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Article

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Land defragmentation in China: does rental transaction inside acquaintance networks matter?

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ABSTRACT

Using household-level data collected from three provinces in China, this paper investigates the links between land rentals conducted by acquaintances and land fragmentation. The econometric results indicate that the land rentals between acquaintances and those between non-acquaintances have similar effects on defragmentation when considering the endogeneity problem. Moreover, the land rentals between acquaintances have an increasingly positive impact on defragmentation as land rents increase. Further evidence shows that there is no significant difference in land rents between rental transactions conducted by acquaintances and those conducted by non-acquaintances, implying increasing marketization of land rentals inside acquaintance networks. Our findings validate the belief that the land rentals between acquaintances in China today have enormous potential for defragmentation.

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Land fragmentation; land rentals; acquaintances; land rents; China

1. Introduction

Land fragmentation is a common phenomenon in Africa, Asia and Europe (Rahman & Rahman, 2009; Wan & Cheng, 2001). Although land fragmentation allows for the use of several eco-zones, permits crop scheduling, and reduces risk (Ntshinyurwa, de Vries, Chigbu, & Dukwiymuphwe, 2019; Tan, Heerink, & Qu, 2006), it is a critical constraint on increasing farm productivity (Kawasaki, 2010).¹ The literature argues that developing land rental markets will reduce land fragmentation. Researchers agree that the positive relationship between land rental markets and defragmentation is not spurious (Carter & Yao, 2002; Tan et al., 2006). Because land rental markets facilitate transfers of land from less productive to more productive households (Carter & Yao, 2002; Deininger & Jin,

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¹While land fragmentation has the advantage of reducing risk and permitting crop scheduling, it also increases costs, negative externalities, loss of land due to boundaries, and has a greater potential for disputes between neighboring farmers (Deininger et al., 2012; Rahman & Rahman, 2009). In other words, land fragmentation reduces production efficiency. We focus on the impact of land rentals on land fragmentation in this paper, but do not consider the advantages, e.g., the ecological value or other advantages for small farmers. For the lessees, improving farm productivity is crucial to maximize profit. Furthermore, Liu, Yang, Long, Gao, and Wang (2014) find that lessees tend to maximize profit and increase the returns relative to the land scale, i.e., Chinese lessees are likely to choose to reduce land fragmentation. In addition, land fragmentation is likely to hinder the usage of mechanization and increase the labor input in agriculture. With the increase in rural-urban migration in China, agricultural labor costs have increased rapidly in the past decade, and reducing land fragmentation is highly conducive to reducing labor costs and increasing farm productivity in rural China.

2009; Feng, Heerink, Ruben, & Qu, 2010), it should help realize considerable gains in productivity (Deininger & Jin, 2005). However, Matsuoka (1995) finds that land fragmentation is more likely to exist in informal land rental markets, where land rentals are typically between acquaintances. Holden and Ghebru (2005) argue that those rental transactions accompanied by kinship contracts are associated with less efficient land use. Kajii (1990) even claims that one of the causes of fragmentation is the relatively closed land markets where close social relationships function well. Several researchers claim that land rental markets themselves are highly fragmented (Lipton, 1968), restricting the potential land supply and requiring unanimous agreement to consolidate fragmented land (Dorner, 1977).

Why should land rentals between acquaintances have negative effects on land consolidation? As many researchers argue, the informal rentals are conducted between partners who trust each other (Deininger & Jin, 2005) and are always accompanied by low or zero rents (Liu, Wang, Tang, & Nan, 2018), suggesting that the usual coordinating function of price is not present. In fact, the neoclassical economics perspective proposes that the function of market is realized by price, which determines the factor distribution (Friedman & Friedman, 1980; Kreps, 2013; Luenberger, 1995). The essential difference between informal and formal land rentals is the role of price. When facing similar land rents to those between strangers, the rental transactions between acquaintances can theoretically stimulate land consolidation to reduce the production costs caused by land fragmentation. However, a recent paper argues that the land rents inside and outside acquaintance networks are almost the same when accounting for lessees' profit motivations and endogeneity problems (Qiu, Luo, & He, 2018). Obviously, the convergence of land rents means that the price mechanism functions well inside acquaintance networks and this might directly change several features of the land rentals between acquaintances, with implications for academic understanding and practical policies (Qiu, Choy, He, Li, & Luo, 2020d; Qiu, Luo, Choy, Li, & He, 2020c; Qiu, Luo, Choy, Ma, & He, 2020b; Qiu, Luo, & He, 2020a).

China has a serious land fragmentation problem, partially caused by the population growth in the aftermath of the Household Responsibility System (HRS) (Rozelle & Li, 1998). To reduce fragmentation, some researchers suggest developing land rental markets as an efficient approach (Deininger & Jin, 2005). Since land rental was officially approved in 1998 and strengthened in 2002 and 2008, farmers have had the freedom to adjust their plots (Deininger & Jin, 2009; Wang, Tong, Su, Wei, & Tao, 2011). However, the most prevalent form of land rentals in rural China is between acquaintances (Feng et al., 2010; Ma, Heerink, Feng, & Shi, 2015). The lessees transacting within the villages accounted for 89.6 percent of all the lessees, and the lessors transacting within the villages accounted for 70.9 percent of all the lessors (Qiu et al., 2018). Considering that more than 55.18 percent of the transferred land area in 2016 was conducted within the villages,² the impact of land rentals between acquaintances on defragmentation is important for China's land scale management. Although the average number of land plots per farm household has decreased from 6.06 plots in 1999 to 3.27 plots in 2015 in rural China,³ land fragmentation is still a major obstacle to China's agricultural development.

