clearly by land right and land market history starting in 1949 (see Table 1). There are three distinct periods: 1949-1953 (land ownership owned by farmers), 1953-1978 (cooperation and collective management stage), and 1978-present (household contract management stage) (Liu et al., 2007). In each of these periods, rural land right and land transfer system are different.

During 1949-1953, land right belonged to farmers, and there was a complete property right system in operation. Farmers obtained ownership right from landlords, and they could transfer land freely (Liu et al., 2007, Zhang, 2015). This is a continuation of the private system, the only difference is that farmers had full control of their property and agricultural outputs produced from the land.

The second period (1953-1978) is cooperation and collective management stage. This period is further divided into three subperiods. Subperiod I: 1953-1956 is primarily the cooperative phase. Subperiod II: 1956-1958 is the advanced cooperatives phase. Subperiod III: 1959-1978 is the people' commune stage. During 1953-1956, farmers joined cooperatives with land and other means of production as shares, production is distributed by cooperatives, farmers did not have rights to choose crops to grow on the cooperative land. Ownership rights and management rights of rural land were separated for the first time. Farmers obtained

return from the land because they hold land ownership indicated by shares of cooperatives (Liu et al., 2007, Zhang, 2015). During the advanced cooperative stage (1956-1958), rural land and other means of production belonged entirely to cooperative thereby eliminating farmer' private ownership right. Chinese land system completed the transformation from private ownership right to public ownership right. Management right and ownership right of land are unified. Output distribution depended on how much work farmers did every day, which was reported in working score. Scores were changed into salary. During the subperiod III (1959-1978), rural land and other means of production belonged to three organizations: commune, production brigade, and production team. Land ownership and management rights were implemented by the production brigade. Distribution pattern functioned as if it were an advanced cooperative. During 1953-1978, farmers were not allowed to transfer land. Experience and history proved land system during this stage did not match the agricultural productivity of that time. As a result, income and efficiency of farmers reduced substantially.

The current stage of land management started in 1978 which is known as the household contract management phase. Starting then and even at the current, rural land ownership right belongs to village collective, which is contracted by farmers. This contract right is protected by the Chinese Constitution. Farmers can transfer their land to others. Ownership rights and management rights are separated. Farmers can transfer land management rights, and they get outputs produced on their land.

Presently, Chinese government is intensifying rural land reform system to increase farmers' income, while adhering to collective land ownership right system, promoting separation of ownership rights, contract rights and management rights, and removing management rights transferring channel.

An amendment to the Chinese constitution in 1988 allowed land management rights transfer within a certain legal framework. Farmers could transfer their land to others. Ownership rights and management rights were separated. Farmers could transfer land management rights; however, output of land was retained by farmers. Based on the district economic situation, land transfer was classified as transfer land contract right (original contract farmer has no right and obligation with collective), rent or subcontract (original contract farmer has right and obligation with collective, new subcontract farmer has relationship with original contract farmer), share based on land, auction (used on wasteland), and collateral.

Although the Chinese government has set up the land management rights transfer system since 1982, the land market did not get developed for a long time. For 20 years or so after the amendment to the constitution, land transfer rate was still around 1-2%. The low land transfer was result of low transfer fee, land area limitation, underdeveloped land market, and lack of relevant laws. Additionally, urbanization and rural-urban labor migration lead more and more rural land uncultivated leaving experienced farmers with limited land to cultivate. Land as capital can provide returns only when farmers combine with other forms of capital and inputs. Additionally, lack of fully functioning land transfer market lead to land

idling, leading to poverty and liquidity problem in rural areas. In 2013, Chinese government stressed land management right transfer issue again to improve production efficiency and fair allocation of land.

According to the Statistics of the Ministry of Agriculture of China, as of 2013, nationally contracted land transfer area reached 340 million mus which is 3.1 times more than land transferred in 2008, turnover ratio reached 26%, which is 17.1% higher than 2008. By the end of June 2014, the national rural contracted land transfer area was 380 million mus accounting for 28.8% of the total area of the contracted land.

### **3. Literature review**

Land transfer have positive impact on agricultural productivity, income enhancement, and poverty reduction (Mao et al., 2015), food security, non-agricultural self-employment, credit, efficiency, equity, and household welfare outcomes (Deininger et al., 2008, Chamberlin and Ricker-Gilbert, 2016, Ali et al., 2014, Jacoby et al., 2002, Mendola and Simtowe, 2015). Women compared to men receive more benefits and change in social status through transferring land out (Mendola and Simtowe, 2015). These benefits are likely to increase as land market matures (Mendola and Simtowe, 2015, Chamberlin and Ricker-Gilbert, 2016).

Deininger and Ali (2008) studying about Ugandan land right reform claim that transferring land right allows land to go to more efficient users, maximize allocative efficiency, maximize agricultural productivity, and allow the flow of labor from



agriculture to non-agriculture sectors. They also add that confirming land right makes rural land eligible for collateral and promotes the development of rural financial markets. Before land transfer, land right must be established which can clarify land relationship, reduce the transaction costs and friction of land transfer, and improve participation in land transfer (Ali et al., 2015).

Transfer contract type can influence land transfer. According to sharecropping lease contract, landlord-cum-tenant farmers have a greater productivity on owned land than on leased land. However, if farmers who rent out land have concurrently a functioning farm operation or have relatives in the village, this inefficiency can be reduced. If input cost is included in rent, inefficiency can be reduced. In the presence of functioning agricultural insurance market, lease contract with fixed rent can provide an efficient solution (Deininger et al., 2013).

