Tenure security, social relations and contract choice: Endogenous matching in the Chinese land rental market

X. Ma[1]; Y. Zhou[1]; N. Heerink[2]; X. Shi[1]; H. Liu[3]

1: Nanjing Agricultural University, , China, 2: Wageningen University, , Netherlands, 3: Shenyang Agricultural University, , China

Corresponding author email: zhouyuepeng@njau.edu.cn

Abstract:

In the developing countries rental transactions between partners with close social relations that use informal contracts are still widespread and this may reduce the potential of the land rental market to enhance productivity and equity. Based on household data collected in Jiangxi and Liaoning provinces in China in 2015, this paper examines the relationship between land tenure security, social relations and land rental contract choices, using a nested logit framework. The empirical results show that landlords are more likely to rent out land to tenants who live in the same village, rather than to relatives or strangers, and that insecure land tenure encourages landlords to select informal contracts. Our findings suggest that these decisions (of partner-type and contract-type) are made simultaneously, and that they are made on the basis of a landlord's perceived security of his land rights and the priority he gives to establishing a flexible rental relationship. Key Words: land rental market; contract choice; tenure security, social relations

Acknowledegment: Financial support for our research is provided by the National Natural Science Foundation of China (71773054; 71373127; 71503174) and by the Programme Strategic Scientific Alliances of the Royal Netherlands Academy of Arts and Sciences (KNAW) and the Ministry of Science and Technologies of P.R. China (SURE+ project, 2016YFE0103100).

JEL Codes: D91, Q18

Tenure security, social relations and contract choice: Endogenous matching in the Chinese land rental market

Abstract

In the developing countries rental transactions between partners with close social relations that use informal contracts are still widespread and this may reduce the potential of the land rental market to enhance productivity and equity. Based on household data collected in Jiangxi and Liaoning provinces in China in 2015, this paper examines the relationship between land tenure security, social relations and land rental contract choices, using a nested logit framework. The empirical results show that landlords are more likely to rent out land to tenants who live in the same village, rather than to relatives or strangers, and that insecure land tenure encourages landlords to select informal contracts. Our findings suggest that these decisions (of partner-type and contract-type) are made simultaneously, and that they are made on the basis of a landlord's perceived security of his land rights and the priority he gives to establishing a flexible rental relationship.

Key Words: land rental market; contract choice; tenure security, social relations

1 Introduction

Agricultural economists have been discussing contract choice in agricultural land tenancy since the nineteenth century. This discussion, which has covered both developed and developing countries, has often focused around the choice between crop sharing and cash leases. In China crop sharing contracts do not exist and fixed rent contracts dominate. Moreover a significant part of most land rental transactions are conducted between neighbours or close circles of relatives so that social sanctions can be applied to ensure that the land is returned at the end of the rental period (Jin and Deininger 2009; Prosterman *et al.* 2009; Rozelle *et al.* 2010; Wang *et al.* 2015). Another significant characteristic of land rental contracts in China is that informal (verbal) contracts are widely used (Feng 2008; Jin and Deininger 2009; Wang *et al.* 2015). These two characteristics of land rental contracts can be also found in other developing countries, such as Guatemala, Dominican Republic and Ethiopia (Ghebru and Holden, 2015; Macours et al. 2010; Gavian and Ehui 1999). Although these two features of land rental contracts can reduce transaction costs when a high level of

trust exists (Holden and Ghebru 2005), they do contribute to market segmentation and unstable contracts and this generates two significant limitations.

Our research of the literature reveals little material on the factors that influence the choice of informal or formal contracts in either developed or developing countries, although the Chinese literature does contain a few studies concerning the choice between informal and formal contracts (Hong and Gong 2015; Luo *et al.* 2015; Qian *et al.* 2015). However, these studies do not take into account endogenous matching between landlords and tenants, which may bring out a potential estimation bias. There are two studies, from the Dominican Republic (Macours and Swinnen 2002) and Guatemala (Macours et al 2010), that examine the determinants of the choice of contracting partners. They claim that landowners lacking a formal title to their land tend to only rent to tenants from the same ethnic group due to higher levels of trust. However, different countries have different legal systems and in many developing countries, including China, the lack of an individual land titles does not necessarily imply that land tenure is insecure. In such instances household perceptions about land tenure security (i.e. the perceived tenure security) forms the basis upon which the landowner takes land-related decisions (Ma *et al.* 2015; Van Gelder, 2009). Examining the effects of both actual (land certification) and perceived tenure security on contract choice can give a clearer picture of the role that land tenure plays in shaping contract types in developing countries.

This paper analyzes the relationship between land tenure security, social relations and land rental contracts in Chinese agricultural land tenancy, using household data collected in Jiangxi and Liaoning Provinces in 2015. We focus on both the choice between a formal and an informal contract and of the contracting partner. Different type of contracts involve different enforcement mechanisms, and imply different enforcement costs and different degrees of flexibility if one of the partners wants to change the terms of a contract. Social relations, an important informal institution, often play a key role in agricultural land tenancy contracting, especially when formal institutions' capacity to resolve property rights is (perceived to be) lacking. In this study we differentiate between relatives, people living in the same village who know each other, and strangers, as embodying different social distances. In order to reduce estimation bias resulting from endogenous matching between landlords and tenants, we follow Macours's (2014) methodology and use a nested logit framework for empirical analysis, and a mixed logit model to check for robustness.

The paper contributes to the literature on the relationship between formal and informal governance mechanisms (institutions) and land rental contracts in three ways. First, by taking into account endogenous matching in the Chinese land rental market, it examines the effects of tenure security and social relations on two important features of land rental contracts, the choice between informal and formal contacts and the choice over contracting partners. Second it examines the effects of both the actual and the perceived tenure security on household decisions regarding choice of contract. Thirdly it identifies that household decisions regarding choice of contract is made by balancing tenure security and flexibility of contract relationship. Our research aims to provide new insights into the choices currently made about contract types for agricultural land tenancy in China (and by extension other developing countries, such as Guatemala, Dominican Republic and Ethiopia), where formal institutions do not function well and land rental markets are segmented.

The paper is structured as follows. Section 2 presents a conceptual framework and the empirical specifications that we use to analyze how tenure security and social relations affect joint choices about informal/formal contracts and contracting partners. Section 3 summarizes the data collection methods and presents the definitions and descriptive statistics of the variables used in the analysis. Section 4 reports on, and discusses the estimation results. Our concluding remarks are presented in section 5.

2 Conceptual framework and model specification

2.1 Conceptual framework

In the field of contract choice, a substantial amount of research follows the principal-agent framework to test the impacts of optimal risk sharing, optimal incentives, binding financial constraints, low transaction costs and screening/sorting on contract choice (Allen and Lueck 1993; Bierlen *et al.* 1999; Ackerberg and Botticini 2002; Allen and Lueck 2004; Huffman and Just 2004; Fukunaga and Huffman 2010). In terms of the endogenous matching of contract choice, which is the interest of this study, Ackerberg and Botticini's (2002) model of the endogenous matching of contract choice, using a standard moral hazard model in which a principal and agent contract each over a task is generally applied. This model can be used to identify the observed and unobserved characteristics of the principal / task and agent and

thereby explain the contract choice. During field observations in the Dominican Republic, Macours et al. (2010) established a principal-agent model in which the potential landlord makes an offer to the tenant, and the tenant accepts or rejects the offer. Since there is a possibility of the tenant squatting (*i.e.* illegal remaining on the land after the expiry date of the land contract) a potential landlord has to choose a tenant in whom he has confidence so as to minimize the chance of future disutility. Macours (2014) subsequently extended this model to analyze the determinants of both partner and contract choice in Guatemala. Once a potential landlord decides to rent out his land, he has to decide who he wants as a tenant and between a fixed rent contract and an interlinked land-labour contract. The probability of the same tenant squatting the landlord's land varies between two types of rental contracts, and under the same rental contract, the probability of different tenants squatting the land will also vary. Therefore, a landlord has to make a joint decision about the tenant and contract type. In this section we sketch the conceptual (principal-agent) framework that illustrates why partner and contract choices are jointly made and the factors that affect these choices in China.