²Source: The authors' calculations using the Statistical Annual Report on Rural Management in China.

³Source: The authors' calculations using the Survey Data of National Rural Fixed Observation Points.

Several papers propose the negative effects of land rentals between acquaintances (Holden & Ghebru, 2005; Kawasaki, 2010), but few confirm the reliability of these predicted effects. Few papers investigate the impact of land rentals between acquaintances on land fragmentation, and only Tan et al. (2006) empirically examine the relationship between land rentals and defragmentation in China. We assess the links between land rentals conducted by acquaintances and defragmentation in China and explain the functions of land rents in this process. It should be noted that formal and informal land rentals have not been rigidly distinguished or defined in the literature. The literature commonly claims that land rentals conducted within villages contain a large amount of informality (Deininger & Jin, 2005, 2009; Wang, Riedinger, & Jin, 2015) because they are conducted by partners with close social relationships and oral contracts are common (Ma et al., 2015). The land rentals between acquaintances in this paper represent those conducted by farm households within the same village, and as villages in rural China are relatively small, those living within the same village may regard each other as acquaintances. Furthermore, a village in this paper refers to a group of villagers (i.e., natural villages) based on blood relations and geographical proximity. Farm households within the same natural village share the same cultural knowledge, social norms, and self-governance rules, resulting in close social relationships.

We make three contributions. First, our analysis clarifies the impact of land rentals on land fragmentation by considering that a large number of formal land rentals have occurred among acquaintances. Our second contribution is to introduce land rents as a crucial element in explaining the effect of land rentals between acquaintances; we do this because Friedman and Friedman (1980) argue that price is the most important symbol of market function. The third contribution is that we identify the causality between land rentals among acquaintances and land fragmentation using the instrumental variable (IV) method to estimate parameters. The problem of self-selection exists in the relationship between land rentals and defragmentation, which is not addressed by the literature.

Other developing countries, such as Guatemala, the Dominican Republic and Ethiopia, also rely on oral contracts and transactions conducted by acquaintances in the land rental markets (Ghebru & Holden, 2015; Macours, De Janvry, & Sadoulet, 2010). Our findings on consolidating fragmented land through land rentals within villages have direct implications for China and other developing countries (Jia & Petrick, 2014).

Our paper is structured as follows. Section 2 presents the background in China, including the features of land fragmentation and land rental markets in rural areas. Section 3 introduces the data, the variables and the estimation strategy. The estimated results are presented and discussed in section 4, and section 5 summarizes the main findings and policy implications.

2. Background in rural China

2.1. Land fragmentation in China

The population pressure in rural China has resulted in serious land fragmentation (Nguyen, Cheng, & Findlay, 1996). The problem of land fragmentation was further aggravated by the frequent land redistribution in the aftermath of the HRS. Farm

households in rural China had 8.43 plots on average in 1986 and 6.06 plots in 1999 (Tan et al., 2006). The average number of land plots below and above 1 mu (a unit commonly used in China, with 15 mu equal to a hectare) in 2000 was 4.15 and 1.75 per farm household, respectively, while the average number of land plots above 3 mu was only 0.21 according to the SDNRFOP.

Table 1 reports the trend in land plots and land size per farm household since 2000.⁴ As the farmland size per farm household barely changed during 2000–2015, the trend in land fragmentation can be described by the land plots. The nationwide land fragmentation has decreased because the average number of land plots per farm household has decreased from 5.90 in 2000 to 3.27 in 2015. In addition, we present the number of farm households with different land sizes in Table 2. This shows that the number of farm households with a land size above 200 mu increased from 238,000 in 2009 to 366,000 in 2016, and the number of farm households with land size between 50 mu and 200 mu rose from 2,503,000 in 2009 to 396,000 in 2016, implying that the defragmentation is to a great extent caused by land consolidation in rural China.

Table 3 shows the land plot size distribution, confirming that land fragmentation is serious in rural China and that there are more land plots below 1 mu than above 1 mu. We also find that the number of land plots below 3 mu declined between 2000 and 2015, and the number of land plots above 3 mu increased slightly.

Tables 4 and 5 show the number of land plots per farm household by region from 2000 to 2015 and land plot size distribution by region in 2015, respectively. Table 4 shows that the average number of land plots per farm household in western China was greater than that in eastern and central China between 2000 and 2015. Table 5 shows that there were fewer land plots of any size in the eastern region than the central or western regions. In the western region, the average number of land plots below 3 mu was 3.97, but the

Table 1. Number of land plots and land size per farm household in rural China unit: plot, mu.

Term	2000	2002	2004	2006	2008	2010	2012	2014	2015
Land plot	5.90	5.75	4.96	4.71	4.26	4.02	3.58	3.33	3.27
Land size	7.43	7.55	7.34	7.32	7.16	7.14	7.56	7.36	7.26

Sources: The SDNRFOP from 2000 to 2015.

Table 2. Number of farm households with different land sizes unit: ten thousand household.