Land transfer includes transferring management right on land rent market and ownership right transfer on the land trade market. The determinants of land rent and land trade are different. Land rent has endowment equilibrium effect, with large land holding farmers renting out and small land holding farmers renting in. Ali et al. (2015) identify that younger, poorer, household with more workers, and male headed household farmers lease in more compared to their counterpart. They also add that land endowment decreases possibility of becoming wage earning laborer, and non-agricultural self-employment (Ali et al., 2014).

Land-related investments are a key factor of economic growth, poverty reduction and sustainable natural resource management, because agricultural

investment can improve productivity and evade natural and price risk (Deininger and Ali, 2008, Takeshima and Yamauchi, 2012). Land tenure (contract right) insecurity has a negative impact on agricultural investment, especially long term investment (Jacoby et al., 2002). Land ownership has more positive impact on agricultural investment than land tenure right. Term of land tenure right is also a key factor, longer term gives more positive impact on investment than a shorter term (Deininger and Ali, 2008). In China, farmers invest more on private plots than collective plot, especially when comes to long-term investment such as organic fertilizer. This is because the terms of private plot contract is longer than collective plot (Jacoby et al., 2002).

Capital is one of the most important factors of the production function. In an imperfect market, resource endowments of farmers will affect the input use. Credit restriction has a negative impact on agricultural input and output, efficiency of agricultural production, increasing income of farmers, agricultural resources allocation, productivity, investments, and possibility of engaging non-agricultural self-employment with higher return (Ali et al., 2014, Takeshima and Yamauchi, 2012). Without upfront investment farmers cannot obtain income diversity. The loan allocation reduces the possibility of farmers engaged in non-agricultural self-employment, but it increases the likelihood of farmer becoming wage-labor in agriculture. Land ownership increases the likelihood that farmers engage in non-agricultural self-employed job, and its positive influence exceeds loan allocation's negative impact (Ali et al., 2014, Reyes and Lensink, 2011). Farmers without credit restriction use more fertilizer, improved seeds, extension advice than farmers with

credit restrictions. Farmers without loan allocation use more hired labor, farmers with loan allocation use more family labors (Ali et al., 2014).

More years of farming experience can improve efficiency, increase revenue, the farmers do not want loan, and are in favor of self-financing. Exotic crop could encounter credit restriction because of technology risk. Insurance has dual impact on loan, farmers with more insurance means less confidence to succeed, it gives the bank a signal they are risk customer, at the same time insurance can give bank a security when farmers encounter risk. So credit insurance is security to bank, and the property insurance is risk. Land transfer gives farmers qualified collateral, so more lands should give farmers more probability of apply for more credit, but farmers with more lands would not like to apply for more credit, because of the risk of losing lands (Reyes and Lensink, 2011).

Credit restriction or loan allocation to farmers because of without qualified collaterals could be resolved through the maturation of land transfer. Microcredit can offer loan to farmers without collateral through activating social capital. Making the non-tradable land into tradable land and rendering land obtain liquidity are another way to break loan restriction. Subjects of tradability can be ownership right or management right of land. Power of obtaining financial resource is greater than land title and land transfer to farmers on development and poverty reduction(Chirwa and Chinsinga, 2008).

But the success of land market needs inputs market, outputs market, and financial market to have unlock channel to link. Especially rural land market and

financial market are reciprocal and promote each other. Land transfer needs financial support. World bank gave fund support to Malawi land market reform, which is spent on the land purchasing, relocation and agricultural development (Mendola and Simtowe, 2015).

The literature described so far provided information about the relationship among land transfer, loan allocation, and investment. There lacks a study on financial impact of land transfer including financial behavior change of farmers on credit, deposit invest and insurance before and after land transfer. This paper attempts to fill this void in the literature.

#### **4. Empirical study**

##### *4.1 Methodology and econometric model*

We use a doubly-robust estimation method to analyze the financial impact of land transfer. Inverse probability weighted estimator with regression-adjustment (IPWRA), and the augmented inverse probability weighted estimator (AIPW) are doubly-robust estimators. These estimators have double robust property because they specify outcome model and treatment model at the same time, while propensity score matching (PSM) specifies only the treatment model. IPWRA and AIPW have bias rectifying mechanism to estimate consistent effects even if outcome model or treatment model is incorrectly specified (Stata manual, 2016, p. 192-256).

IPWRA is an estimator combination of Inverse probability weighted estimator (IPW) and Regression-adjustment (RA). IPW is a way to use probability of being in a treatment group as weighted value to calculate mean outcome. In these estimators, we weigh observations on transfer land by  $1/p_i$  so that weights will be large even when the probability of transferring land by a farmer is small. We will weight observations by  $1/(1-p_i)$  if farmers are not transferring land so that weights will be large when the probability of land transfer is small. RA estimator use means of outcome to calculate treatment effects without the propensity score matching process. That is  $E(Y_g | X)$  for  $g = 0,1$ . RA has an outcome model, but there is no treatment model for the non-random treatment assignment. It obtains unobserved potential outcome using a separate outcome model. IPW has a treatment model but no outcome model. IPWRA specify outcome and treatment model together, use inverse treatment probability to weigh correct regression coefficients that are from outcome regression adjustment. This makes estimator doubly robust. The estimators of the financial effects of land transfer are consistent even if two models are not specified correctly.

