

The Impact of Farmland Transfers on Agricultural Investment in China: A Perspective of Transaction Cost Economics

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Abstract

There is growing concern that farmland transfers lead to less agricultural investment, which may adversely affect agricultural productivity growth in China. Prior research has primarily focused on the differences between owned cultivated land and rented plots, but little is known about how farmland transfers between relatives, which are popular in rural China, specifically affect agricultural investment. In this paper, we present a conceptual framework of transaction cost economics to compare different contracting strategies in China's farmland rental markets. As farmland rental markets in China are immature, land transfer between relatives establishes bilateral governance, which has the advantage of addressing the opportunistic activities of both parties and can ultimately increase investment by tenants. Based on data from two waves of household surveys, we empirically examine the impact of bilateral governance on the application of organic fertilizer, an indicator for agricultural investment. Our findings show that apart from economic factors, kinship is important to the functioning of farmland rental markets in rural areas.

Key words: agricultural investment, farmland rental market, governance structure, transaction cost economics

JEL codes: D23, Q12, Q15

I. Introduction

Farmland rental markets have grown rapidly in rural China since the 1990s. According

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to nationwide household surveys, the proportion of farm households that rented land increased from 6.9 percent in 2000 to 19.3 percent in 2008, at an annual growth rate of 13.7 percent (Huang et al., 2012). Recently, under several government incentive programs, such as official farmland transfer platforms and subsidies, farmland rental markets in rural areas have significantly developed, inducing more land transfers among farmers and stimulating the expansion of farm size in China. Increased farmland rental activity is playing an important role in transforming China's agricultural sector from a small-scale production system into a market-oriented modern agricultural sector.

However, there is growing concern that farmland transfers may adversely affect agricultural investment and consequently threaten long-term agricultural productivity growth in China. Several studies have shown that tenants may have less incentive to invest in rented plots (Yu et al., 2003; Cai et al., 2008; Gao et al., 2012). For example, Gao et al. (2012) showed that farmers tend to apply less organic fertilizer, measured as an indicator of agricultural investment, to rented plots than to their own cultivated land. The low investment in rented plots may impose a considerable challenge for China to maintain long-term growth of agricultural productivity, especially in the context of rapid expansion of farm size via rental markets.

Prior research examining the effects of farmland rental markets on agricultural investment in China has generally focused on the differences between owned cultivated land and rented plots (Cater and Yao, 2002; Gao et al., 2012). However, a unique feature of China's farmland rental markets often does not receive wide attention and may lead to different effects on agricultural investment. In rural China, farmland rental often occurs between relatives rather than strangers. For example, several studies have reported that approximately 50 percent of farmland transfers occurred between relatives (Zhong and Wang, 2003; Chen and Ni, 2006). Moreover, such farmland transfers are often applied without contracts or with informal oral contracts (Ding and Zhang, 2008; Guo, 2009). Unlike farmland rental between strangers, renting land from relatives provides tenants greater security as a result of their kinship and social linkage, and therefore may encourage tenants to invest more in rented plots.

In this paper, we examine the effects of farmland transfers between relatives on agricultural investments from the perspective of transaction cost economics (TCE). We seek to understand why farmland transfer between relatives is popular in rural China and examine its potential impact on agricultural investment. TCE is a good tool to analyze China's rural farmland rental markets as they experience rapid development and accrue high transaction costs in terms of searching for partners, negotiating rental contracts, and enforcing transactions. This study is the first to apply TCE to farmland rental markets in rural China, enabling a comprehensive understanding of farmland transactions.

Following previous studies, we consider the application of organic fertilizer as a measure for investment activity by farmers (Li et al., 1998; Jacoby et al., 2002; Gao et al., 2012; Gao et al., 2017). Using data from two waves of surveys in rural China, we empirically assess the impact of farmland transfers between relatives on organic fertilizer use. As farmland transfers between relatives can establish bilateral governance, which has the advantage of addressing opportunistic activities, tenants have greater incentive to increase investment in rented plots. Indeed, our results show that compared to farmland transfers between non-relatives, bilateral governance encourages the application of organic fertilizer by tenants, and consequently mitigates the possible adverse effects of farmland rental markets on agricultural investment.

The rest of the paper is organized as follows. Section II presents a conceptual framework to discuss farmland transfers in rural China. Section III discusses the data and empirical specifications. Section IV reports our results. Section V concludes with a discussion of policy implications.