Land area	2009	2010	2011	2012	2013	2014	2015	2016
< 10 mu	19,023.6	22,387.4	22,659.3	22,523.3	22,666.4	22,815.7	22,931.7	22,968.0
= 0 mu				1375.2	1414.4	1577.0	1656.6	1853.8
10–30 mu	2762.8	2825.2	2819.3	2741.8	2711.8	2703.3	2760.6	2814.4
30–50 mu	582.3	609.0	611.4	603.5	673.6	691.4	695.4	700.6
50–100 mu	189.5	201.2	197.1	204.9	225.8	235.4	242.3	251.9
100–200 mu	60.8	48.8	53.2	56.9	62.9	74.8	79.8	87.7
> 200 mu	23.8	23.3	25.7	25.7	28.9	31.1	34.5	36.6

Sources: The SARRM from 2009 to 2016.

Notes: The data about the number of farm households with different land sizes are available since 2009; The data about the number of farm households with 0 mu are available since 2012.

⁴It should be noted that land refers to cultivated land (including the contracted land and the rented land) in this section.

Table 3. Plot size distribution in rural China unit: plot.

Plot size	2000	2002	2004	2006	2008	2010	2012	2014	2015
< 1 mu	4.15	4.07	3.15	2.94	2.55	2.40	1.98	1.84	1.85
1–3 mu	1.24	1.16	1.26	1.23	1.15	1.08	1.02	0.92	0.88
3–5 mu	0.30	0.30	0.31	0.30	0.31	0.30	0.31	0.30	0.30
> 5 mu	0.21	0.22	0.24	0.24	0.25	0.24	0.27	0.27	0.25

Sources: The SDNRFOP from 2000 to 2015.

Table 4. Average number of land plots per farm household from 2000 to 2015 by regions unit: plot.

Land plot	2000	2002	2004	2006	2008	2010	2012	2014	2015
Eastern	4.16	3.91	3.49	3.20	3.22	2.93	2.77	2.47	2.38
Central	5.22	5.03	4.50	4.20	4.28	3.79	3.58	3.36	3.29
Western	9.14	8.85	7.27	6.19	6.82	5.60	4.59	4.36	4.43

Sources: The SDNRFOP from 2000 to 2015.

Notes: The three regions of eastern China, central China and western China are defined based on geographical features and economic development levels.

Table 5. Land plot size distribution by regions in 2015 unit: plot.

Plot size	Eastern	Central	Western
< 1 mu	1.26	1.53	2.94
1–3 mu	0.73	0.91	1.03
3–5 mu	0.28	0.38	0.23
> 5 mu	0.11	0.48	0.13

Sources: The SDNRFOP in 2015.

number above 3 mu was only 0.36. The average number of land plots below 3 mu was 1.99 in the eastern region and 2.44 in the central region, respectively, while the number above 3 mu was up to 0.39 and 0.86, implying that land fragmentation is a more serious problem in western China, even though all three regions face the problem of small plots.

2.2. Land rental markets in rural China

Since the 1990s, land rental transactions have increased considerably in rural China. According to Ma, Heerink, van Ierland, van den Berg, and Shi (2013), only 15 percent of farm households rented areas to cultivate in 2008 and 2010, whereas in 2012, 19.52 percent of farm households participated in the land rental markets (Wang, Li, Li, & Tan, 2018). Land rental markets have become more active (Kimura, Otsuka, Sonobe, & Rozelle, 2011) with the rapid development of off-farm employment in rural China since 2000 (Cai, 2018).

However, the land rental markets in China are largely informal. Oral contracts are widely used (Deininger & Jin, 2009; Wang et al., 2015) and the majority of land rental transactions are conducted between neighbors or relatives based on trust (Deininger & Jin, 2005). About 85.47 percent of rental transactions in 2008 were conducted within a village and 89.05 percent of the rental transactions relied on oral contracts (Wang et al., 2015). Ma et al. (2015) report that 94 percent of rental contracts in Jiangxi in 2010 were oral contracts, compared with 58 percent in Gansu province in 2009. As much as 95 percent of

the land rentals in Jiangxi province and 85 percent of the rentals in Gansu province were conducted between acquaintances. The abovementioned studies indicate the existence of a large amount of informality in China's land rental market before 2010.

Table 6 reports the land transfer rate in China during the 2006–2016 period. It shows that the land transfer rate increased from 4.57 percent in 2006 to 35.14 percent in 2016, implying an extensive development of land rental markets over this period. The pattern of land transfer was stronger in the eastern and central regions than the western region. One important reason for this is that the level of economic development in the eastern and central regions was higher, with more off-farm employment opportunities. The positive impact of labor migration on land transfers is well documented (Feng et al., 2010; Kimura et al., 2011).

Table 7 shows the trend in the land rental market (including land area transferred outside the villages and land area transferred through contracts) in rural China from 2006 to 2016. As shown, the proportion of land area transferred by non-villager lessees to the total transferred land area has increased continuously. Specifically, the proportion of land area transferred by non-villager lessees increased to 34.30 percent in 2015 from 21.87 percent in 2006. We also find that the proportion of land area transferred with a signed contract to the total land area transferred increased from 6.38 percent in 2009 to 22.56 percent in 2015.

Table 8 presents the features of land rentals using data from the China Household Finance Survey (CHFS), covering 28 provinces in 2015. It shows that 89.6 percent of lessees transacted with acquaintances and 54.1 percent of lessees rented land for the sake of profit.⁵ The average land rents were 177.237 yuan/mu, with 67.3 percent of lessees

Table 6. Land transfers in China unit: percent.