Augmented inverse probability weighing (AIPW) estimator adds a bias-corrected term to IPW to correct biases that result from incorrect specification of outcome and treatment models. If treatment model is specified correctly, the bias-correction term equals zero. If treatment model is specified incorrectly and outcome model is correct, it will correct the bias, which makes estimator robust. Although IPWRA is similar in some respect with AIPW, and AIPW has good estimators if

conditional mean function and the conditional probability function are specified incorrectly (Tan, 2010).

We specify a logistic outcome model based on the property of distribution of data and binary outcome variables. The outcome variables are whether the deposit has increased, whether borrowed or not from a formal financial institution, willingness to borrow from formal financial institutions, borrowing from private sources, lending to private individuals, and purchasing agricultural insurance. Agriculture investment entails investment in purchasing machine and equipment therefore it is a continuous variable. We use a linear model to specify agriculture investment.

For discrete outcome variables:

$$\widehat{m}_1(x_i) = \exp(x_i \widehat{\beta}_1) / (1 + \exp(x_i \widehat{\beta}_1)) \quad (1)$$

$$\widehat{m}_0(x_i) = \exp(x_i \widehat{\beta}_0) / (1 + \exp(x_i \widehat{\beta}_0)) \quad (2)$$

$$\ln\left(\frac{P_i}{1 - P_i}\right) = \alpha_1 D_i + \alpha_2 S_i + \alpha_3 E_i + \alpha_4 L_i + \alpha_5 F_i + \varepsilon_i \quad (3)$$

■

For continuous outcome variable,

$$AI_i = \chi_1 D_i + \chi_2 S_i + \chi_3 E_i + \chi_4 L_i + \chi_5 F_i + \varepsilon_i$$

Independent variables used are demographic characteristics ( $D_i$ ), social relationship ( $S_i$ ), economic situation ( $E_i$ ), location attributes ( $L_i$ ), and distance to a nearby city ( $F_i$ ).

In the second step, we model the treatment as a function of covariates to estimate the propensity score (PS) for each farmer according to the observable data. Covariates defining probability of farmer to transfer land are demographic ( $D_i$ ), social relationship ( $S_i$ ), economy situation ( $E_i$ ), and land title situation ( $T_i$ ).

$$\widehat{p}_i(x_i) = \exp(x_i \widehat{\delta}) / (1 + \exp(x_i \widehat{\delta}))$$

$$\ln_{treatment} \frac{p_{oi}}{1 - p_{oi}} = \beta_1 D_i + \beta_2 S_i + \beta_3 E_i + \beta_4 T_i + \varepsilon_i$$

The third step we use inverse probability to weight the conditional mean. The propensity score (PS) obtained from the second step can be used to weight the observed data. Inverse probability weights are calculated as the inverse of the conditional probability that farmer transfers land:  $1 / \widehat{p}(x_i)$  is for the treatment farmers,  $1 / 1 - \widehat{p}(x_i)$  is for the non-treatment farmers.

$$\min_{\beta_1} \sum_{i=1}^N D_i (y_i - \exp(x_i \widehat{\beta}_1) / (1 + \exp(x_i \widehat{\beta}_1)))^2 / \widehat{p}(x_i)$$

$$\min_{\beta_0} \sum_{i=1}^N (1 - D_i) (y_i - \exp(x_i \widehat{\beta}_0) / (1 + \exp(x_i \widehat{\beta}_0)))^2 / (1 - \widehat{p}(x_i))$$

Lastly, we estimate average treatment effects (ATE) on population, average treatment effects (ATET) on treatment sample, average treatment effects on untreated sample (ATENT) by doubly-robust estimation as (Cerulli, 2015):

$$ATE^{\widehat{}} = 1 / N \sum_{i=1}^N \left\{ \left[ \exp(x_i \widehat{\beta}_1) / (1 + \exp(x_i \widehat{\beta}_1)) \right] - \left[ \exp(x_i \widehat{\beta}_0) / (1 + \exp(x_i \widehat{\beta}_0)) \right] \right\}$$

$$ATE\widehat{T} = 1 / N_1 \sum_{i=1}^N D_i \left\{ \left[ \exp(x_i \widehat{\beta}_1) / (1 + \exp(x_i \widehat{\beta}_1)) \right] - \left[ \exp(x_i \widehat{\beta}_0) / (1 + \exp(x_i \widehat{\beta}_0)) \right] \right\}$$

$$ATE\widehat{N}T = 1 / N_0 \sum_{i=1}^N (1 - D_i) \left\{ \left[ \exp(x_i \widehat{\beta}_1) / (1 + \exp(x_i \widehat{\beta}_1)) \right] - \left[ \exp(x_i \widehat{\beta}_0) / (1 + \exp(x_i \widehat{\beta}_0)) \right] \right\}$$

ATE, ATET, and ATENT are often defined as the mean outcome difference of treated and untreated farms matched by PS weighting. In other words, according to ATET, the average non-transfer land-outcome of farmer that transfers land selected by PSM to express counterfactual outcome using transfer land sample. According to ATENT, the average transfer land-outcome of farmer that non-transfers land selected by PSM to express counterfactual outcome using non-transfer land sample. ATE uses the same matching rule on population sample.

The estimator will be unbiased under three conditions (Funk et al., 2011).

The first condition requires conditional independence. That is:

$$E(Y_1 | x, D) = E(Y_1 | x)$$

$$E(Y_0 | x, D) = E(Y_0 | x),$$

The second is common support that requires propensity score can cover transfer land farmers and non-transfer land farmers. This condition is shown in Figure 2 (transfer land-out) and Figure 4 (transfer land-in), about all treatment and untreated sample on the support. Outside support farmers cannot find matching one to obtain the counterfactual outcome. The third condition is balancing (Funk et al.,



2011), though PSM can finish the goal that the distributions of covariates are similar for the transferred land and non-transferred land farmers. Balancing test indicates high quality result with standard bias below 10%, and the most standard bias around 0, that reduced after matching on Table 10 and Figure 1 ( for transfer land-out), also on Table 19 and Figure 3 (transfer land-in).