II. Farmland Transfer and Investment in China: A Conceptual Framework

In this section we present a conceptual framework to demonstrate why farmland transfers between relatives are popular in rural China and examine the potential impact on agricultural investment. Based on TCE theory, we consider farmland rental activity as an incomplete contract between a landowner and tenant. Several features of farmland markets in rural China guide our discussion, including the bounded rationality and opportunism of farmers, the uncertainty of farmland transfers, the specificity of agricultural investment, and the interlinkages among factor markets in rural China.

1. Limited Rationality and Opportunism of Farmers

According to the cognitive assumption that TCE relies on, farmers are assumed as rationally limited. Indeed, limited rationality may well describe the majority of Chinese farmers who are not capable of predicting all possibilities regarding farmland transfer activities. For instance, farmers often cannot precisely predict changes in rental rates in the future, they do not know exactly when and why a village would reallocate their farmland and they may not have sufficient information about changes in agricultural taxes and subsidies. With limited knowledge and information on planning and executing a contract, comprehensive contracting between landowner and tenant may not be a realistic governance structure. Instead, farmers tend to pursue an adaptive contract and then form a special governance structure, such as relational contracting or kinship

contracting (in our case) to address unexpected developments in farmland transfers.

Moreover, the farmland rental market faces enormous opportunistic challenges in China. A landowner may conduct opportunistic behavior, such as increasing rental rates and discontinuing rental contracts. A tenant may also act opportunistically by altering farmland use, refusing to pay rent, and discontinuing rental contracts. Several studies have shown the types of opportunistic activities conducted by Chinese farmers. For example, Bao et al. (2009) reported that many farmers in Jiangsu Province altered their farmland rental contracts or even discontinued their contracts when agricultural taxes were abolished and an agricultural subsidy policy was announced in 2006. Using data from a household survey conducted in 2007, Zhao and Tang (2008) showed that some landowners in Sichuan Province overruled the tenants' decision on how to manage the land and arbitrarily terminated farmland rental contracts. These opportunistic activities occur quite often in China's farmland rental markets (Zhong and Wang, 2003).

The limited rationality of farmers, along with their concerns over opportunistic activities, drives farmers to be conservative when choosing partners. In a situation where the farmland rental market is less developed and the enforcement cost of rental contracts is high, farmland transfers between relatives can provide a relational contract to reduce transaction costs as a result of the kinship linkage between landowner and tenant.

2. Uncertainty in Farmland Transfers

The uncertainty in farmland transfers in rural China results from several sources. First, there is substantial uncertainty about the profitability of farming because of unexpected changes in crop prices or agricultural subsidies. Both the landowner and tenant face uncertainty over profitability, which influences their rental activities and contract choices. When farmers expect a rapid increase in grain prices, they tend to reduce the amount of farmland available for rent and are more likely to discontinue rental contracts (Zhao and Li, 2009).

Second, farmers face uncertainty about their non-farm employment opportunities. In China, farmland provides self-employment for farmers. When landowners face the risk of losing their non-farm work, they can return to their farmland and withdraw it from the rental market. Some farmers who work in non-farming sectors still farm part-time because of the potential uncertainty of non-farm employment (Wang and Zhong, 2008). Huang et al. (2010) found that during the 2008 financial crisis many farmers lost their non-farm work in southeast areas and returned to farming, resulting in contract disputes over farmland transfers. On the other hand, if tenants have better non-farm employment opportunities they seek

employment elsewhere, consequently reducing the demand for farmland.

Third, changes to China's farmland policy are subject to uncertainty and farmers cannot fully predict such changes. In the past decade, Chinese governments have launched several farmland policy reforms. These policies were often administered by local authorities with uncertainty. Consequently, farmers cannot form a stable expectation of future policy, which increases the transaction costs of farmland transfers in rural China (Li, 2009).

Facing an uncertain future, both landowners and tenants in China have incentives to pursue a flexible contract in order to reduce the uncertainty regarding farmland transfers and form an adaptive governance structure to handle unexpected developments. Farmland transfer between relatives, also known as kinship contracting, involves personal trust relations and can be sufficiently adaptive to address uncertainty at less cost than a pure faceless market transaction.