Following Macours (2010, 2014), we model a landlord's joint decision for tenant type and formal/informal contract. However, our framework differs from Macours' (2014) framework in three aspects. First, Macours does not explicitly discuss the flexibility of rental relationships which is a major feature of relational governance that allow both landlords and tenants to adapt the content of rental contracts in response to unforeseeable events. This adaptation is based on a commitment to joint action and information-sharing which can benefit both parties (Jones *et al.* 1997; Poppo and Zenger 2002). In our framework, potential landlords choose a certain type of partner and contracts based on balancing the risk of losing the land and the flexibility of the rental relationship. Second, with an informal contract a tenant who seeks to squat the land will only be subject to moral sanctions, whereas under a formal contract he could also be subject to legal punishment. Third, apart from that of a tenant squatting, landlords can also lose their land without adequate compensation due to village-level reallocations or governmental expropriations in China (see Ma et al., 2015, 2016). We will discuss these scenarios later.

As discussed in Section 2.3, land rental transactions in rural China mostly occur between households and land plays an important role as a substitute for the weak social security systems in rural areas (Ma *et al.* 2015). Given the context of insecurity of land tenure and unstable off-farm employment, landlords will not participate in the land rental market,

especially, will not rent out land to non-family members and sign formal contracts unless they can get a satisfactory agreement. Therefore, landlords always have more bargaining power in land rental agreements and we assume that potential landlords first make an offer of land rental contract (formal or informal) to a tenant, who either accepts or rejects it. When choosing a partner, landlords have to balance different factors: on the one hand, since there is the possibility of losing land due to insecure land rights, a landlord is more likely to rent out land to partners with whom he or she has close social relations (because the contract enforcement mechanisms under this form of matching are based on informal rules). On the other hand, if a landlord faces the possibility of ending or changing the rental relationship (for example as result of returning from migrant work in the city) he is more likely to choose a partner with whom he has close social relation as the rental relationship will be easier to change or terminate. As regards to contract choice, formal contracts have more complete contents (*i.e.* the contract duration, amount of rent, how and when the rent is to be paid, a clear definition of rights and duties) than informal contracts and the rules specified by formal contracts can be legally enforced. However, it is hard to estimate which type of contract provides better protection for the landlord's land tenure, and this usually depends on whether formal or informal enforcement mechanisms are dominant. Formal contracts are less flexible than informal contracts, and it is harder for either landlords or tenants to change the contents of the former.

In our framework, the landlord first makes his contract offer k (k=1 indicating formal contract, k=0 indicating informal contract) on plot i at t=0. The tenant j decides whether or not to squat plot i when the contract period is due at time t=1, with the decision variable s_{ijk} being either 0 (ending land rent contract and returning the plot to the landlord) or 1 (breaking the contract and squatting the plot). The tenant's decision is determined by the trade-off between the value of the future benefits of the plot if he successfully squats the land and the value of reputational loss or moral punishment (in the case of an informal contract), or both moral and legal punishment (in the case of a formal contract). The value of future benefits of the plot depends on the physical characteristics of the plot and the tenant's agricultural production skills. The value of reputation loss depends on whether the landlord and tenant have close social relations: the closer the social relation is, the larger the value of reputational loss will be.[1] The legal

[1] Households with blood ties or within the same natural village usually involve a small group of familiar people, and all the households in the group know each other quite well. A household will be moral punished by the other households if he illegitimately deprives other households in the small group of benefits that are rightfully theirs.

punishment only applies under formal contracts and will depend on the extent to which formal enforcement mechanisms exist in the village. The better the legal enforcement mechanism is, the larger the legal punishment. All the benefits and costs occurred in the future are discounted to the present value. The probability of successfully squatting depends on the (perceived) land rights security that the landlord has over the plot, since landlords who perceive that they have more secure land rights are more likely to expend more efforts in reclaiming their land.

The tenant will decide to squat if the expected utility E(U) is positive:

$$\mathrm{E}(U \mid S_{ijk} = 1) = \sigma_t(X_i^s) * \mathrm{V}(\mathrm{X}_i^q) - R(\Delta_{ij}) - (1 - \sigma_t(X_i^s)) * L(X_k) > 0 \qquad (1)$$

where $\sigma_t(X_i^s)$ denotes the probability of success of squatting on plot *i*, which is a function of the plot characteristics (X_i^s) that determine the tenure security of that plot; the value of the plot, $\mathrm{V}(\mathrm{X}_i^q)$, is a function of physical characteristics of the plot (X_i^q); the cost of the reputational loss (moral punishment), $R(\Delta_{ij})$, is a function of the social relations between tenant *j* and the landlord of plot *i* (Δ_{ij}); and the legal punishment, $L(X_k)$, is a function of legal enforcement mechanism for contract *k* (X_k).

Let δ be the discount factor, and ε_{ijk} denote the tenant *j*'s unobserved aversion to squatting on plot *i* given contract *k*. The outcome of the tenant's decision process will be

$$S_{ijk}^* = S_{ijk}^*(X_i^s, X_i^q, \Delta_{ij}, X_k, \delta, \varepsilon_{ijk}) \qquad (2)$$

The landlord chooses a certain tenant and contract based on the trade-off between the profits he gets from renting out the land versus all the anticipated costs involved in the land transfer. The profits mainly consist of land rent paid by the tenant. The expected costs include the potential loss of future profit of the land if the tenant successfully squats it, or expropriation by the village or the government if land reallocation and governmental expropriation (without adequate compensation) occurs in the village, the transaction costs involved in finding a

tenant with desired characteristics and signing a contract, and the expected cost of ending or enforcing the rental contract or changing the content of the rental contract if for any reason he wants to reclaim the land for his own use. The landlord's utility from renting plot *i* to a tenant *j* under contract *k* is

$$U_{ijk} = (\pi_{ijk} - \overline{U}_{ijk} - S_{ijk} - C_{ijk} - \mathrm{A}_{ijk}) - \left[\mathrm{Prob}(S^*_{ijk} = 1) * \sigma_t(X_i^s) + \sigma_V(X_i^s) \right] * V(X_i^q) + \nu_{ijk} \qquad (3)$$

Subject to:

$$\pi_{ijk} = V(X_i^q, X_j^p) \qquad (4)$$

$$\overline{U}_{ijk} = V(X_i^p) \qquad (5)$$

$$T_{ijk} = C(X_k^n) \qquad (6)$$

$$C_{ijk} = C(X_k) \qquad (7)$$

$$\mathrm{A}_{ijk} = A(\Delta_{ij}, X_j^p, \mathrm{X}_k) \qquad (8)$$

where π_{ijk} is the profit from plot *i* with tenant *j* under contract *k*, which is affected by the characteristics of plot *i* (X_i^q) and the characteristics of the tenant *j* (X_j^p); The reservation utility of the tenant *j* willing to rent the plot *i* under contract *k* ($\overline{U}_{ijk}$) is determined by X_j^p [2]; search costs (T_{ijk}) are determined by the number of tenants with the characteristics of *j*, who are interested in renting in land under contract *k* in the region of plot *i* (X_k^n); the costs of signing a contract (C_{ijk}) are a function of the contract-type (X_k) with formal contracts normally having a higher cost because they have more detailed contents. The costs of altering the contract relationship (A_{ijk}) is a function of the social relationship (Δ_{ij}), the characteristics of potential tenants (X_j^p) and the contract type (X_k). $\mathrm{Prob}(S^*_{ijk} = 1) * \sigma_t(X_i^s)$ measures the risk of land loss due to the tenant squatting , and $\sigma_V(X_i^s)$ indicates the risk of land loss due to

[2] The reservation utility can be considered to be the tenant's opportunity costs in renting in the plot, namely, the benefits from renting (an) other plot(s) or engaging in off-farm employment.

expropriation by the village or government. Both risks are related to the tenure security of plot i.e. v_{ijk} is the unobserved part of the landlord's utility.