Land rental	Region	2006	2008	2010	2012	2014	2016
Land transfer rate	Nationwide	4.57	8.90	14.65	21.24	30.36	35.14
	Eastern	6.31	10.72	17.28	24.01	34.66	39.74
	Central	2.81	7.73	13.68	21.61	31.61	36.44
	Western	3.88	7.09	11.50	16.33	21.95	26.44

Sources: The SARRM from 2006 to 2016.

Notes: The land transfer rate is measured by the proportion of the total land area transferred to the total contracted land area distributed to farm households.

Table 7. The characteristics of land rental markets in China unit: percent.

Item	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Land transfer rate outside the villages	21.87	23.12	26.19	25.69	26.36	27.07	28.86	31.67	33.15	34.30
The transferred land area with contracts				6.38	8.31	10.91	13.84	16.94	20.26	22.56

Sources: The SARRM from 2006 to 2015.

Notes: The land transfer outside the villages refers to as that those lessees outside the villages rent farmers' cultivated land, and the land transfer rate outside the villages is measured by the proportion of the land area rented by the lessees outside the villages to the total transferred land area. The data about the land transfer area with contracts signed are available since 2009, and the transferred land area with contracts is measured by the proportion of the transferred land areas with contracts signed to the transferred land area with contracts.

⁵It should be noted that the definition of acquaintance in Table 3 is similar to that in this paper, i.e., those farm households within the same villages are regarded as acquaintances.

Table 8. Features of land rentals in rural China: evidence from the CHFS.

Types	Transaction partner ^a	Profit motivation ^b	Land rent ^c (yuan/mu)
All land lessees	0.896	0.541	177.237
Transaction partner = 1		0.525	168.620
Transaction partner = 0		0.673	251.701

Notes: ^a1 if the lessee rents an acquaintance's land, and 0 otherwise. ^b1 if the lessee rents the land for profit, and 0 otherwise. ^c\$1 = 6.92 yuan, 1mu = 1/15 ha.

renting for profit when transacting with non-acquaintances compared with 52.5 percent when transacting with acquaintances, implying that a large number of rental transactions between acquaintances are accompanied by profit motivation and high land rents.⁶

In addition, the theoretical model of Qiu et al. (2018) implies that if a profit motivation is assumed, the transaction partner does not affect the land rent paid by the lessee because the prices set by the non-villager lessees can affect the transactions. They find that the land rents of transactions with acquaintances are close to those with non-acquaintances if the lessees are motivated by profit.⁷ According to Hart and Moore (2007), Hart & Moore (2008) and Hart (2008), the price in the market provides a reference point for the trading relationship, which confirms the parties' feelings of entitlement.⁸ In that case, each party's *ex post* performance (i.e., in abiding by the contract or cheating) depends on whether they get what they are entitled to under the contract. In other words, with market-oriented land rentals within the acquaintances networks, land rents are converging in rural China (Qiu et al., 2020d, 2020c, 2020b, 2020a), and the presence of transactions among acquaintances based on price rather than social relationships have been confirmed by Dixit (2004).

3. Data, variables and estimation strategy

3.1. Data

This study used household survey data collected in Jiangsu, Jiangxi and Liaoning provinces from 2014 to 2015. These three provinces are major grain producing areas in China. A multistage sampling procedure was used for data collection. First, two counties were selected from each province by consulting local researchers and policy makers: Guangyun and Jinhu in Jiangsu province, Fengcheng and Suichuan in Jiangxi province and Sujiatu and Donggang in Liaoning province. Incomes in the sampled counties depend more on agriculture than the incomes of other counties. Next, based on county size, four to seven towns were selected in each county. Third, several villages were selected randomly in each town; on average, 20–40 households were randomly interviewed in each village. The final dataset covers 910 households in Jiangsu, 817 households in Jiangxi, and 811 households in Liaoning. For more details see Zhou, Shi, Heerink, and Ma (2019).

⁶For more details on the CHFS, see the introduction of Zhang (2016).

⁷Qiu et al. (2018) find that lessees transacting with acquaintances for the sake of profit pay 322.148 yuan/mu on average, and those transacting with non-acquaintances for profit pay 370.365 yuan/mu.

⁸In recent studies, we further analyze the demonstration effect in the land rental market and find that the emergence of non-villager lessees is likely to positively affect land rents between acquaintances and improve the functioning of the price mechanism.

Our survey data show that 25.43 percent of farm households participate in the land rental market, which is similar to the national statistics (23.66 percent) calculated using the SARRM data for 2015. In addition, the land transfer rate in the sample provinces is 36.53 percent, which is close to the national level (33.29 percent) in 2015, implying that the data in this paper are representative. We excluded some households because their village's information is incomplete. Because the focus of our interest is on the impact of land rentals between acquaintances on defragmentation, the dataset used in this paper covers 605 land lessees, of whom 300 rent an acquaintance's land, while 49.6 percent transact with partners within the same village, consistent with the SARRM 2015 finding that 47.03 percent of land rental transactions are conducted by farm households within the same village.

3.2. Variables

The main dependent variable is land defragmentation. Although the literature suggests that land fragmentation can be proxied for by the number of plots per farm household and land size per plot (King and Burton, 1982; Deininger, Savastano, & Carletto, 2012), we cannot identify the change in land fragmentation caused by the land rentals because the information on land plots and size prior to the rentals is unavailable from our questionnaire.⁹ Whether the rented land is adjacent to the lessee's land serves as an alternative proxy for land defragmentation. It should be noted that lessee's land includes their contracted land and the previously rented land. Renting adjacent land is conducive to consolidating fragmented land and increasing the average land size per plot, so this indicator suffices to measure farmers' voluntary consolidation through land rental markets.