3. Specificity of Agricultural Investment

The issue of asset specificity arises in most agricultural investments. Agricultural investments, such as land quality enhancement, irrigation and infrastructure, are often fixed in the land and cannot be redeployed without sacrificing productive value. If farmland rental contracts are interrupted or terminated, tenants lose the return of such investments. In our case, the application of organic fertilizer, which can improve land quality for four to five years, is considered a specific investment by farmers (Jacoby et al., 2002). In conjunction with limited rationality and the opportunism of the landowner, the tenant may not be able to capture the whole benefit of such investment if the rental contract is terminated prematurely.

Prior studies have argued that a well-developed land market may mitigate the adverse effect of asset specificity on agricultural investment (Besley, 1995). Through a comprehensive contract whereby the value of specific investment is described, the tenant can be compensated for any investment; therefore, a classic contract can remedy the issue of asset specificity. However, in the case of organic fertilizer, a classic contract may not work well, as the value of applying organic fertilizer is difficult to verify in practice. As such, it is impossible for the landowner and tenant to specify a detailed contract before making a farmland transfer transaction.

Faced with the prospective breakdown of classic contracting in such circumstances, farmers tend to choose alternative governance structures. Farmland transfers between relatives permit a long and stable relationship between the landowner and tenant. Because of the kinship between them, both parties have an incentive to sustain their relationship and to avoid sacrificing the value of specific investment. Thus, under

kinship (relational) contracting, the tenant has more incentive to invest in rented land than under classic contracting.

4. Setup Costs of Kinship Contracting

Specialized governance structures often involve greater costs than unspecialized ones. When the setup costs of kinship contracting in farmland transfers are high, the transaction will not be justified. In our case, contracting between relatives is sustained for two reasons. First, kinship between the landowner and tenant is predetermined and exogenous to farmland rental activity. Thus, neither party are required to invest additional costs to form this specialized governance structure.

Second, the costs of kinship contracting can easily be recovered through the interlinkages of other transactions. In rural China, farmland rental markets may interlink with other markets, such as credit and labor markets (Braverman and Stiglitz, 1982). Besides farmland transfers, relatives often support each other financially via informal credit markets (Zhu et al., 2003). They may also exchange family labor during the peak season of agricultural production. Therefore, supplemented by the interlinkages of multiple transactions, relational contracting is commonly observed in farmland transfers in rural China.

5. Comparison of Different Governance Structures

There are three main types of contracting or governance structures in China's farmland rental markets:

(1) Market Governance

Classic contracting is defined as market governance where the market price serves as the main governance mode. Under market governance, the personal identity of both landowner and tenant is not important and the rental rate of farmland provides all of the information of the transaction. The farmland rental contract is enforced and protected mainly by legal rules.

(2) Trilateral Governance

Relies on a third party (or arbitration) rather than court-ordered litigation to resolve disputes and evaluate the performance of farmland transfers. Trilateral governance aims to sustain such transactions between a landowner and tenant, while market governance has no effect on sustaining the relationship because such a relationship is not independently valued. Farmers in China sometimes apply trilateral governance into farmland transfers as it has the advantages of evaluating specific investments and sustaining rental contracts.

(3) Bilateral Governance

Farmland transfer between relatives is a typical bilateral governance structure where the autonomy of the landowner and tenant is maintained. As a result of kinship, both parties have an incentive to sustain the transaction and avoid sacrificing the valued specific investment made by the tenant.

Table 1 presents a comparison of transaction costs in farmland transfers under different governance structures in rural China. We distinguish ex ante and ex post transaction costs in farmland transfers. Considering the specific investment in rented farmland, market governance often involves relatively high costs of searching for partners, bargaining over a contract, renegotiating an agreement, and enforcing a contract. An advantage of market governance is the negligible setup cost, as legal services are provided free to the public.

Compared to market governance, trilateral governance often has a medium level of transaction costs associated with negotiating, renegotiating ex post, and enforcement of the contract because of the assistance of a third party. However, the landowner and tenant need to pay setup costs in order to form this governance structure.

Unlike market and trilateral governance, bilateral governance (i.e. the farmland transfer between relatives) has relatively low ex ante and ex post transaction costs. The costs of drafting, negotiating and safeguarding a farmland rental contract are low because of the kinship relation. Because of the autonomy of the landowner and tenant, the setup cost is negligible. In addition, with personal trust and interlinkages of other transactions, bilateral governance can attenuate the opportunism of both parties. Therefore, among the three types of governance structures, bilateral governance is the most effective for reducing transaction costs in farmland transfers and can largely encourage specific investment in rented land.