The landlord will choose tenant *j* under contract *k* in order to maximize his expected utility:

$$EU_{ijk} = \max_{jk} U_{ijk} \qquad (9)$$

Based on Equation (9) the landlord's decision process in our conceptual framework is similar to that proposed by Macours (2014), but some aspects are unique to our case. Contract choice (informal or formal) and partner choice (transactions with partners with whom the landlord has different social relations) involve different enforcement mechanisms, and thus imply different degrees of punishment and flexibility. Tenure insecurity has three sources which are the tenant squatting, village-level land reallocations and governmental expropriations without appropriate compensation. We can draw three propositions from this conceptual framework.

a. A landlord's choice of partner and contract are made simultaneously, if we estimated the determinants of partner choice and informal/formal contract choice separately this would give a biased estimation.

b. The choice of contract type and partner involve making a trade-off between the flexibility of the rental relationship and the security of land rights (in the case of high tenure insecurity and unstable off-farm employment). Greater flexibility will reduce the cost of altering the contract relationship in the future, which needs to be traded off against the perceived risk of losing land benefits in the future.

c. Both the nature of the social relationship and the land tenure security affect joint decisions about the partner and the type of contract through reducing the risk of losing the land and increasing the flexibility of the rental relationship.

2.2 Specification of the empirical model

Ackerberg and Botticini (2002) propose using regional instruments for endogenous partner choice in order to reduce estimation bias brought about by joint decisions of partner and

contract choices. Macours (2014), however, suggests using a nested logit approach to model the key features of the joint decisions that landlords make. There are two main advantages of using the nested logit approach, compared to the instrumental variable (IV) approach used by Ackerberg and Botticini (2002). First, in the nested logit framework, the characteristics of several potential tenants (*e.g.* the number of potential tenants, the average age of the household head and the education level of potential tenants) can be modelled as alternative-specific variables that affect the joint partner and contract choice, while the IV approach only accounts for overall differences in all landlords and tenants in the sample by using a regional dummy as a proxy. In practice, it is very difficult to find appropriate instruments to evaluate each of several potential tenants. Second, the nested logit approach allows the analysis to derive conclusions on the differences in the importance of partner choice for different type of contracts. In light of these advantages, we use a nested logit approach to model the joint decisions of partner and contract choices.

Because informal and formal contracts have different degrees of flexibility and enforcement mechanisms, we hypothesize that partner choice will be less important for formal contracts, since these are mostly enforced by legal, rather than informal, rules. To test this hypothesis, a nested logit is estimated by allowing partner choice to have a different effect on the two types of contracts. The nested logit model covers two levels: the first level equation models the determinants of a landlord's contract choice, while the second level equation models the determinants of partner choice, given the choice of a certain contract type.

Let the landlord's utility from renting plot *i* under contract *k* to tenant-type *j* be

$$U_{ijk} = W_{ik}\beta_k + Y_{ijk}\gamma + e_{ijk} \quad \text{for } j \text{ in } B_{ik} \qquad (10)$$

where B_{ik} is the set of possible types of tenant with whom the landlord with plot *i* can match, given contract *k*. *k* indicates the contract type, either an informal contract (a) or a formal contract (b), W_{ik} affects the choice of contract *k*, and does not correlated to the tenant-type *j*; Y_{ijk} correlates to both contract *k* and tenant-type *j*; e_{ijk} is assumed to follow a generalized extreme value (GEV) distribution, which allows the e_{ijk} within each subset to be correlated,

but not correlated between subsets. $\tau_k = \sqrt{1 - Corr(\varepsilon_{kj}, \varepsilon_{kl})}$ is the coefficient of dissimilarity. β_k and γ are estimated parameters. The probability of choosing tenant-type *j* in subset B_{ik} can be written as

$$P_{ij} = P_{B_{ik}} \cdot P_{ij|B_{ik}} = \frac{\exp(\mathrm{W_{ik}}\,\beta_{\mathrm{k}} + \tau_{\mathrm{k}}\,\mathrm{I_{ik}})}{\sum_{k\in(a,b)} \exp(\mathrm{W_{ik}}\,\beta_{\mathrm{k}} + \tau_{\mathrm{k}}\,\mathrm{I_{ik}})} \cdot \frac{\exp(Y_{ijk}\gamma / \tau_{\mathrm{k}})}{\sum_{j\in B_{ik}} \exp(Y_{ijk}\gamma / \tau_{\mathrm{k}})} \qquad (11)$$

where $I_{ik} = \ln \sum_{j\in B_{ik}} \exp(Y_{ijk}\gamma / \tau_{\mathrm{k}})$

In Equation (11), W_{ik} is determined by the landlord or plot specific characteristics affecting the contract choice; and Y_{ijk} is determined by a vector of characteristics of the partnership created by matching the landlord of plot *i* with tenant-type *j* and contract *k*.

3 Data Set

3.1 Data collection

This study uses data from two household surveys, one from Jiangxi Province, located in the Poyang Lake plain in central-south China, and Liaoning Province in the Songnen Plain, north east China. Both provinces are important bases for commercial grain production in China. Table 1 shows some social-economic indicators for these two provinces and the average values for rural China as a whole. It shows that these two provinces had similar household incomes and households earn a similar proportion of their income through agriculture (in 2014), but that land endowments per capita in Liaoning were more than double than in Jiangxi. Rice and maize are the two most widely cultivated crops in Liaoning province; while rice is the most widely cultivated crop in Jiangxi province. Household income per capita in the two provinces is slightly higher than the average for rural China, and agricultural income plays a more important role in households' overall income as these provinces are important commercial grain production bases.

[Table 1]

A multistage sampling procedure was used to select households. First, four counties (two in each province) were selected through consulting with local researchers and policy makers. They were Fengcheng County, Yichun City and Suichuan County, Jian City, in Jiangxi Province, and Sujiatun District (County), Shenyang City and Donggang County, Dandong City, in Liaoning Province. These counties are good representatives of each region in terms of topography, distance from the provinces' capital cities and economic development. Fengcheng County and Sujiatun District are mainly on the plains, close to the capital city and have a higher level of economic development. The other two counties are in more hilly areas, further away from the capital city with a lower level of economic development. We then selected seven towns in each county of Jiangxi province, and four towns in each county of Liaoning province. These towns were chosen as being representative of the diverse rural conditions found in each county (e.g. topographic features, distance to county centre, agricultural development and rural labour force). We then randomly selected a number of villages in each town. The number of villages chosen in each town was based on the number of villages and their size (in terms of land and population). The primary rule is that more villages were selected from towns with more villages and / or more land and population. In most towns between 2 and 4 villages were surveyed, with a maximum of 6 and a minimum of 1. Next a number of households was selected randomly from each village, with the number of households interviewed varying according the size of each village (in terms of both population and the land area). Households were grouped into three categories: renting in households, those self-sufficient in land and renting out households. Rural household surveys with a random selection process often under-enumerate renting out households because they are more likely to migrate elsewhere(permanently or temporarily) and cannot be found at home at the survey time. In order to reduce this bias, we first interviewed village leaders to get a general idea of the share of each group of households in the village, and then used this estimate to adjust the number of households from each group that were interviewed. Through the sampling strategy we tried to make the share of the three groups of households (renting-out, self-sufficient and renting-in) was consistent with the population in the villages. The farm household survey in Jiangxi province was held in January 2015. It covered 817 households, living in 44 villages. The survey in Liaoning province was held in May 2015, and covered 811 households, living in 23 villages.[3] We excluded seven sample households that did not

[3] In addition to the household survey, surveys of village leaders and agricultural cooperatives and enterprises were conducted in the two research areas at the same time.

belong to the sample villages in Jiangxi province, and therefore use a sample of 1621 households for this study (810 households in 38 villages in Jiangxi province and 811 households in 23 villages in Liaoning province).