#### *4.2 Data*

We use 2014 data from randomly selected interview sample of 2,700 households from 578 villages of nine provinces of China. Data contain information about household characteristics, labor market, financial market, and land transfer. Nine provinces selected in this study are Sichuan, Shanxi, Liaoning, Ningxia, Jiangsu, Henan, Guizhou, Jiangxi, and Guangdong. These provinces cover eastern, middle, and western parts of China and represent the current land transfer situation in the country.

We use labor ratio (ratio of working adults divided by total family members), number of working adults with a junior high school education or below, number of working adults with a high school degree, and number of adults who is full time farm workers. Average labor ratio in our sample is 0.7. On average on each household, there are two adults with junior high school education, 0.8 adult with a high school degree, 1.05 labors doing farming only, and 0.81 labors doing farming and off farm work.

We use village cadre, dominance of the same last name as the household interviewed (big name), relative and friends to indicate farmers' social relationship. Relatives and friends are informal financial resources. Households who responded they have many friends and relative are 45.7%, those who responded they have few friends and relatives are 5.63%, and those who responded a few friends and relatives are 48.67%. These circles of friends and relatives give farmers enough network to borrow and lend from informal sources. Village cadre can assist to get relevant information about national policy to make a right decision for his household and receive more benefits. We find 12.63% household have/had a family member as a village cadre. Big name means there are many household with same last name in village, they are relatives from several generations. Household with big name has more speaking rights than small name in the village. We find 50.07% household are with a big name in the village, 20.52% household have small name, and 29.41% household have average name.

We use land holding size, amount of income from agriculture sources, size of uncultivated land, and land title as economic variables. Average household land areas are 6.814 mus (1mu=0.067 hectares), of which uncultivated lands are 0.609 mus (8.94%). Farmers' share in total income from agricultural source is 36.59%, 48.59% income is from migrant working, 4.29% is from business, 5.17% is from other sources. We can find out low agriculture income through income structure and labor structure, that is, 1.05 labors doing farming only, 0.81 labors doing farming while working off farm as well. This income and labor structure

prove to be a catalyst for change in the rural market. Off farm work reduces on farm labor availability and results in more uncultivated lands but at the same time provides more workers to small-medium enterprises.

One of the reforms in China is titling of land for implementing transfer land-out or in. We find that 721 households have not finished titling (26.7%), 1454 households have been titled (53.86%), the rest 525 (19.44%) households do not know if land have been titled.

We analyze treatment effect of transfer land-out or in on agriculture investment, deposit, loan, loan willingness, borrow from private, lend to private and insurance. These variables are dependent variable on treatment models and outcome models. We find 613 (22.7%) households have transferred land out and 326 (12.17%) households have transferred land in. Before transferring land, farmers most obtain titling. In our sample only 53.86% households obtain the titling certification which might explain the low ratio of transfer land-out and in. The average value of equipment and machinery used in agriculture is 5759. Households who have not borrowed account for 80.52% of which 22.91% household have willingness to apply for loan still, but others 77.09% do not have willingness to apply for loan from formal financial institutions. Households with deposit in a bank account for 75.85% which means they have chance and convenience to apply for loan. Some of these households (28.96%) also show increase in deposit amount in 2014 compared to 2013. Borrowing from informal source is an important avenue for farmers because of credit constraint 37.04% household borrowed from private sources, 31.74% lend to others. Agriculture

insurance is national policy - 21.56% household bought the insurance because financial institutions do not give loan to high risk agricultural enterprises without insurance.

## **5. Results**

### *5.1 Transfer land-out effect on farmer's financial behavior*

We divide financial activities to formal and informal sources. Formal financial activities include deposit, loan, willingness to borrow from financial sources and agricultural insurance purchase. Informal financial sources include borrowing from relatives, friends and other informal sources, and lending to relatives, friends and other informal outlet.

Transfer land-out gives farmer more capital that is from rent at first, also from laborers' salary that is earned by the farmers who are now free to work off farm. Regression results show farmers that transfer land-out will allocate the increased capital as deposits in the financial institutions and lend out to private sources.

Results indicate that farmers deposit money in financial institutions, especially in rural cooperatives that is the focus of farmers in China. Compared to those households who do not transfer land-out, the farmers who transfer land-out have 14.8% amount deposited in banks. Another way to allocate capital is to lend money to private, informal financial outlets. Transfer land-out make farmers to lend 15.6% more fund to private outlets than no transfer land-out farmer.

Agriculture insurance provides safety net to farmers in the event of catastrophic loss. Chinese government subsidizes farmers to purchase agricultural insurance and it is restricted to some different agricultural products including planting and breeding enterprises. The government encourages farmers to insure their products at a low price and the premium is subsidized by national, province, city, and county government equaling 65%-80%. The minimum national subsidy for agricultural insurance set by the national government is 65%. Land transfer out and in have significant impact on farmers' insurance behavior. Doubly-robust regression results show that transfer land-out makes farmer increase insurance by 10.5% (Table 7), transfer land-in makes farmer to increase their insurance purchase by 9.3% (Table 16) on ATE of APIW. When we restrict the analysis to only treatment sample, transfer land-out do not show significant impact on agriculture insurance purchase, transfer land-in still can increase insurance purchase at about 9.3%. This indicates that transfer land-in makes farmers buy more agricultural insurance.