Table 1. Comparison of Transaction Costs in Farmland Transfers under Different Governance Structures

	Governance structure	Transaction costs				
		Ex ante		Ex post		
		Search for partners	Bargaining	Re-bargaining	Setup costs	Contract enforcement
Non-kinship	Market governance	High	High	High	None	High
	Trilateral governance	High	Medium	Medium	Low	Medium
Kinship	Bilateral governance	Low	Low	Low	None	Low

Source: Authors' own construction.

III. Data and Empirical Specification

1. Data

The data used in the study were obtained from two waves of household surveys. The first-round survey was conducted in November 2000. A stratified random sampling method was used. To obtain a nationally representative sample, six provinces, including Hebei, Liaoning, Shanxi, Zhejiang, Sichuan and Hubei, were selected. We then randomly selected five counties in each province, two townships in each county and one village within each township. Finally, 20 households were selected for each sampled village. In total, 1200 farm households were interviewed.

The sample households were revisited in April 2009. However, because of massive labor migration in rural China, a few of the sample households were unavailable when the second survey was carried out. We interviewed those households via telephone, but had difficulty tracking all of the sample households. In addition, an earthquake damaged two of the sample villages in Sichuan Province in 2008 and thus the participants were not available for the survey. Therefore, the second-round survey only included 1046 households.

The surveys gathered detailed information on grain output and input on each plot, including organic fertilizer, chemical fertilizer, seeds, machinery and labor. Information on land tenure of each plot was collected. The survey also contained information on the characteristics of each plot, including size, land quality, terrain and irrigation condition, as well as household socioeconomic information.

The final sample used in this study is comprised of 316 households that rented plots in 2000 and 2009. Table 2 presents the number of tenants and rented plots in the sample. In 2000, 67.1 percent of the rented plots were transferred from relatives. The proportion of plots rented from relatives decreased slightly in 2008, but still accounted for about 60 percent of the total rented plots. This demonstrates the popularity of kinship farmland transfers in rural China.

Table 2. Number of Tenants and Plots in the Sample

	Number of tenants	Rented plots			Share of plots from relatives (%)
		Total	From non-relatives	From relatives	
2000	149	243	80	163	67.1
2008	167	301	119	182	60.5
Total	316	544	199	345	63.4

Source: Calculations based on survey data.

Table 3 shows the differences in organic fertilizer use under different governance structures. On average, the tenants applied 2.7 tons per hectare more organic fertilizer in plots rented from relatives than from non-relatives. Although the overall application of organic fertilizer in rented plots decreased from 2000 to 2008, the difference between these two governance structures remains.

Table 3. Average Organic Fertilizer Use under Different Governance Structures (ton/hectare)

Year	Kinship contracting	Non-kinship contracting	Difference
	(1)	(2)	(1) – (2)
2000	6.8	4.9	1.9
2008	5.3	2.3	3
Total	6.0	3.3	2.7

Source: Calculations based on survey data.

2. Empirical Specification

The econometric model used to estimate the effect of a bilateral governance structure in farmland transfers on organic fertilizer use is as follows:

$$Y_{ij} = \alpha + \beta_1 R_i + \beta_2 C_i + \beta_3 L_i + \beta_4 X_j + \beta_5 D + \varepsilon_{ij}, \quad (1)$$

where Y_{ij} stands for the application of organic fertilizer in plot i by household j . We use two variables to measure the use of organic fertilizer. One is a binary variable (Y_1 : 1 denotes the application of organic fertilizer, 0 otherwise), and the other is a measurement of the actual quantity of organic fertilizer used (Y_2 : ton per hectare).

The variable, R_i , is a dummy variable, measuring the governance structure of farmland transfer (1 denotes bilateral governance, 0 otherwise). C_i is a set of variables that describe the characteristics of the farmland rental contract of plot i , including fixed duration, contract type and years of the contract. L_i represents the characteristics of the plot, such as the size of the plot, land quality, irrigation and distance. X_j includes controls for household characteristics, such as the age, education and farming experience of the household head; average age of family laborers; number of family laborers; number of agricultural laborers; and household assets. A set of county dummy variables, D , are also included. Table 4 summarizes all of the variables used in the study. We also estimate Equation (1) using an interaction of R_i with year when we pool 2000 and 2008 data together. The primary coefficient of interest is β_1 , which captures the effect of the bilateral governance on organic fertilizer use.