Whether a land rental is conducted by acquaintances is the main independent variable in this paper because transaction partner is commonly regarded as a symbol indicating the level of informality in land rental markets (Ma et al., 2015; Wang et al., 2015). The indicator takes the value of 1 if the lessees rent an acquaintance's land and 0 if the lessees rent a non-acquaintance's land. As described in the introduction, villagers within the same villages are regarded as acquaintances, and lessors such as farm households outside the villages, cooperatives, or enterprises are regarded as non-acquaintances because the economic organizations function on market principles, and the close relationships between acquaintances or villagers within the same village do not apply to them. In addition, we introduce land rents to identify the differential effects of land rentals between acquaintances. When facing high land rents, the lessees tend to maximize profit by consolidating the fragmented land. The reason for this is that the land rentals between acquaintances are not necessarily informal with regard to increases in land rents because price represents the market orientation, even when the transactions are conducted by partners with close social relationships.

⁹For example, let us assume that two farm households *A* and *B* have five and four land plots, respectively. If *A* rents a plot adjacent to the land he/she owns, he/she still has five land plots, yet the statistics show that the land rental results in fragmentation because lessee *A* has even more land plots than *B* after the land rental. It is obvious, however, that renting an adjacent land plot means an increase in the land size per plot. Similarly, if *A* rents a land plot that is not adjacent to the land he/she owns, the average land size may increase, implying that it is difficult to identify land defragmentation if the information before the land rental is unavailable. If the rented land is adjacent to the current land, it inevitably implies land defragmentation. To further identify land defragmentation, a different indicator for defragmentation is used in the robustness checks.

The control variables in this paper include the characteristics of the household head (Liu et al., 2018; Ma et al., 2015), household (Abdulai, Owusu, & Goetz, 2011; Feng et al., 2010; Ma et al., 2013), land (Tan et al., 2006), land tenure (Wang et al., 2011), and village characteristics (Deininger & Jin, 2005). The household head characteristics include sex, age, education, and the status of their off-farm employment. Household characteristics cover the dependency ratio, the proportion of household members engaged in off-farm employment, main family income sources and agricultural assets. Land characteristics also include land plots in the second land contract and land tenure. Land certificate and land redistribution are used to measure land tenure (Deininger & Jin, 2005). Finally, village characteristics include labor migration, location, economic status, agricultural income, land certificate, and land redistribution at the village level. For more details on the definition and description of variables see Table 9.

3.3. Estimation strategy

We assess the links between land rentals between acquaintances and defragmentation and test whether land rents are the crucial ingredient in this process. To identify the impact of land rentals between acquaintances on defragmentation, we assume that land defragmentation is a linear function of an independent variable (X_i) and a vector of explanatory variables (D_i). The model is

$$Y_i = \beta_i X_i + \xi_i D_i + \varepsilon_i \quad (1)$$

Table 9. Definition and description of variables (N = 605).

Variable name	Definition	Mean	SD
Land defragmentation	1 if renting adjacent land, 0 otherwise	0.379	0.485
Transaction partner	1 if renting an acquaintance's land within the same village, 0 otherwise	0.496	0.500
Land rent	The money paid by the lessees (yuan/mu)	343.491	377.060
H_sex	1 if the household head is male, 0 otherwise	0.972	0.165
H_age	Age of the household head	56.007	8.880
H_education	The household head's years of education	7.084	2.620
H_migration	1 if the household head is engaged in off-farm employment, 0 otherwise	0.172	0.378
Dependency ratio	The proportion of household members below 15 and over 70 years old	0.277	0.252
Off-farm ratio	The proportion of household members engaged in off-farm employment	0.193	0.212
Main family income source	1 if from farming, 0 otherwise	0.476	0.500
	1 if from part-time off farm, 0 otherwise	0.336	0.473
	1 if from off-farm employment, 0 otherwise	0.188	0.391
Agricultural asset	The economic value of agricultural assets (10 thousand yuan)	2.038	6.782
Land plots	The number of land plots in the second land contract	4.507	3.938
Land certificate	1 if the household owns a land certificate, 0 otherwise	0.732	0.443
Land redistribution	1 if the household has experienced land redistribution since the second land contract in 1998, 0 otherwise	0.256	0.437
Village labor migration	The proportion of laborers engaged in off-farm employment at the village level	0.562	0.396
Village location	The distance to the nearest town (km)	7.763	5.713
Village economy	The total income of the village (10 thousand yuan)	275.170	1429.759
Village agriculture income	The agricultural income per capita	2354.149	1644.510
Village land certificate	1 if the village allocates land certificates, 0 otherwise	0.856	0.351
Village land redistribution	1 if the village has redistributed land since 1998, 0 otherwise	0.440	0.497

where Y_i denotes land defragmentation, and X_i represents transaction partner and is a binary indicator, taking the value of 1 if the household rents an acquaintance's land and 0 if the household rents a non-acquaintance's land. D_{ni} is a vector of control variables including household head characteristics, household characteristics, land characteristics, and so on. β_i and ξ_i are the parameters of interest. ε_i is a standard error term and is assumed to be normally distributed.