3.2 Descriptive statistics

Table 2 summarizes the characteristics of the development of the land rental market in the two case study areas, which can best be described as partially developed. The probability of renting out land and renting in land are comparable in two regions, with approximately 30 per cent of households renting in land and 30 per cent of households renting out. However, the land area leased per household is larger in Liaoning (5.43 mu[4] for renting out and 31.85 mu for renting in) than in Jiangxi (3.74 mu for renting out and 15.01 mu for renting in) (see Table 2). Other surveys conducted in three other counties in Jiangxi province (Yanshan County, Yujiang County, Guixi County) in 2011 (2010 data) found 37 per cent of households were renting in land, with an average rented-in land area of 10.0 mu. Thus the probability of participating in the land rental market has not changed significantly, but the area that is rented has increased significantly from 2010 to 2014.

[Table 2]

Table 3 shows the characteristics of landlords in our sample who selected formal and informal contracts: 15.75 per cent of the rental contracts in the two regions were formal contracts. Informal contracts were much more common in Jiangxi with 91.54 per cent of the rental contracts being verbal or informal written ones, compared to 76.47 per cent of rental contracts in Liaoning. Overall only 3 per cent of landlords who used formal contracts rented land to relatives, 36 per cent of them rented land to villagers, and the remainder (61%) were with strangers. With informal contracts an almost opposite pattern appeared only 10 per cent of these contracts were with strangers, and 90 per cent of them were with relatives or villagers. In general, landlords preferred informal contracts when renting out land to partners with whom they have closer social relations. We also found that landlords who used formal contracts had a higher possession of land certificates, and a slightly higher perception of the risk of losing land in the future. This finding suggests that possession of a land certificate does

[4] Fifteen mu equals one hectare.

not necessarily strengthen perceptions about land tenure security (Ma et al., 2015). We found that the age and education of the household head, the contracted land area, available family labour and assets did not significantly influence the choice between formal or informal contracts. However, political status and geography did play a role: landlords whose head of household is a village leader or party member preferred informal contracts and landlords located closer to the centre of town were more likely to use formal contracts. Lastly, we found that the land area rented through formal contracts was generally less than through informal contracts. The finding is not consistent with our expectation that the transformation of land rental contracts from informal to formal ones will induce the transfer of larger areas of land. One possible reason is that landlords are more likely use formal contracts when they rent out land to strangers and also chose to rent them less land.

[Table 3]

Table 4 presents the characteristics of potential tenants that are used in the matching analysis. Based on our field survey, landlords chose their partners from within the boundaries of township and potential landlords usually search for partners from the village where they live. If they fail to find matching partners in their own village they will then look for partners from the surrounding villages, but they seldom look for partners from outside of the township.[5] These potential tenants include households who already rent in land or are willing to rent in land from the certain range of landlord types and contract options. Since we only randomly interviewed a portion of households from each village, we could not identify potential tenants with specific characteristics (renting land from different landlords and selecting different contracts). We therefore calculated the ratio of potential tenants to all households that were interviewed in each town. As Table 4 shows, the highest percentage (20.09 per cent) of potential tenants would prefer to rent in land from other villagers and to use informal contracts, and about 12 per cent of potential tenants would prefer to rent in land from other villagers and to use formal contracts, or to rent in land from relatives using an informal contract. Only 2 per cent of potential tenants would prefer to rent in land from strangers, whatever the contract type.

[5] We found a few agricultural enterprises (strangers) from outside the township or county to invest in agricultural production, but these cases samples were excluded in this study (as explained in Section 4.1).

We also calculated the average value of household characteristics (e.g. age and education of household head, available family labour, agricultural assets) for potential tenants who would be willing to rent from different types of landlord. We did not find any significant differences in the age, the education of household head or and available family labour between different group of potential tenants, although we did find that tenants who would potentially rent land from other villagers had more agricultural assets (11500 yuan) than those would rent land from relatives and strangers (around 7000 yuan). This suggests that those who would rent land from other villagers operate larger scale agricultural production than those who would rent land from relatives and strangers. On the one hand, this finding is consistent with our expectation that rental activity between kinship members generally does not involve transferring land to households with a higher production capacity. On the other hand, it shows that tenants who would potentially rent from strangers are not large agricultural production entities and that large scale farming households are more likely to rent land from villagers rather than strangers.

[Table 4]

3.3 Variable definitions and expected effect

(1) Contract choice and partner choice

Contract choice is measured by a dummy variable which is equal to 1 if a landlord selects a formal contract, and 0 otherwise. Two dummy variables are used to measure partner matching between landlords and tenants. Renting to villagers equals 1 when a landlord rents land to villagers living in the same village and 0 otherwise; Renting to strangers takes the value of 1 when a landlord rents land to strangers and 0 otherwise. These two dummy variables also measure social relations between landlord and tenant, which interact with the land tenure security variables, to test the hypothesis that renting to closer social relations is less likely when land tenure is secure. In our nested logit model, at the first decision level, we test the landlord's choice between a formal or informal contract; while at the bottom level the decision between tenant type under specific contract is decided.

(2) Land tenure security

Following Van Gelder (2010) and Ma et al. (2015), we differentiate between actual land tenure security and perceived security. Actual tenure security is represented by possession of

a land certificate, which takes the value 1 when a household possessed an official land certificate at the time of the survey, and 0 otherwise. Perceived tenure security is measured by household perceptions on the risk of losing contracted land, which takes the value 1 when a household does not expect that he/she will lose contracted land in the future, and 0 if the household either expects land loss in the future or is unsure.

The actual tenure security variable is predetermined, because possession of a land certificate is determined before a household makes land rental decisions. However, some unobserved characteristics and past actions of households and villages may influence whether an individual household holds a land certificate and may also affect land rental decisions made by the household at the time of the survey. Following Macours (2014) and Ma et al. (2017), we used the two-step instrumental variables approach to address potential endogeneity. In the first step, we regressed the individual possession of a land certificate against individual characteristics, land endowments as well as instruments (the average value of individual status of possession of a land certificate in the village, based on other sampled households who live in the same village as the surveyed household). In the second stage, the resulting predicted values of the individual status of possession of a land certificate was introduced into the main equations seeking to explain the determinants of joint and contract choice. Given that the rules of issuing land certificates are largely determined by village governance procedures and informal norms, the individual possession of a land certificate is closely correlated with other households in the same village possessing a land certificate. However, it seems reasonable to assume that other households' possession of a land certificate does not affect the landlord's matching along social relations and contract choice other than through the correlation with the landlord's possession of a land certificate.

There is also a potential endogeneity problem with perceived tenure security, which arises from the potential causal relationship between the perception of tenure security and participation in the land rental market, as well as other, omitted and unobservable, characteristics that may affect both contract choice and tenure perception (Brasselle *et al.* 2002; Mullan *et al.* 2011; Ma *et al.* 2016; Ma *et al.* 2017). We used a similar method to address this potential problem as we did for the possession of a land certificate. We used the average value of perceived tenure security in the village based on the other sampled households that live in the same village as the surveyed household as an instrument to obtain the predicted values of individual perception on tenure security, which were then introduced

into the main equations. Given that the unobservable factors that affect perceived tenure security are mainly the village-level rules (informal and formal) associated with enforcement of land tenure reform and the dissemination of information (Ma et al., 2015), individual tenure security perception is closely correlated with the tenure security perceptions of other households in the same village. However, other households' tenure security perceptions do not affect matching along social relations and contract choice other than through correlation with the tenure security perceptions.