Table 4. Summary Statistics of Variables

Variable	Definition and explanation	Mean	Standard deviation
Y_1	Whether or not organic fertilizer is applied (1 = yes; 0 = no)	0.35	0.48
Y_2	Quantity of organic fertilizer used (ton/hectare)	5.03	10.38
Governance	1 = kinship contracting; 0 = non-kinship contracting	0.63	0.48
Fixed duration	1 = fixed; 0 = not fixed	0.1	0.3
Contract type	1 = written contract; 0 = oral contract	0.06	0.24
Years of the contract	Years of the plot cultivated under the contract (unit: years)	4.38	4.39
Year dummy	1 = 2008; 0 = 2000	0.55	0.5
Plot size	Unit: hectare	0.16	0.34
Land quality-medium	1 = medium; 0 = other	0.56	0.5
Land quality-high	1 = high; 0 = other	0.28	0.45
Irrigation	1 = yes; 0 = no	0.66	0.47
Distance	Unit: kilometers	0.71	0.78
Age of household head	Unit: years	49.5	10.5
Education of household head	Unit: years	6.34	3.26
Farming experience of household head	1 = yes; 0 = no	0.94	0.24
Average age of family	Unit: years	36.55	11.6
Number of family laborers	Unit: person	3.11	1.46
Number of agricultural laborers	Unit: person	2.09	0.65
Household assets	Unit: yuan	71,420.1	192,757

Source: Calculations based on survey data.

Note: The sample size is 544.

The regression for the binary measurement of organic fertilizer use is estimated using a linear probability model. The regression using the measurement of the actual quantity of organic fertilizer used is estimated with a Tobit model. The Tobit model accounts for zero values of organic fertilizer use, assuming that the unobservable was drawn from a normal distribution. We consider robust standard errors in all regressions.

One concern about our specification is that rented plots are possibly selected by the tenant, which generates a potential endogeneity issue associated with governance structure. Unfortunately, our data do not contain a sufficient number of tenants who rented plots from both relatives and non-relatives and we are unable to account for unobserved household level confounders. However, as the tenant often has a small number of relatives located in the same village, the selection of rented plots is largely restricted by the limited supply of kinship plots and is less likely to be determined by the tenant herself. Moreover, we compare the household characteristics of both kinship and non-kinship contracting to check whether significant differences exist between these two groups. We find that the two groups are similar (see Appendix). Thus, we believe that the endogeneity problem is not severe.

IV. Results

Table 5 reports the estimates for predicting the likelihood of tenants applying organic fertilizer in rented plots. As previously discussed, farmland transfers between relatives create a bilateral governance structure on the transaction of farmland and can generally reduce transaction costs. Consequently, it provides tenants an incentive to invest more in rented plots. Our results confirm this prediction, indicating that bilateral governance significantly increases the propensity of applying organic fertilizer to rented plots. On average, the effect sizes represent a 15–20 percent increase in the probability of using organic fertilizer (Table 5, row 1).

Our results show that the farmland rental contract also has an important impact on tenants' specific investment in rented plots (Table 5, row 2–4). The fixed duration of a farmland rental contract provides tenants stable expectations and can also enhance the probability of applying organic fertilizer. In addition, the time that the tenant has cultivated the rented plot can influence the specific investment made. A tenant is more likely to apply organic fertilizer in a rented plot when she has cultivated the plot for a long period.

Table 6 presents our Tobit model estimates. In general, our results further confirm the key prediction that bilateral governance of farmland transfers in rural China can increase the specific investment made by tenants. Specifically, the tenants in our sample apply 1.3–1.85 tons per hectare more organic fertilizer on plots rented from relatives than from non-relatives (Table 6, row 1).

Moreover, we find that contracts of a fixed duration can dramatically increase the application of organic fertilizer to rented plots by 2.26–2.94 tons per hectare on average, indicating that stable expectation on farmland plays an important role in specific investment in agricultural production (Table 6, row 2).