Production factors re-allocation makes farmers to get engaged in nonagricultural and or off farm work Transfer land-out reduces agricultural investment (indicated by food crop and cash crop equipment and machine value) by 42% compared to non-transfer land-out. On treatment sample with land transfer out this percentage is 95.4%.

We did not find any evidence of borrowing and willingness to borrow from financial institutions impacted by land transfer out (Table 2).

## *5.2 Transfer land-in effect on farmer's financial behavior*

Transfer land-in induces demand for capital because of cost of transfer land-in and need for agricultural investment to purchase machine and equipment. Transfer land-in costs farmer an average of RMB 360.52 per mu per year, and an average of RMB 9331.39 per farm for agricultural investment related to farm machinery, equipment. Investment grows at 68.6% compared with non-transfer land-in farmers.

The fund can be acquired through owned capital or borrowing from financial institutions or private sources. Results from ATE of AIPW estimator show that fund for transfer land-in comes from borrowing from non-financial sources (Tables 8 and 9). Compared with farmers who are not transferring land-in, farmers with transfer land-in increase borrowing from informal sources by 10.4%. Informal financial source for farmers is friends and relatives (Table 10) which provided needed fund to 93.3% farmers. The second main informal financial source is farmers from the same village. Farmers also borrowed from village collectives, mutual-loan club, Farmers Cooperation Fund, and leading agricultural enterprises. Although transfer land-in need fund to disburse cost of transfer land-in and agricultural investment it has no significant impact on loan and willingness for loan application from formal.

Credit constraint is likely to persist in the Chinese villages even if land title and land transfer would provide farmers an ability to use land as collateral. Evidences from many countries show their positive relationship with borrowing from formal

financial institutions (Barham et al., 2008, Field and Torero, 2006, Feder et al., 1988, Carter and Olinto, 2003). Our data indicate that only 2.84% of farmers used land as collateral to obtain credit from formal financial institutions. Bank and cooperatives cannot increase credit supply for land collateral given that land market and land transfer laws are still in their infancy. This imperfection will increase collateral cost that will directly increase borrowing cost to farmers.

## **6. Conclusions**

We found that land transfer changes farmers' financial behavior. Transfer land-out results in deposit increase, lending of more fund to private sources, and reduction in agricultural investment. Transfer land-in causes farmers to borrow more from informal financial channel, especially from friends and relatives, increase agricultural investment, and purchase agricultural insurance.

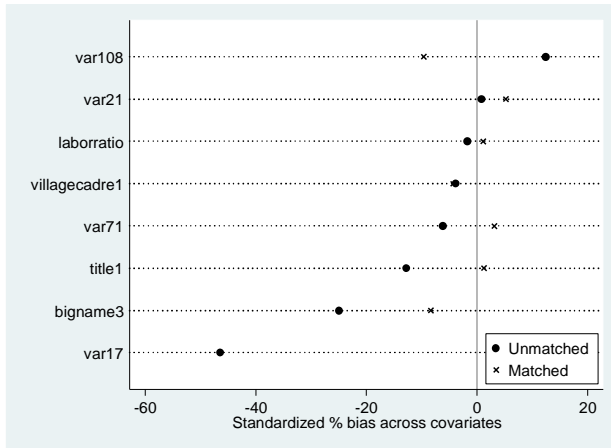
This study also implies serious credit restriction in rural China. With further development of land transfer market, fund demand is likely to increase substantially. Informal financial sources are less likely to satisfy this demand and at the same time formal financial institutions may not want to take risk and disburse additional fund for the purpose. In our survey, 69.2% farmers borrowed without contract and 16.4% farmers have been overdue on informal finance. This indicates an opportunity to develop effective microcredit institutions in rural China.

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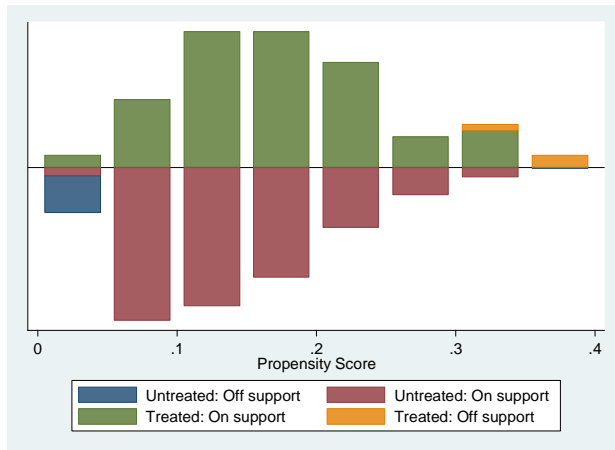
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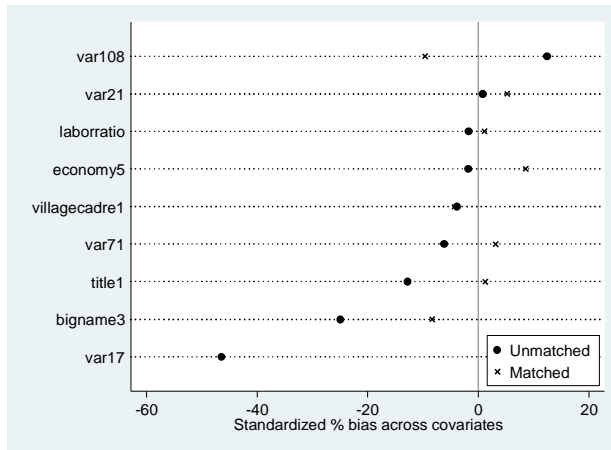
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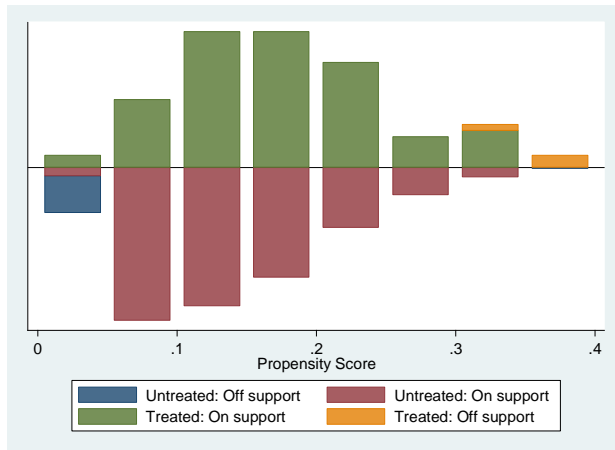
**Figure 1. Standardized percentage bias across covariate associated with land transfer-out**