(3) The characteristics of landlords and the land

Landlord's characteristics include the age and education level of the household head, whether or not he is a village leader or party member and the household's wealth. The education level of the household head is measured by a categorical variable. Being a village leader or party member is a dummy which takes the value of 1 when a household head is a party member or village leader, and 0 otherwise. Household wealth is the value of all agricultural devices, livestock, electronic instruments, furniture and vehicles and is used as an indicator of the economic and social power of a household within the village.

Land characteristics are measured by the contracted land area allocated by village committee in the second round Land Contracting Program. The effect of contracted land area on contract choice is ambiguous. The more contracted land a landlord has, the more land he may rent out. The type of contract he will select will depend on which contract is safer and more flexible. The area and quality of the land that is leased by a landlord are also important attributes in determining its value. However, we excluded them from our models. Land area that is leased is expected to be endogenous with contract choice because the two decisions are determined simultaneously. Our survey did not cover information about land quality and we did not include them in the model. 'Distance to town' measures the distance between the household's residence and the closest town.

(4) The characteristics of potential tenants

Potential tenant's characteristics include the ratio of potential tenants, their average age and the education level of the household head, the average available family labour and their agricultural assets. The ratio of potential tenants is defined as the proportion of potential tenants selecting each type of contract and partner out of all the households interviewed in a

town (see detail discussion in Section 4.1).This variable measures the relative scarcity of the different types of potential tenants in each town.

(5) Regional characteristics

Since we introduced village and town dummies to address the endogenous problem of tenure security variables and calculated the characteristics of potential tenants in each town, we also included county dummy variables in the models. Three dummy variables, that equal one for households living in *Suichuan, Sujiatun* and *Donggang* counties, respectively, are included to control for major unobserved differences between the four counties in factors which may affect contract choice.

4 Estimation results

The nested logit models were estimated using full-information maximum-likelihood estimations. The hypotheses that the coefficients of the inclusive values are both equal to one were rejected for all specifications, supporting our choice for a nested logit as opposed to a more restrictive model. We were surprised to find that the dissimilarity parameters, which measure the degree of correlation of random shocks within each of the two types of contracts, were significantly greater than one. This is inconsistent with the random utility maximization (RUM) principal. One possible reason is that we did not specify suitable variables at the bottom-level that vary between the three types of tenant types, but not between households. We will later estimate a mixed logit model to test whether the findings obtained from the nested logit model are robust. Table 5 reports the regression results for the effect of holding a land certificate and social relations on joint decisions about partner and contract choice, while Table 6 shows the effect of perceived tenure security and social relations on these joint decisions and we report on these two models. Possession of a land certificate is assumed to be exogenous, and its original value is included in model 1; while in model 2 possession of a land certificate is considered to be an endogenous variable and its predicted value is used (see our detail discussion about instrument identification in Section 4.3). Due to the insignificance of the interaction between land tenure variables and social relation dummies in most models, Tables 7 and 8 report the regression results for possession of a land certificate and perceived tenure security, respectively, excluding the interaction terms.

[Table 5]

[Table 6]

[Table 7]

[Table 8]

With regards to the determinants of partner choice, we found that the two interaction terms of land tenure security variables and social relation dummies are not significant (Tables 5 and 6), particularly when controlling for the endogeneity of land tenure variables. This finding does not support evidence that landlords with lower tenure security are more likely to choose tenants with whom they have closer social relations, which is not consistent with Macours et al.'s (2014) finding in Guatemala. The possible reason is that security of land tenure is not the main criterion for landlords to match tenants: the flexibility of the rental relationships may play a more important role in partner matching (as we argued in the conceptual framework). The results reported in Tables 7 and 8 show that, keeping other variables constant, landlords in our research areas are more likely to rent out land to people from the same village as them. It further indicates that landlords may match tenants according to their social relations not only to protect their security of land rights, but also for flexibility in the rental relationship. A flexible rental relationship play a more important role, as landlords may face lower costs for ending or changing rental relationships if they rent land to other villagers as opposed to relatives or strangers. The literature about company contracts shows that formal contracts serve only as reference points to a trading relationship; while flexibility provisions provide an informal framework that enables mutual adaptations to unfolding contingencies, without the associated hazards of underinvestment or maladaptation (Banerjee and Duflo 2000; Schwartz and Watson 2001; Susarla 2011). The ratio of potential tenants is significant in all models, suggesting that search costs are important and that landlords are more likely to match with a more common tenant-type with more household members. We also found that landlords are more likely to match potential tenants who are older and have less family labourers. These potential tenants have less power to enforce land rental contracts and are also less likely to be mount a larger scale agricultural production. Landlords may have less risk of losing their land if they match with tenants with these characteristics and land rental relationships with these tenants are easier to end or change.

As for the determinants of contract choice, we found that possession of a land certificate significantly increases the probability of selecting a formal contract, but this positive effect

becomes not significant when controlled for by the potential endogeneity of possessing a land certificate. We also found that perceived tenure security has a positive effect on the probability of formal contracts. This, again, confirms that perceived tenure security plays a more important role than an actual land certificate in China (Ma *et al.* 2015; Ma *et al.* 2017). The positive effect suggests that informal contracts associated with relational governance may substitute formal contracts in regions with lower land tenure security. We also found that landlords with a higher education level are inclined to select informal contracts, which runs against our expectations.[6] One possible reason is that better educated landlords are more likely to take off-farm employment, and informal contracts allow them to change or end contract relationships if they need to return to their village. The landlords with more contracted land from the second round contracting period are more likely to select formal contracts for land rentals since these landlords, on average, rent out more land and prefer formal contracts as a means of preventing tenants making changes to the contract relationship. As expected, landlords in more remote areas are more likely to select informal contracts as informal rules play a more important role in these areas.

As a robustness check, we estimated a group of mixed logit models (an alternative-specific conditional logit model) which allows for two types of independent variables: alternative-specific variables, which vary across both cases and alternatives, and case-specific variables, which only vary across cases. The variables which vary across alternatives but not across cases are not necessarily specified in the mixed logit model.[7] We again found that the ratio of potential tenants was significant in all models, and suggest that search costs are important determinants of contract type and partner matching. We also found that land tenure security, measured by a low level of perceived risk of land loss, encourages landlords to select formal contracts and to match with people from the same village. This again confirms that the effect of search costs leads landlords to match with partners whom they have certain social relations (medium-level social relations in our case) by signing formal contracts. This kind of matching may provide a good balance between tenure security and a flexible contract. These findings are consistent with the data presented in Tables 5-8.

[6] Educated households can be expected to have a better knowledge of laws and agreements and thus are expected to prefer formal contracts for land rentals.

[7] Because limitation of length (no more than 8500 words), the results obtained from using mixed logit models are not reported, but can be requested to authors.

5 Conclusions

Using data collected from two household surveys in Fengcheng County and Suichuan County (Jiangxi Province) and in Sujiatun County and Donggang County (Liaoning Province) in China we found that landlords are more likely to rent out land to tenants who live in the same village, rather than relatives or strangers. This kind of partner matching may be based on consideration of both the risk of land loss and the flexibility of rental relationships. In the first place since landlords who rent out land to tenants with whom they have closer social relations will have less risk of losing land, while the latter suggests that landlords select tenants with whom they have certain social relations so that the rental relationships will be less costly to end or change if they lose off-farm employment in urban area. return to village and need to reclaim their land. Search costs are an important factor that drives landlords to match with a more common tenant-type as the search for such tenants generally involves fewer search costs.