Table 5. Effects of Bilateral Governance on the Likelihood of Applying Organic Fertilizer to Rented Plots

Variable	Probit model ($Y_1 = 0/1$)		
	2000 (1)	2008 (2)	Total (3)
Governance	0.20** (0.09)	0.17** (0.08)	0.15* (0.08)
Fixed duration	0.25 (0.17)	0.40** (0.16)	0.26** (0.10)
Contract type	-0.06 (0.23)	-0.23 (0.22)	-0.03 (0.12)
Years of the contract	0.00 (0.00)	0.01* (0.10)	0.01** (0.00)
Governance X Year			0.05 (0.11)
Year			-0.11 (0.08)
Plot size	-0.85*** (0.31)	-0.22** (0.1)	-0.22** (0.11)
Land quality-medium	0.09 (0.11)	0.07 (0.11)	0.11 (0.07)
Land quality-high	0.17 (0.11)	0.07 (0.13)	0.14* (0.08)
Irrigation	-0.42*** (0.11)	-0.02 (0.10)	-0.18** (0.07)
Distance	-0.24*** (0.09)	0.08 (0.05)	0.00 (0.03)
Age of household head	0.00 (0.01)	-0.03*** (0.01)	-0.01** (0.00)
Education of household head	0.01 (0.01)	-0.04*** (0.01)	-0.02** (0.01)
Farming experience of household head	-0.29 (0.19)	0.42** (0.17)	0.12 (0.11)
Average age of the family	0.02** (0.01)	0.02*** (0.01)	0.01*** (0.00)
Number of family laborers	-0.09** (0.04)	-0.03 (0.04)	-0.01 (0.02)
Number of agricultural laborers	0.08 (0.06)	0.18** (0.08)	0.06 (0.04)
Household assets	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Pseudo R^2	0.37	0.31	0.23
Wald χ^2/F	97.61	94.62	126.51
Prob > χ^2/F	0	0	0
Observations	243	301	544

Source: Calculations based on survey data.

Notes: Marginal effects of variables are reported in all probit models. Standard errors are corrected for heteroskedasticity in all regressions. A set of county dummies are included, but not reported. ***, **, * represent statistical significance at 1, 5 and 10 percent levels, respectively.

Table 6. Effects of Bilateral Governance on the Quantity of Organic Fertilizer Use in Rented Plots

Variable	Tobit model (Y_2 , ton/hectare)		
	2000	2008	Total
	(1)	(2)	(3)
Governance	1.30*	1.64***	1.85**
	(0.71)	(0.57)	(1.86)
Fixed duration	2.26*	2.40**	2.94***
	(1.16)	(1.01)	(1.01)
Contract type	-1.76	-1.51	-0.99
	(1.29)	(2.38)	(1.19)
Years of the contract	0.02	0.03	0.04
	(0.03)	(0.03)	(0.03)
Governance X Year			0.56
			(1.08)
Year			-1.22*
			(0.72)
Plot size	-8.47***	-1.80**	-4.40**
	(2.64)	(0.89)	(1.72)
Land quality-medium	0.72	-0.94	0.31
	(0.83)	(0.73)	(0.73)
Land quality-high	1.38	0.04	1.28
	(0.87)	(0.89)	(0.81)
Irrigation	-2.53***	0.02	-1.62**
	(0.78)	(0.73)	(0.69)
Distance	-2.01***	0.22	-0.11
	(0.72)	(0.25)	(0.29)
Age of household head	0.04	-0.20***	-0.12***
	(0.06)	(0.05)	(0.05)
Education of household head	0.12	-0.21**	-0.17*
	(0.12)	(0.09)	(0.09)
Farming experience of household head	-1.94	2.12*	1.26
	(1.45)	(1.12)	(1.11)
Average age of family	0.11*	0.12***	0.11***
	(0.06)	(0.04)	(0.04)
Number of family laborers	-0.80**	0.06	0.00
	(0.36)	(0.31)	(0.25)
Number of agricultural laborers	0.74	1.57***	0.78
	(0.52)	(0.61)	(0.49)
Household assets	-0.00*	0.00	0.00
	(0.00)	(0.00)	(0.00)
Pseudo R^2	0.16	0.1	0.08
Wald χ^2/F	157.81	122.65	180.77
Prob > χ^2/F	0	0	0
Observations	243	301	544

Source: Calculations based on survey data.

Notes: Marginal effects of variables are reported in all Tobit models. Standard errors are corrected for heteroskedasticity in all regressions. A set of county dummies are included, but not reported. ***, **, * represent statistical significance at 1, 5 and 10 percent levels, respectively.