**Figure 2. Propensity score for land transfer-out**



**Figure 3. Standardized percentage bias across covariate associated with land transfer-in**



**Figure 4. Propensity score for land transfer-in**

**Table 1. The stages of rural land reform in China**

Period	First stage		Second stage		Third stage
	1949-1953	1953-1956	1956-1958	1959-1978	1978-present
Land Ownership	Farmers' Land	Primary cooperative	Advanced cooperative	People's commune	Household contract management
Land right	Private by farmer	Owned by farmer	Owned by Cooperative	Owned by Commune production brigade and production team	Farmer based owned by Collective
Management right	farmer	Cooperative (small private plot can be managed by individual)	Cooperative	production team (small private plot can be managed by individual)	Farmer managing
Distribution pattern	Farmer receives the output of land	Distributing according to land share (private plot returns belong to individual)	Distributing according to work	Distributing according to work (private plot returns belong to individual)	Farmer receives the output of land
Land market	Ownership of land can be traded	Cannot trade land	Cannot trade land	Cannot trade land	Management right and contract right can be traded

Source: Guangdong Liu and Jiumiao Cheng, 2007. Theory and practice of change of rural land system of China since 1949 . *China Rural Survey*, 2, pp.70-80

**Table 2. Variable definition**

<b>VARIABLES</b>	<b>Definition</b>	<b>Mean</b>	<b>STD.</b>
<b>Dependent variables</b>			
Transfer-out	Household transfer land out	0.227	0.419
Transfer-in	Household transfer land out	0.122	0.327
Deposit	Household increase deposit this year	0.290	0.454
Loan	Household do not have loan from financial institutions	0.805	0.396
Loan willingness	Household hope to loan more	0.301	0.459
Borrow from private	Household do not borrow money from relatives and friends	0.630	0.483
Lend to private	Household do not lend money to relatives and friends	0.683	0.466
Agricultural investment	Household food crop and cash crop equipment and machine value	5759.286	20575.2
Insurance	Household buy agriculture insurance	0.216	0.411
<b>Demographic</b>			
Junior high school	The number of labor with junior high school level	2.257	1.291
High school	The number of labor with high school level	0.808	1.024
Labor ratio	working adults divided by total family members	0.725	0.254
Farming	The number of doing farming only in your household	1.049	1.052
<b>Social relationship</b>			
Big name	Last name of your household is big name in village	0.501	0.500
Relative	Household has few relatives and friends	0.056	0.231
Village cadre	There are village cadres in your family	0.126	0.332
<b>Economic situation</b>			
lands	The area of household lands	6.814	19.946
agriculture income	The ratio of household agricultural income and total income	36.589	33.127
Uncultivated land	The number of uncultivated land in your household	0.609	3.298
title	Household land have not been titled	0.267	0.442
<b>Location attribute</b>			
Economy	This county economic development level is very low on this province	0.062	0.241
transportation	Distance of this village and downtown	0.072	0.2583

**Table 3. The impact of transferring land-out on deposit, loan and willingness to borrow from financial institutions**

<b>VARIABLES</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>	<b>Model 5</b>
<b>Deposit of financial institutions</b>					
Land transfer vs. no land transfer out	0.145**	0.140**	0.148**	0.150**	0.128**
	(0.065)	(0.0593)	(0.0636)	(0.0602)	(0.0581)
Average value of no land transfer out	0.278***	0.280***	0.279***	0.279***	0.292***
	(0.019)	(0.0263)	(0.0193)	(0.0193)	(0.0285)
Average value of land transfer out	0.423***				
	(0.062)				
Observations	622	622	622	622	622
<b>Loan willingness from financial institutions</b>					
Land transfer vs. no land transfer out	0.00186	-0.0101	-0.00294	-0.0120	-0.0108
	(0.0587)	(0.0550)	(0.0596)	(0.0571)	(0.0549)
Average value of no land transfer out	0.354***	0.351***	0.355***	0.355***	0.352***
	(0.0206)	(0.0283)	(0.0207)	(0.0207)	(0.0300)
Observations	622	622	622	622	622
<b>Loan from financial institutions</b>					
Land transfer vs. no land transfer out	-0.0178	0.00272	0.00797	0.00968	-0.00208
	(0.0532)	(0.0521)	(0.0494)	(0.0454)	(0.0509)
Average value of no land transfer out	0.747***	0.747***	0.746***	0.746***	0.752***
	(0.0188)	(0.0249)	(0.0188)	(0.0188)	(0.0261)
Observations	622	622	622	622	622

Note: 1. Model 1 is average treatment effect in Regression-adjustment (RAATE), model 2 is average treatment effect in Regression-adjustment using treatment sample (RAATET), model 3 is average treatment effect in Augmented Inverse Probability Weighting estimator with Regression-adjustment (AIPWATE), model 4 is average treatment effect in Inverse probability weighting estimator with Regression-adjustment (IPWRAATE), model 5 is average treatment effect in Inverse probability weighting estimator with Regression-adjustment using treatment sample (IPWRAATET).