To identify the impact of land rentals between acquaintances with the increases in land rents, we follow Bodea and Hicks (2015) in introducing an interaction term to Model (1), resulting in

$$Y_i = \beta_i X_i + \varpi R_i + \pi X_i R_i + \xi_i D_i + \varepsilon_i \quad (2)$$

where R_i is an indicator of land rents and $X_i R_i$ is the interaction term. ϖ and π are the parameters of interest. The other variables are the same as in Model (1). R_i is not measured by the land rents paid by lessees but by the average land rents of other lessees within the same village because land rents are endogenous to the land consolidation decision. We calculate the average land rent at village level by referring to similar practices on labor migration. According to Hart and Moore (2007), Hart & Moore (2008), the price in the market sets a reference point for other transactions, i.e., the demonstration effect exists in determining land rents within the villages, and the higher the land rent paid by other lessees within villages, the more likely the lessee is to pay a higher land rent.

Because unobserved variables such as motivation could confound the estimation through their influences on transaction partners and defragmentation, serious endogeneity problems exist in our analysis. The instrumental variable method is widely used to deal with endogeneity problems, and land rentals at the village level are feasible instrumental variables for land rentals at the individual level (Ma et al., 2013). Because this paper compares the different land rental transactions farm households have participated in, we do not need to consider whether farm households participate in land rentals when constructing an instrumental variable. Theoretically, the transaction partner is determined to a great extent by land rentals at the village level, meaning that the more rental transactions that are conducted between acquaintances within the villages, the more likely lessees are to rent an acquaintance's land. Thus, the proportion of lessees transacting with acquaintances within the same village to the total lessees at the village level serves as an instrumental variable for the transaction partner variable. It is known that land rental is the main approach to reducing land fragmentation for farmers when the land consolidation program conducted by governments is excluded. The proportion of land rentals between acquaintances at the village level can affect farmers' defragmentation only through affecting the transaction partner because the development of land rental markets at the village level determines the transaction partners to a great extent, indicating that the instrumental variable in this paper is suitable.

Because the dependent variable is a binary indicator and endogenous variables exist in our analysis, it would be appropriate to use an instrumental variable probit model. However, the instrumental variable probit model requires the endogenous variable to be continuous, but as the endogenous variable in this paper is a binary indicator, we

cannot use this model. Therefore, the extended probit regression (eprobit) model is used to estimate Models (1) and (2) because, according to Gregory (2015), it accommodates any covariates, nonrandom treatment assignment, and endogenous sample selection.¹⁰

4. Empirical evidence

4.1. Descriptive statistics: land rentals and defragmentation

Table 10 presents the descriptive statistics for the relationship between land rentals and defragmentation. As shown, the land rentals conducted by 229 lessees result in defragmentation and account for 37.85 percent of the total land rentals, while the land rentals conducted by 118 lessees transacting with acquaintances are accompanied by defragmentation, accounting for 39.33 percent of the land rentals between acquaintances. The land rentals conducted by 111 lessees transacting with non-acquaintances reduce land fragmentation and account for 36.39 percent of the land rentals between non-acquaintances. The results of the Pearson's chi-square test presented in Table 10 show that land rental has a significantly positive relationship with land defragmentation, and there is no significant difference in the relationship between land defragmentation and land rentals when conducted between acquaintances rather than non-acquaintances (see P values). These findings indicate that land rentals are likely to reduce land fragmentation, as noted in the literature (Tan et al., 2006).

However, there is no evidence that land rentals between acquaintances negatively affect defragmentation, as suggested by Matsuoka (1995). The descriptive statistics indicate that land rentals between both acquaintances and non-acquaintances are accompanied by defragmentation, and their effects are similar, implying the enormous potential of land rentals within a village to reduce land fragmentation. A more detailed analysis is provided in the following section.

4.2. The impact of land rentals between acquaintances on defragmentation

Table 11 reports the eprobit model estimates for Model (1) in Column 2 and those for Model (2) in Column 3. The results of the Hausman test indicate that the endogeneity problem exists in the relationship between transaction partner and defragmentation. The results of the under-identification and weak IV test show that our estimates do not face the problem of under-identification and weak IV.

Table 10. Distribution of defragmentation by transaction partner (N = 605).

Type of land rental	Land defragmentation	No land defragmentation
Land rental	229	376
Land rental between acquaintances	118	182
Land rental between non-acquaintances	111	194
Correlation between land rental and defragmentation	Pearson's chi-square	P value
Participation vs. non-participation in land rental	743.0015	0.000
Land rental between acquaintances vs. non-acquaintances	0.5557	0.456

Sources: The authors' calculations using the survey data for three provinces.

¹⁰We use the command *eprobit* in Stata 15.

Table 11. Estimated results of the impact of transaction partner on defragmentation using the eprobit model.

Variable name	Land defragmentation	Land defragmentation
Transaction partner	0.702(1.429)	−1.740(1.217)
Transaction partner × Land rent		0.587*** (0.211)
Land rent		−0.169(0.115)
H_sex	−0.261(0.454)	−0.127(0.379)
H_age	0.002(0.009)	−0.004(0.008)
H_education	0.014(0.022)	0.013(0.020)
H_migration	0.359** (0.159)	0.304** (0.154)
Dependency ratio	−0.071(0.242)	−0.002(0.216)
Off-farm ratio	−0.337(0.305)	−0.191(0.294)
Main family income source (taking farming income as reference)		
Part-time off farm	0.013(0.141)	−0.006(0.123)
Off farm	−0.206(0.225)	−0.286* (0.156)
Agricultural asset	−0.006(0.010)	0.001(0.009)
Land plots	−0.021(0.019)	−0.013(0.017)
Land certificate	0.197(0.216)	0.086(0.188)
Land redistribution	−0.237(0.161)	−0.177(0.145)
Village labor migration	0.063 (0.149)	0.068(0.142)
Village location	−0.024* (0.012)	−0.020* (0.012)
Village economy	−0.000(0.000)	−0.000(0.000)
Village agricultural income	−0.088(0.116)	−0.068(0.110)
Village land certificate	−0.186(0.302)	−0.067(0.240)
Village land distribution	−0.146(0.176)	−0.271* (0.156)
County dummy	yes	yes
Constant	0.833 (1.395)	1.538 (1.347)
Observation	605	605
Log pseudolikelihood	−716.9814	−1286.1647
Hausman test	33.85***	
Under-identification test	18.724***	6.400***
Weak IV test	9.610	3.090