Apart from governance structure of farmland transfer and rental contracts, several other factors affect tenant application of organic fertilizer to rented plots. For example, the size and irrigation condition of the plot, age and education of the household head, and the value of household assets are negatively associated with the application of organic fertilizer. The average age of family members and the number of agricultural laborers in the household may increase tenants use of organic fertilizer.

It is worth highlighting that our estimates show that both a bilateral governance structure and the fixed duration of farmland rental contracts play critical roles in encouraging tenants to make a specific investment in rented plots. This finding implies that legal rules alone cannot fully solve the incentive issue associated with specific investment in farmland transfers, as in rural China these kinds of contracts are often incomplete. Given the same formal terms of contract, the personal identity of both the landowner and tenant may contain valuable information for farmland transfers. The kinship relation between the landowner and tenant can supplement the legal rules and establish adaptive bilateral governance for farmland transfers, which can reduce the transaction costs and ultimately encourage specific agricultural investment by tenants.

V. Conclusion and Policy Implications

There is growing concern that farmland transfers in rural China may adversely affect agricultural investment and productivity growth. However, a unique feature of China's farmland transfers does not receive wide attention. In China, a significant proportion of farmland transfers occur between relatives, which creates adaptive bilateral governance of farmland transfers. While the effects of rental markets on agricultural investment have been examined in several studies, little is known about how the bilateral governance structure affects specific investment in rented plots in China. Using the application of organic fertilizer as an indicator, our results show that bilateral governance of farmland transactions can generate an incentive for tenants to increase specific agricultural investment.

Our findings improve the understanding of farmland rental markets in rural China. Although farmland rental markets have emerged since the 1990s and play a critical role in the modernization of China's agricultural sector, the landowner and tenant still face high transaction costs, which undermines the operation of rental markets. In such circumstances, farmland transfers between relatives establish bilateral governance that has the advantage of addressing the opportunistic activities of the two parties and ultimately increase the specific investment made by tenants. Our results imply that apart from economic factors, kinship in rural areas is of importance to the functioning of

farmland rental markets.

It is worth noting that while the kinship relation is important, we cannot neglect the significance of legal rules in farmland transfers. Our results do not necessarily mean that market governance in farmland transfers is inferior. Instead, they indicate that bilateral governance via kinship contracting may have some advantages in diminishing transaction costs in situations where legal regulation is absent or law enforcement is weak. However, bilateral governance relies on limited kinship relations and cannot work well as rental markets grow beyond the family linkage. As farmland rental markets expand, the transaction costs of relational contracting will increase dramatically. The improvement of the legal environment and deepening specialization in markets will reduce farmers' demands for the special relationship between partners in farmland transfers. In such a situation, other contract arrangements, such as contract farming and integration, may be better ways to deal with transaction costs. Therefore, for large-scale farmland transfer, legal rules are essential. To promote the development of rural farmland rental markets, Chinese governments should further improve rural farmland transfer platforms, reduce the uncertainty of transactions, and enhance the arbitration system so that disputes over rural farmland transfers can be effectively resolved.

Finally, our results should be interpreted in light of additional caveats. While our strategy controls for household heterogeneity, we cannot rule out with certainty the influence of other household unobservable factors on organic fertilizer use, mainly because of data limitations. Therefore, the findings in present study are preliminary only.

References

- Bao, Z. S., Z. M. Xu, S. Gao and C. F. Zhou, 2009, "Regional disparities and influencing factors of rural land transfer: Evidence from Jiangsu province," *Zhongguo Nongcun Jingji (Chinese Rural Economy)*, No. 4, pp. 23–30.
- Besley, T., 1995, "Property rights and investment incentives: Theory and evidence from Ghana," *Journal of Political Economy*, Vol. 103, No. 5, pp. 903–37.
- Braverman, A. and J. Stiglitz, 1982, "Sharecropping and the interlinking of agrarian markets," *American Economic Review*, Vol. 72, No. 4, pp. 695–715.
- Cai, F., D. W. Wang and Y. Du, 2008, *Rural Reform and Change in China: Analysis of 30 Years' History and Lessons*, Shanghai: Truth & Wisdom Press, Shanghai People's Publishing House (in Chinese).
- Carter, M. and Y. Yao, 2002, "Local versus global separability in agricultural household