With respect to contract choice, we found that insecure land tenure encourages landlords to select informal contracts, because these contracts may function as substitutes for formal contracts in regions with lower land tenure security. Besides tenure security, landlords also make contract decisions based on the flexibility that the contract will afford them. Better educated landlords are more likely to opt for a flexible (informal) contract, because they are more likely to take off-farm employment. We also found that landlords living in relatively remote areas are more likely to select informal contracts, due to the social norms that prevail in such regions.

The focus of our research has been on two economically less-developed areas with low degrees of urbanization where mandatory land rentals promoted by governments are not widespread. It would be interesting to explore the extent to which our paper's main findings hold true in other settings in rural China, particularly in more economically developed regions (i.e. Yangtze River Delta and Pearl River Delta regions) where land transactions between households and village committees or between households and agricultural enterprises are more common. Although we discussed two important functions of land rental contracts in rural China, (i.e. security of land rights and flexibility of rental relationship) the observed effect of land contracts is the combined effect of these two functions. Future empirical research could separate out these two functions and compare them, using appropriate variables to indicate the different characteristics of contracts.

Taking these limitations into account, the results of our study raise a number of potentially important implications for policy making. One such implication is that land rental market segmentation and the informality of contracts in terms of endogenous matching of social relations limit productivity and equity in rural China. Recent policy reforms have focused on improving land tenure security and reducing peasant's reliance on it as a social security mechanism. The recent land tenure policy reforms (particularly the New Round of Rural Land Ownership Registration Certification Work initiated by the central government in 2013), are expected to help strongly develop land rental markets, but could be further strengthened by additional measures to convince rural households that formal rules (*i.e.* land certificates, land laws) are a more robust way of protect existing land rights than informal village rules. More specifically the rural legislative system could be adapted to reduce the potential costs to farm households incurred in protecting their land rights through legal means, including official meditation, arbitration and in the last resort, going to court. A second implication is related to the central role that land plays as a social security mechanism for those who return from cities as a result of losing their jobs or becoming older. This leads landlords to match with tenants with whom they have certain (close) social relations and to sign informal contracts. The "Three rights division" policy initiated in 2014 can be used to reduce farmers' reliance on land which, by separating contracting rights and management rights, would reduce social matching between partners with close relations. If effectively implemented on the ground, this policy could significantly reduce market segmentation. Other helpful governmental measures, apart from land tenure policy reforms, could include initiating and /or improving access to pensions for rural inhabitants and unemployment insurance for returning rural-urban migrants as well as providing more stable rural off-farm employment, all of which could play an important role in improving the rural land rental market.

References

Ackerberg, D. A. and M. Botticini (2002). "Endogenous matching and the empirical determinants of contract form." Journal of Political Economy **110**(3): 564-591.

Allen, D. W. and D. Lueck (1993). "Transaction Costs and the design of cropshare contracts." The RAND Journal of Economics **24**(1): 78-100.

Allen, D. W. and D. Lueck (2004). "The nature of the farm: Contracts, risk, and organization in agriculture." Journal of Economics **82**(1): 100-104.

Banerjee, A. V. and E. Duflo (2000). "Reputation effects and the limits of contracting: A study of the Indian software industry." Quarterly Journal of Economics **115**(3): 989-1017.

Bierlen, R., L. D. Parsch and B. L. Dixon (1999). "How cropland contract type and term decisions are made: Evidence from an Arkansas tenant survey." International Food & Agribusiness Management Review **2**(1): 103-121.

Brandt, L., S. Rozelle and M. A. Turner (2004). "Local government behavior and property right formation in rural China." Journal of Institutional and Theoretical Economics **160**(4): 627-662.

Brasselle, A. S., F. Gaspart and J. P. Platteau (2002). "Land tenure security and investment incentives: Puzzling evidence from Burkina Faso." Journal of Development Economics **67**(2): 373-418.

Deininger, K. and G. Feder (2009). "Land registration, governance, and development: Evidence and implications for policy." The World Bank Research Observer **24**(2): 233-266.

Deininger, K. and S. Jin (2005). "The potential of land rental markets in the process of economic development: Evidence from China." Journal of Development Economics **78**(1): 241-270.

Deininger, K. and S. Jin (2009). "Securing property rights in transition: Lessons from implementation of China's rural land contracting law." Journal of Economic Behavior & Organization **70**(1): 22-38.

Falco, S. D. and E. Bulte (2013). "The impact of kinship networks on the adoption of risk-mitigating strategies in Ethiopia." World Development **43**(3): 100-110.

Feng, S. (2008). "Land rental, off-farm employment and technical efficiency of farm households in Jiangxi Province, China." NJAS-Wageningen Journal of Life Sciences **55**(4): 363-378.

Fukunaga, K. and W. E. Huffman (2010). "The role of risk and transaction costs in contract design: Evidence from farmland lease contracts in U.S. agriculture." American Journal of Agricultural Economics **91**(1): 237-249.

Fukuyama, F. (1996). "Trust: The Social Virtues and Creation of Prosperity." Simon & Schuster US, New York, USA.

Ghebru, H. H. and S. T. Holden (2015). "Reverse-Share-Tenancy and Agricultural efficiency: Farm-level evidence from Ethiopia." Journal of African Economies **24**(1): 1-25.

Gavian, S. and S. Ehui (1999). "Measuring the Production Efficiency of Alternative Land Tenure Contracts in a Mixed Crop-livestock System in Ethiopia." Agricultural Economics 20(1): 37-49.

Hao, L., J. Huang and X. Ji (2014). "The effect of village-level transfer controls on farmland transfer and its change." China Rural Economy (12): 18-29 (in Chinese).

He, X., T. Jiang, L. Guo and L. Gan (2016). "China's arable land transfer market development and households' transfer behavior --Evidence from a household survey in 29 provinces from 2013-2015." Management World(6): 13-23 (in Chinese).

Holden, S. and H. Ghebru (2005). Kinship, Transaction Costs and Land Rental Market Participation. Discussion paper, Department of Economics and Management, Norwegian University of Life Sciences, http://www.umb.no/statisk/dre-projects/data/discussion_paper_files/kinship_and_land_rental_market_participation3.pdf.

Hong, M. and L. Gong (2015). "Empirical research on the rural land transfer oral contracts self-enforcing mechanism." Agricultural economic problems(8): 13-20 (in Chinese).

Huffman, W. E. and R. E. Just (2004). "Implications of agency theory for optimal land tenure contracts." Economic Development & Cultural Change **52**(3): 617-642.

Huhe, N., J. Chen and M. Tang (2015). "Social trust and grassroots governance in rural China." Social Science Research **53**: 351-363.

Jacoby, H. G. and G. Mansuri (2010). "Incomplete contracts and investment: A study of land tenancy in Pakistan." Social Science Electronic Publishing: 1-34(34).

Jin, S. and K. Deininger (2009). "Land rental markets in the process of rural structural transformation: Productivity and equity impacts from China." Journal of Comparative Economics **37**(4): 629-646.

Jones, C., W. S. Hesterly and S. P. Borgatti (1997). "A general theory of network governance: Exchange conditions and social mechanisms." Academy of Management Review **22**(4): 911-945.

Larson, A. (1992). "Network dyads in entrepreneurial settings: A study of the governance of exchange relationships." Administrative Science Quarterly **37**(1): 76-104.

Lin, J. Y. (1992). "Rural reforms and agricultural growth in China." The American Economic Review: 34-51.

Luo, B., W. Lin and Z. Qiu (2015). "Farmland land rental contracts and partner choice: Evidence from a rural household survey." Journal of Agrotechnical Economics(9): 4-16 (in Chinese).

Ma, X., N. Heerink, S. Feng and X. Shi (2015). "Farmland tenure in China: Comparing legal, actual and perceived security." Land Use Policy **42**: 293-306.

Ma, X., N. Heerink, S. Feng and X. Shi (2017). "Land tenure security and technical efficiency: New insights from a case study in Northwest China." Environment and Devlopment Economics(22): 1-23.