2. The POM for each treatment level is an average of each potential outcome:

3. Robust std. err. in the parentheses



**Table 4. The impact of transferring land-out on informal financial behaviors of farmers**

<b>VARIABLES</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>	<b>Model 5</b>
<b>Borrowing from private</b>					
Land transfer vs. no land transfer out	0.0560	0.0110	0.0299	0.0258	0.0113
	(0.0654)	(0.0586)	(0.0665)	(0.0653)	(0.0594)
Average value of no land transfer out	0.568***	0.614***	0.568***	0.568***	0.614***
	(0.0214)	(0.0279)	(0.0214)	(0.0214)	(0.0295)
Observations	622	622	622	622	622
<b>Lending to private</b>					
Land transfer vs. no land transfer out	-0.145**	-0.169***	-0.156***	-0.167***	-0.167***
	(0.0588)	(0.0575)	(0.0579)	(0.0558)	(0.0586)
Average value of no land transfer out	0.657***	0.692***	0.657***	0.657***	0.690***
	(0.0205)	(0.0259)	(0.0205)	(0.0205)	(0.0276)
Observations	622	622	622	622	622

Note: Model 1 is RAATE, 2 is RAATET, 3 is AIPWATE, 4 is IPWRAATE, 5 is IPWRAATET

**Table 5. The impact of transferring land on insurance**

<b>VARIABLES</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>	<b>Model 5</b>
<b>Transfer land out</b>					
Land transfer vs. no land transfer out	0.107*	0.0870*	0.105*	0.112*	0.0765
	(0.0604)	(0.0495)	(0.0627)	(0.0612)	(0.0543)
Average value of no land transfer out	0.198***	0.174***	0.198***	0.198***	0.185***
	(0.0172)	(0.0199)	(0.0172)	(0.0172)	(0.0281)
Observations	622	622	622	622	622
<b>Transfer land in</b>					
Land transfer vs. no land transfer in	0.102**	0.102**	0.0959**	0.0999**	0.0932*
	(0.0480)	(0.0484)	(0.0477)	(0.0475)	(0.0482)
Average value of no land transfer in	0.189***	0.205***	0.189***	0.189***	0.214***
	(0.0177)	(0.0227)	(0.0176)	(0.0176)	(0.0245)
Observations	616	622	616	616	616

Note: Model 1 is RAATE, 2 is RAATET, 3 is AIPWATE, 4 is IPWRAATE, 5 is IPWRAATET

**Table 6. The impact of transferring land on agricultural investment (PSM)**

<b>VARIABLES</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>
<b>Transfer out</b>				
Land transfer vs. no land transfer out	-0.316	-0.559**	-0.339**	-0.576***
	(0.208)	(0.238)	(0.172)	(0.201)
Observations	622	622	622	622
<b>Transfer in</b>				
Land transfer vs. no land transfer in	0.382*	0.434**	0.491**	0.511***
	(0.223)	(0.195)	(0.225)	(0.177)
Observations	616	616	616	616

Model1 is neighbor PSM (k=1) of average treatment effect, Model2 is neighbor PSM (k=1) of average treatment effect on treatment sample, Model3 is neighbor PSM (k=4) of average treatment effect, Model 4 is neighbor PSM (k=4) of average treatment effect on treatment sample

**Table 7. The impact of transferring land on agricultural investment (doubly robust)**

<b>VARIABLES</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>	<b>Model 5</b>
<b>Transfer out</b>					
Land transfer vs. no land transfer out	-0.424**	-0.981***	-0.424**	-0.439**	-0.954***
	(0.193)	(0.375)	(0.187)	(0.180)	(0.363)
Average value of no land transfer out	7.711***	8.050***	7.714***	7.713***	8.023***
	(0.0838)	(0.372)	(0.0833)	(0.0831)	(0.353)
Observations	622	622	622	622	622
<b>Transfer in</b>					
Land transfer vs. no land transfer in	0.710***	0.568***	0.686***	0.664***	0.555***
	(0.207)	(0.173)	(0.206)	(0.208)	(0.172)
Average value of no land transfer in	7.460***	7.484***	7.462***	7.462***	7.496***
	(0.0682)	(0.0754)	(0.0679)	(0.0679)	(0.0757)
Observations	616	616	616	616	616