- models: The factor price equalization effect of land transfer rights,” *American Journal of Agricultural Economics*, Vol. 84, pp. 702–15.
- Chen, H. W. and B. Nie, 2006, “Analysis of farmers’ land leasing behavior: Evidence from farmers’ survey in Fujian and Heilongjiang provinces,” *Zhongguo Nongcun Jingji (Chinese Rural Economy)*, No. 2, pp. 82–91.
- Ding, G. P. and A. L. Zhang, 2008, “Investigation and analysis of land tenancy under the policy of benefiting peasants in central-south area in Hubei province,” *Journal of China University of Geosciences (Social Sciences Edition)*, No. 2, pp. 55–59.
- Gao, L. L., D. Q. Sun and J. K. Huang, 2017, “Impact of land tenure policy on agricultural investments in China: Evidence from a panel data study,” *China Economic Review*, Vol. 9, No. 45, pp. 244–52.
- Gao, L. L., J. K. Huang and S. Rozelle, 2012, “Rental markets for cultivated land and agricultural investments in China,” *Agricultural Economics*, Vol. 43, No. 4, pp. 391–403.
- Guo, J., 2009, “The operation and creation of the farm land transfer contract institution,” *Zhongguo Nongye Daxue Xuebao (China Agricultural University Journal of Social Sciences Edition)*, No. 4, pp. 37–44.
- Huang, J. K., H. Y. Zhi, Z. R. Huang, S. Rozelle and J. Giles, 2010, “The impact of the global financial crisis on off-farm employment and earnings in rural China,” *World Development*, Vol. 39, No. 5, pp. 797–807.
- Huang, J. K., L. L. Gao and S. Rozelle, 2012, “The effect of off-farm employment on household’s decisions to rent out and rent in cultivated land in China,” *China Agricultural Economic Review*, Vol. 4, No. 1, pp. 5–17.
- Jacoby, G., G. Li and S. Rozelle, 2002, “Hazards of expropriation: Tenure insecurity and investment in rural China,” *American Economic Review*, Vol. 95, No. 2, pp. 1420–47.
- Li, G., S. Rozelle and L. Brandt, 1998, “Tenure, land rights, and farmer investment incentives in China,” *Agricultural Economics*, Vol. 19, pp. 63–71.
- Li, K. Y., 2009, “The effects of the nature of the farmland used for a special purpose and the uncertainty of transactions in it on the transaction costs of farmland transfer,” *Guanli Shijie (Management World)*, No. 3, pp. 92–8.
- Wang, X. W. and F. N. Zhong, 2008, “Land fragmentation and land transfer market,” *Zhongguo Nongcun GuanCha (China Rural Survey)*, No. 4, pp. 29–34.
- Yu, H., J. K. Huang, S. Rozelle, L. Brandt and L. X. Zhang, 2003, “Use rights security, land transfer and resource degradation,” *Jingji Yanjiu (Economic Research Journal)*, No. 9, pp. 82–91.
- Zhao, Q. Z. and Z. Tang, 2008, “Analysis of the status of agricultural land transfer and the choice of farmers’ land transfer contracts,” *Zhongguo Nongcun GuanCha (China Rural Survey)*, No. 3, pp. 13–19.

- Zhao, X. Q. and H. J. Li, 2009, "Research on the factors influencing farmers' willingness of transferring out land in Western China," *Zhongguo Nongcun Jingji (Chinese Rural Economy)*, No. 8, pp. 70–78.
- Zhong, Z. B. and P. Wang, 2003, "Analysis of farmer household's behavior in the transfer of the rural land: Evidence from Hubei and Zhejiang," *Zhongguo Nongcun Guancha (China Rural Survey)*, No. 6, pp. 55–64.
- Zhu, S. Y. and Z. X. Zhang, 2003, "China's rural financial market supply and demand: Evidence from traditional agricultural areas," *Guanli Shijie (Management World)*, No. 3, pp. 88–95.

Appendix

Table. Household Characteristics of Different Groups

	Kinship contracting	Non-kinship contracting	Difference
Age of household head	49.2	50.1	-0.9
Education of household head	6.2	6.5	-0.3
Farming experience of household head	0.9	0.9	0.0
Average age of family	36.8	36	0.8
Number of family laborers	3	3.3	-0.3*
Number of agricultural laborers	2.1	2.1	0.0
Household assets	69773.2	74275.2	-4502

Source: Calculations based on the sample.

Note: * represents statistical significance at 10 percent.

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