Ma, X., N. Heerink, E. V. Ierland and X. Shi (2016). "Land tenure insecurity and rural-urban migration in rural China." Papers in Regional Science **95**(2): 383–406.

Ma, X., J. Wesseler, N. Heerink and F. Qu (2013). "Land tenure reforms and land conservation investments in China – What does real option value theory tell us?" Review of Economics & Finance **3**(9-13).

Macours, K. (2014). "Ethnic divisions, contract choice, and search costs in the Guatemalan land rental market." Journal of Comparative Economics **42**(1): 1-18.
Macours, K., A. De Janvry and E. Sadoulet (2010). "Insecurity of property rights and social matching in the tenancy market." European Economic Review **54**: 880-899.
Macours, K. and J. F. M. Swinnen (2002). "Patterns of agrarian transition." Economic Development and Cultural Change **50**(2): 365-394.
McMillan, J., J. Whalley and L. Zhu (1989). "The impact of China's economic reforms on agricultural productivity growth." Journal of Political Economy **97**(4): 781–807.
Mullan, K., P. Grosjean and A. Kontoleon (2011). "Land tenure arrangements and rural–urban migration in China." World Development **39**(1): 123-133.
Poppo, L. and T. Zenger (2002). "Do formal contracts and relational governance function as substitutes or complements?" Strategic Management Journal **23**(8): 707-725.
Prosterman, R., K. Zhu, J. Ye, J. Riedinger, P. Li and V. Yadav (2009). Secure land rights as a foundation for broad-based rural development in China: Results and recommendations from a seventeen-province survey. NBR Special Report.
Qian, L., M. Hong and H. Liu (2015). "Selection of agricultural land transfer contracts from the persective of pattern of difference sequence." Journal of Northwest A&F University(4): 47-54 (in Chinese).
Qu, F., N. Heerink and W. Wang (1995). "Land administration reform in China: Its impact on land allocation and economic development." Land Use Policy **12**(3): 193-203.
Rozelle, S., L. Zhang, S. Jin, K. Deininger and J. Huang (2010). Rights and rental: Is rural cultivated land policy and management constraining or facilitating China's modernization? Edited by Oi, Jean C., S. Rozelle, and X. Zhou Growing Pains: Tensions and opportunities in China's transformation. Stanford, CA: , Shorenstein APARC.
Schwartz, A. and J. Watson (2001). "The law and economics of costly contracting." Journal of Law, Economics and Organization **20**(1): 2-31.
Susarla, A. (2011). "Contractual flexibility, rent seeking and renegotiation design: An empirical analysis of information technology outsourcing contracts." Management Science **58**(7): 1388-1407.
Tan, R., F. Qu, N. Heerink and E. Mettepenningen (2011). "Rural to urban land conversion in China—How large is the over-conversion and what are its welfare implications?" China Economic Review **22**(4): 474-484.
Tu, Q., A. P. J. Mol, L. Zhang and R. Ruben (2011). "How do trust and property security influence household contributions to public goods?: The case of the Sloping Land Conversion Program in China." China Economic Review **22**(4): 499-511.
Van Gelder, J. L. (2009). "Legal tenure security, perceived tenure security and housing improvement in Buenos Aires: an attempt towards integration." International Journal of Urban and Regional Research **33**(1): 126-146.
Yu, H., J. Huang, S. Rozelle, L. Brandt and L. Zhang (2003). "Use rights security, land transfer and resource degradation." Economic Research Journal, 9, 82-91. (in Chinese)
Wang, H., J. Riedinger and S. Jin (2015). "Land documents, tenure security and land rental development: Panel evidence from China." China Economic Review **36**: 220-235.
Wang, H., J. Tong, F. Su, G. Wei and R. Tao (2011). "To reallocate or not: Reconsidering the dilemma in China's agricultural land tenure policy." Land Use Policy **28**(4): 805-814.
Zhao, D. and Y. Wu (2011). "The theory and policies of agricultural land use rights exchange in China's rural areas under the government's perspective." Issues in Agricultural Economy(7): 36-45+111.
Zhu, K., R. Prosterman, J. Ye and P. Li (2006). "The rural land question in China: Analysis and recommendations based on a seventeen-province survey." Special Paper of the Geological Society of America **415**(6): 43-60.

Tables:

Table 1 Socio-economic indicators for the two case study areas and rural China

Indicator	Liaoning	Jiangxi	Rural China
Household net income per capita in 2014 (RMB)	11191.5	11242.56	10488.9
Share of agricultural income in total income in 2014 (%)	46.93%	45.53%	40.40%
Household land area per capita in 2012 (mu)	3.78	1.57	2.34
Main crops	Rice and maize	Rice	_

[a] Source: Calculated from NBS (2013, 2015a, 2015b, 2015c)

Table 2 Land rental market development in the two case study areas[a]

Regions	Share of renting-out households (%)	Share of renting-in households (%)	Area that is rented out per household (mu)[b]	Area that is rented in per household (mu)[b]
Jiangxi	32	29	3.74	15.01
Liaoning	31	27	5.43	31.85

Source: Calculated from household surveys.
15mu=1ha,
[a] In our sample 28households in Jiangxi case and 31 households in Liaoning case rented out land to cooperatives or agricultural enterprises although these cases are not included as household-level renting in activities.
[b] Calculated from the sub-sample of households renting-out and renting-in households.

Table 3 Characteristics potentially affecting landlords' preference for formal or informal contracts

Landlords' characteristics	Formal contract	Informal contract	Significance of difference
Observations[a]	71	383	***
Social relation			
Ratio of renting to relatives (%)	3	24	***
Ratio of renting to other villagers (%)	36	66	***
Ratio of renting to strangers (%)	61	10	***
Land certificate	0.847	0.714	
Perceived tenure security	0.375	0.436	
Age of household head (years)	59.15	57.69	
Education of household head	2.50	2.64	
Village leader or party member	0.042	0.070	*
Household wealth (ten thousand yuan)	11.51	14.83	
Distance to town (km)	3.455	4.415	*
Contracted land area (mu)	7.68	6.85	
Rented land area (mu)	3.90	4.79	**
Family labour	2.81	2.84	

Source: Calculated from household.
15mu=1ha
[a] In our sample 59 households (11%) rented out their land to cooperatives or agricultural enterprises. In these cases landlords are usually forced to follow agreements designed by local governments and large tenants (e.g. agricultural enterprises and large scale cooperatives) and do not have any bargaining power in rental agreements. These landlords therefore are not included in our analysis.

Table 4 Characteristics of potential tenants

Social relation	Potential tenants (willing) to rent from relatives	Potential tenants (willing) to rent from villagers	Potential tenants (willing) to rent from strangers	Significance of difference
Tenants' characteristics				
Ratio of formal contracts (%)[a]	5.64	11.72	2.01	***
Ratio of informal contracts (%)[a]	11.69	22.09	1.88	***
Average household head age of potential tenants (years)	54.29	54.24	52.31	
Average household head education of potential tenants	2.72	2.73	2.77	
Average family labour of potential tenants	3.18	3.21	3.26	
Average agricultural assets of potential tenants (ten thousand yuan)	0.77	1.15	0.65	**

Source: Calculated from household.
15mu=1ha
[a] The ratio of potential tenants who match or are willing to match the landlord-type (renting to relatives, villagers or strangers) and contract-type (formal or informal contract) to all households surveyed in each town.