Note: Model 1 is RAATE, 2 is RAATET, 3 is AIPWATE, 4 is IPWRAATE, 5 is IPWRAATET

**Table 8. Balancing tests for beneficiaries and matched controls**

Variables	Sample	Mean		%bias	%reduct  bias	t-Test	
		Treated	Control			t-Stat	p-Value
Bigname	Unmatched	.375	.49813	-24.9		-2.15	0.032
	Matched	.38824	.42941	-8.3		-0.54	0.588
Villagecadre	Unmatched	.13636	.14981	-3.8		-0.33	0.742
	Matched	.14118	.15647	-4.4		-0.28	0.781
Highschool	Unmatched	.97727	.83708	12.4		1.19	0.233
	Matched	.94118	1.0502	-9.6		-0.61	0.540
laborratio	Unmatched	.73211	.73596	-1.7		-0.15	0.880
	Matched	.73912	.73669	1.1		0.07	0.943
Uncultivated land	Unmatched	.52386	.51002	0.8		0.06	0.951
	Matched	.47176	.38122	5.2		0.40	0.688
agriculture income	Unmatched	28.352	42.215	-46.4		-3.74	0.000
	Matched	29.294	27.415	6.3		0.46	0.648
farmer	Unmatched	1.2273	1.2903	-6.2		-0.53	0.595
	Matched	1.2235	1.1918	3.1		0.20	0.838
title	Unmatched	.20455	.25843	-12.8		-1.08	0.281
	Matched	.21176	.20647	1.3		0.08	0.933

**Table 9. The impact of transfer land in on informal financial institution behavior of farmer**

<b>VARIABLES</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>	<b>Model 5</b>
		<b>deposit</b>			
Land transfer vs. no land transfer in	0.0395 (0.0475)	0.0358 (0.0511)	0.0497 (0.0473)	0.0537 (0.0470)	0.0478 (0.0515)
Average value of no land transfer in	0.290*** (0.0203)	0.298*** (0.0252)	0.287*** (0.0202)	0.287*** (0.0202)	0.286*** (0.0270)
Observations	616	616	616	616	616
		<b>Loan willingness</b>			
Land transfer vs. no land transfer in	0.0304 (0.0530)	0.0489 (0.0512)	0.0283 (0.0521)	0.0305 (0.0533)	0.0405 (0.0510)
Average value of no land transfer in	0.345*** (0.0213)	0.363*** (0.0268)	0.347*** (0.0214)	0.347*** (0.0214)	0.372*** (0.0288)
Observations	616	616	616	616	616
		<b>Loan</b>			
Land transfer vs. no land transfer in	-0.0687 (0.0523)	-0.0677 (0.0485)	-0.0674 (0.0503)	-0.0740 (0.0507)	-0.0680 (0.0477)
Average value of no land transfer in	0.761*** (0.0192)	0.752*** (0.0238)	0.762*** (0.0191)	0.762*** (0.0191)	0.752*** (0.0257)
Observations	616	616	616	616	616

Note: Model 1 is RAATE, 2 is RAATET, 3 is AIPWATE, 4 is IPWRAATE, 5 is IPWRAATET

**Table 10. The impact of transferring land in on borrowing from private**

<b>VARIABLES</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>	<b>Model 5</b>
<b>Borrowing from private</b>					
Land transfer vs. no land transfer in	-0.105*	-0.101*	-0.107*	-0.103*	-0.109**
	(0.0551)	(0.0534)	(0.0546)	(0.0537)	(0.0537)
Average value of no land transfer in	0.587***	0.592***	0.587***	0.588***	0.600***
	(0.0220)	(0.0263)	(0.0219)	(0.0219)	(0.0270)
Observations	616	616	616	616	616
<b>Lending to private</b>					
Land transfer vs. no land transfer in	0.0241	0.0402	0.0279	0.0318	0.0248
	(0.0486)	(0.0503)	(0.0478)	(0.0466)	(0.0511)
Average value of no land transfer in	0.624***	0.618***	0.625***	0.626***	0.633***
	(0.0217)	(0.0259)	(0.0217)	(0.0217)	(0.0272)
Observations	616	616	616	616	616

Note: Model 1 is RAATE, 2 is RAATET, 3 is AIPWATE, 4 is IPWRAATE, 5 is IPWRAATET

**Table 11. Resource of Informal Finance of Farmers in China**

VARIABLES	Friends and relatives	Other farmers of same village	Other persons	Village collectives	Mutual-loan club	Farmers Cooperation Fund	<u>agricultural leading enterprises</u>
Percentage	93.3%	19.2%	9%	1.5%	1%	0.6%	0.3%
Observations	1000	1000	1000	1000	1000	1000	1000



**Table 12. Balancing tests for beneficiaries and matched controls**

Variables	Sample	Mean		%bias	t-Test	
		Treated	Control		t-Stat	p-Value
Bigname	Unmatched	.375	.49813	-24.9	-2.15	0.032
	Matched	.38824	.42941	-8.3	-0.54	0.588
Villagecadre	Unmatched	.13636	.14981	-3.8	-0.33	0.742
	Matched	.14118	.15647	-4.4	-0.28	0.781
Highschool	Unmatched	.97727	.83708	12.4	1.19	0.233
	Matched	.94118	1.0502	-9.6	-0.61	0.540
laborratio	Unmatched	.73211	.73596	-1.7	-0.15	0.880
	Matched	.73912	.73669	1.1	0.07	0.943
Uncultived land	Unmatched	.52386	.51002	0.8	0.06	0.951
	Matched	.47176	.38122	5.2	0.40	0.688
agriculture income	Unmatched	28.352	42.215	-46.4	-3.74	0.000
	Matched	29.294	27.415	6.3	0.46	0.648
farmer	Unmatched	1.2273	1.2903	-6.2	-0.53	0.595
	Matched	1.2235	1.1918	3.1	0.20	0.838
title	Unmatched	.20455	.25843	-12.8	-1.08	0.281
	Matched	.21176	.20647	1.3	0.08	0.933
economy	Unmatched	.03409	.03745	-1.8	-0.15	0.877
	Matched	.03529	.01941	8.5	0.63	0.528