Notes: The eprobit model denotes the extended probit regression model. *, ** and *** represent significance at the 10%, 5% and 1% levels, respectively. Robust standard errors are reported in parentheses.

The coefficient on transaction partner is insignificant in Column 2, indicating that the effect of land rentals conducted by acquaintances on land defragmentation is not different from the effect of rental transactions conducted by non-acquaintances, with similar implications to those in Table 5. Although Matsuoka (1995) argues that land rentals between acquaintances are accompanied by land fragmentation, they ignore the endogeneity problem. Furthermore, their analysis may not apply to rural China because a large number of rental transactions between acquaintances are conducted for the sake of profit (see Table 8), i.e., the land rental markets within the villages in China are no longer closed land markets (Qiu et al., 2020d, 2020c, 2020b, 2018, 2020a). Theoretically, with the development of the rural economy, more market ingredients are embedded into the land rental markets within villages, and the effective functioning of the price mechanism is conducive to optimizing land distribution and reducing land fragmentation no matter who the lessees transact with.

Although the literature argues that a large amount of informality exists in land rentals, transactions between partners who trust each other do not mean informality or imply market failure (Aoki, 1986; Dixit, 2004). Moreover, those transactions between partners with close social relationships reduce transaction costs and other production risks, thus increasing economic performance and transaction prices (Asanuma, 1988; Fukuyama,

1995). Clearly, when the participants are provided with external opportunities, the relation-based transactions among acquaintances can be weakened. Therefore, those lessees renting an acquaintance's land tend to reduce land fragmentation, which is stimulated by the functioning of market principles or the price mechanism.

According to Friedman and Friedman (1980), Luenberger (1995), and Kreps (2013), the market functions through pricing, which is the basis of neoclassical economics. Cheung (1974) also proposes that price rather than contract or transaction partner is an indicator of competitive transactions. In other words, when facing similar land rents, the lessees transacting with acquaintances and non-acquaintances are similarly likely to consolidate fragmented land.

Furthermore, the estimated coefficient on the interaction term in Column 3 of Table 11 is positive at the 1 percent significance level. This indicates that land rentals between acquaintances are more likely to reduce land fragmentation with an increase in land rents. As discussed, market price is the most effective method for distributing factors and realizing the optimal utilization of factors; prices support the functioning of markets (Cheung, 1983). Similarly, land rents determine how cultivated land in the land rental market is distributed and used. Despite social norms and other informal social arrangements, the profit motives still encourage individuals to participate in market competition, thus realizing optimal land utilization.

Among the control variables, the migration of the household head is conducive to land consolidation because the income from off-farm employment increases the household's investments in agriculture. We also find that the further a village is from the nearest town, the less likely defragmentation is to occur because villages near cities have higher land rents, thus increasing agricultural costs and aggravating land fragmentation. Finally, the coefficients on the other variables are insignificant. There are two reasons for this. First, our sample only covers lessees, and land rentals are the crucial determinant of land defragmentation for the farmers. Second, the other control variables only affect land defragmentation by encouraging farmers to transfer land, and thus show no direct impacts.

4.3. Robustness check I: evidence from PSM

We use the propensity score method (PSM) to estimate the impact of land rentals between acquaintances, taking lessees transacting with non-acquaintances as the control group. According to Imbens and Rubin (2015), PSM is based on the counterfactual framework and the key to using PSM is to construct a control group and a treatment group. We use the control variables in Table 9 to match the control group and treatment group, and utilize three matching strategies (nearest neighbor, kernel, and stratification) to estimate the average treatment effect simultaneously.

Table 12 reports the estimates using PSM, and those lessees transacting with non-acquaintances are taken as the control group. The results indicate no significant difference in defragmentation between the land rentals conducted by acquaintances and non-acquaintances; the ATT is insignificant, consistent with the results in Column 1 of Table 11. This finding reconfirms that land rentals inside the acquaintance networks have a similar impact on defragmentation to those outside the acquaintance networks. In addition, we use another indicator to represent land fragmentation, i.e., the increases in land plots after land rentals, which takes the value of 1 if lessees' land plots do not change

Table 12. Robustness test I with evidence from PSM.

Dependent variable	Match strategy	ATT	t
Land defragmentation	Nearest Neighbor	0.058	0.714
	Kernel	0.024	1.212
	Stratification	−0.008	−0.303
Increases in land plots	Nearest Neighbor	0.037	0.628
	Kernel	0.024	1.043
	Stratification	−0.008	−0.202

Notes: *, ** and *** represent significance at the 10%, 5% and 1% levels, respectively.

after land rentals and 0 if they do increase after land rentals. More details about the variable of the increases in land plots after land rentals see the next part. The results show that the ATT in rows 4, 5, and 6 are insignificant, further indicating that there is no difference in the change of land plots between land rentals conducted by acquaintances and non-acquaintances. In general, our estimates are robust when using the counterfactual analysis.