Table 5 Nested logit estimations of joint partner and contract choice (with land certificate as the variable indicator for tenure security and with interaction terms)

	Model 1	Model 2
Determinants of contract choice (probability of formal contract)		
Land certificate[a]	1.446***(0.454)	-0.403(0.978)
Age of household head	-0.015(0.014)	-0.018(0.014)
Education of household head	-0.607***(0.204)	-0.572***(0.207)
Village leader party member	0.286(0.690)	0.415(0.686)
Ln(Household wealth)	0.097(0.204)	0.020(0.192)
Distance to town	-0.107**(0.051)	-0.097*(0.051)
Contracted land area	0.028(0.034)	0.070*(0.039)
Determinants of partner choice		
Renting to villagers	2.614(2.100)	4.029(3.035)
Renting to strangers	0.849(1.924)	1.737(3.250)
Renting to villagers * Land certificate[a]	1.443(1.563)	-0.686(2.916)
Renting to strangers * Land certificate[a]	0.861(2.025)	-0.566(4.005)
Ratio of potential tenants	0.247***(0.046)	0.212***(0.047)
Average household head age of potential tenants	0.893*(0.469)	0.963*(0.516)
Average household head education of potential tenants[b]	-2.029(10.075)	-3.828(10.677)
Average family labor of potential tenants	-6.358**(3.185)	-6.270*(3.224)
Average agricultural asset of potential tenants	-3.375(2.843)	-2.249(2.892)
No. of possible matches between landlords and tenant-types	2,700	2,700
No. of landlords	450	450
LR chi2 (P_value)	47.12(0.000)	40.93(0.002)
LR test $\tau_f = \tau_i = 1$: χ^2-statistic (p-value)	22.91(0.000)	18.01(0.000)
τ_f	7.234***(2.283)	7.693***(2.419)
τ_i	5.143***(1.540)	4.861***(1.626)

Notes:
*,** and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively. Results for regional characteristics (county dummy) are not reported.

[a] The original value of the land certificate is used in model 1; model 2 introduces the predicted value of the land certificate using the average value of land certificates in the village based of the other sampled households who live in the same village as the surveyed household.

Table 6 Nested logit estimations of joint partner and contract choice (with perceived tenure security variable as the tenure security indicator and with interaction terms)

	Model 1	Model 2
Determinants of contract choice (probability of formal contract)		
Perceived tenure security[a]	0.106(0.355)	5.748**(2.315)
Age of household head	-0.015(0.014)	-0.018(0.014)
Education of household head	-0.555***(0.203)	-0.750***(0.219)
Leader or party member	0.461(0.689)	-0.310(0.790)
Ln (Household wealth)	0.048(0.192)	0.078(0.197)
Distance to town	-0.095*(0.051)	-0.109**(0.051)
Contracted land area	0.061*(0.032)	0.056*(0.032)
Determinants of partner choice		
Renting to villagers	2.662(1.954)	1.536(3.589)
Renting to strangers	1.240(1.373)	4.916(4.681)
Renting to villagers * Perceived tenure security[a]	2.745*(1.542)	7.033(8.165)
Renting to strangers * Perceived tenure security[a]	-0.223(1.807)	-8.496(10.756)
Ratio of potential tenants	0.222***(0.045)	0.243***(0.046)
Average household head age of potential tenants	0.842*(0.450)	0.896*(0.492)
Average household head education of potential tenants[b]	-2.144(9.504)	-3.807(10.678)
Average family labor of potential tenants	-5.637*(3.096)	-5.113(3.460)
Average agricultural assets of potential tenants	-3.212(2.763)	-4.071(3.204)
Nr. of possible matches between landlords and tenant-types	2,700	2,700
Nr. of landlords	450	450
LR chi2(P_value)	39.34(0.004)	43.66(0.001)
LR test $\tau_f = \tau_i = 1$: χ^2-statistic (p-value)	17.42(0.000)	22.66(0.000)
τ_f	7.389***(2.490)	7.311***(2.432)
τ_i	4.993***(1.651)	5.751***(1.873)

Note:
*,** and *** indicate statistical significance at the levels of 10%, 5%, and 1% respectively. Results for regional characteristics (county dummy) are not reported.
[a] The original value of perceived tenure security is used in model 1; model 2 introduces the predicted value of perceived tenure security using the average value of perceived tenure security in the village based on the other sampled households who live in the same village as the surveyed household.

Table 7 Nested logit estimations of joint partner and contract choice (with land certificate as the variable indicator for tenure security and without interaction terms)

	Model 1	Model 2
Determinants of contract choice (probability of formal contract)		
Land certificate[a]	1.293***(0.401)	-0.334(0.868)
Age of household head	-0.015(0.014)	-0.018(0.014)
Education of household head	-0.612***(0.204)	-0.571***(0.207)
Leader or party member	0.288(0.690)	0.414(0.686)
Ln(Household wealth)	0.093(0.204)	0.021(0.192)
Distance to town	-0.107**(0.051)	-0.096*(0.051)
Contracted land area	0.029(0.034)	0.070*(0.039)
Determinants of partner choice		
Renting to villagers	3.662*(2.106)	3.542*(2.066)
Renting to strangers	1.619(1.294)	1.251(1.202)
Ratio of potential tenants	0.248***(0.046)	0.212***(0.047)
Average household head age of potential tenants	0.985**(0.473)	0.933**(0.454)
Average household head education of potential tenants [b]	-3.513(10.057)	-2.997(9.351)
Average family labor of potential tenants	-6.634**(3.294)	-6.119**(3.105)
Average agricultural assets of potential tenants	-2.833(2.840)	-2.508(2.658)
Nr. of possible matches between landlords and tenant-types	2,700	2,700
Nr. of landlords	450	450
LR chi2(P_value)	47.56(0.000)	40.96(0.000)
LR test $\tau_f = \tau_i = 1$: χ^2-statistic (p-value)	23.47(0.000)	18.26(0.000)
τ_f	7.532***(2.336)	7.600***(2.359)
τ_i	5.277***(1.591)	4.825***(1.591)

Notes*:*
*,** and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively. Results for regional characteristics (county dummy) are not reported.
a The original value of land certificate is used in model 1; model 2 introduces the predicted value of land certificate using average value of land certificate in the village based of the other sampled households that live in the same village as the surveyed household as instruments.

Table 8 Nested logit estimations of joint partner and contract choice (with perceived tenure security variable as the tenure security indicator and without interaction terms)

	Model 1	Model 2
Determinants of contract choice (probability of formal contract)		
Perceived tenure security[a]	-0.392(0.288)	3.903*(2.061)
Age of household head	-0.018(0.014)	-0.019(0.014)
Education of household head	-0.604***(0.201)	-0.749***(0.219)
Leader or party member	0.509(0.690)	-0.329(0.785)
Ln(Household wealth)	0.023(0.192)	0.067(0.196)
Distance to town	-0.099*(0.051)	-0.109**(0.051)
Contracted land area	0.062*(0.032)	0.058*(0.032)
Determinants of partner choice		
Renting to villagers	3.662*(2.131)	3.852*(2.191)
Renting to strangers	1.307(1.248)	1.548(1.289)
Ratio of potential tenants	0.223***(0.045)	0.243***(0.046)
Average household head age of potential tenants	0.979**(0.470)	0.960**(0.471)
Average household head education of potential tenants[b]	-3.126(9.773)	-3.555(10.039)
Average family labor of potential tenants	-6.401**(3.213)	-6.531**(3.290)
Average agricultural assets of potential tenants	-2.586(2.769)	-2.993(2.867)
Nr. of possible matches between landlords and tenant-types	2,700	2,700
Nr. of landlords	450	450
LR chi2(P_value)	39.34(0.004)	43.70(0.001)
LR test $\tau_f = \tau_i = 1$: χ^2-statistic (p-value)	17.42(0.000)	22.73(0.000)
τ_f	7.389***(2.490)	7.470***(2.361)
τ_i	4.993***(1.651)	5.294***(1.642)

Note:
*,** and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively. Results for regional characteristics (county dummy) are not reported.
a The original value of perceived tenure security is used in model 1; model 2 includes the predicted value of perceived tenure security using the average value of perceived tenure security in the village based of the other sampled households who live in the same village as the surveyed household.