4.4. Robustness check II: substituting the indicator of land defragmentation

According to Tan et al. (2006), there is a negative relationship between land rentals and the number of land plots, indicating that the number of plots does not significantly increase after a land rental. We use a similar indicator (i.e., increases in land plots) to represent land defragmentation, which takes the value of 1 if the number of land plots does not increase after land rental and 0 otherwise. Using the increase in land plots as the variable has two advantages. First, it represents land defragmentation if the number of land plots does not increase after a land rental. Second, it indicates the increase in land size per plot. Table 13 reports the estimates using this indicator and follows a similar estimation strategy to that in Table 11.

The coefficient on the transaction partner in Column 2 of Table 13 is insignificant, indicating that land rentals between acquaintances result in a similar change in land plots to those between non-acquaintances, consistent with the results in Column 2 of Table 11. Additionally, the interaction term in Column 3 of Table 13 indicates a significantly positive impact on the increase in land plots, implying that land rentals between acquaintances are conducive to defragmentation with the increase in land rent. Our estimates are robust when using different measures of land defragmentation.

4.5. Robustness check III: evidence from provincial level data

Although we have demonstrated that the land rentals between acquaintances have similar effects on land fragmentation to those between non-acquaintances at the household level, what is important is whether our results still hold at the macro level. Therefore, we use the number of land plots to measure fragmentation, as suggested by Deininger et al. (2012). While we argue that the number of land plots in cross-sectional data does not accurately measure land fragmentation, the use of panel data can overcome this problem by identifying the variation in the number of land plots over time.

Table 13. Robustness test II with substituting dependent variable.

Variable name	eprobit	eprobit
Transaction partner	−0.754(1.138)	−2.559*(1.526)
Transaction partner × Land rent		0.499*(0.303)
Land rent		−0.120(0.138)
Instrumental variable		
H_sex	−0.268(0.354)	−0.245(0.348)
H_age	0.010(0.007)	0.006(0.007)
H_education	−0.009(0.021)	−0.008(0.020)
H_migration	0.106(0.164)	0.103(0.150)
Dependency ratio	−0.276(0.230)	−0.214(0.223)
Off-farm ratio	−0.443(0.277)	−0.377(0.273)
Main family income source (taking farming income as reference)		
Part-time off farm	0.024(0.127)	0.019(0.122)
Off farm	−0.079(0.195)	−0.152(0.171)
Agricultural asset	−0.010(0.008)	−0.006(0.008)
Land plots	−0.027(0.017)	−0.025(0.018)
Land certificate	0.247*(0.144)	0.206(0.143)
Land redistribution	−0.293*(0.171)	−0.268*(0.160)
Village labor migration	−0.010(0.152)	0.003(0.144)
Village location	−0.005(0.010)	−0.006(0.010)
Village economy	−0.000(0.000)	−0.000(0.000)
Village agricultural income	−0.064(0.104)	−0.073(0.103)
Village land certificate	−0.196(0.204)	−0.164(0.191)
Village land redistribution	0.004(0.159)	−0.123(0.163)
County dummy	yes	yes
Constant	0.754(1.138)	1.536(1.383)
Observation	605	605
Log pseudolikelihood	−746.3829	−1320.8665
Underidentification test	10.613***	6.400**
Weak identification test	10.339	3.090

Notes: *, ** and *** represent significance at the 10%, 5% and 1% levels, respectively.

Robust standard errors are reported in parentheses. The extended probit regression model is used and more details about this method see the part of estimation strategy.

Additionally, the provincial panel data from 2006 to 2016 come from three sources. The number of land plots is collected from the SDNRFOP. The data on land rental markets are collected from the SARRM, provided by the Ministry of Agriculture and Rural Affairs of the People's Republic of China. The data on the arable land area are collected from the Rural Statistical Yearbook of China.

Table 14 reports the estimates, and the estimated results in Column 2 show that land transfer within the villages has a negative impact on land fragmentation, having similar implications to that in Tables 10 and 11. The estimated coefficient on the interaction term in Column 3 is negative at the 5 percent significance level, meaning that land transfer within the villages has an increasingly positive effect on defragmentation as the non-grain probability increases, consistent with the results in Table 11. Theoretically, consolidating fragmented land results in higher transaction costs and lessees consolidate land only if the expected income from land rentals is sufficient to offset the transaction costs. The functioning of prices is crucial in this process because less land use control means the existence of a relatively competitive market and less rent dissipation. In general, our estimates are consistent between the household and province levels.

Table 14. Robustness test III with evidence from the provincial level data.

Variable name	Fixed effects model	Fixed effects model
land transfer within the villages	-1.581*(0.831)	0.498(1.534)
Non-grain probability		-4.293*** (1.350)
land transfer within the villages × Non-grain probability		-9.170** (4.526)
Household size	-0.010(0.066)	0.017(0.064)
Land area per household	0.506*** (0.093)	0.456*** (0.093)
Labor migration	-1.501*(0.812)	-1.377*(0.788)
Land contract	-2.691*** (0.628)	-2.241*** (0.626)
Province dummy	yes	yes
Constant	44.204*** (9.713)	39.060*** (9.462)
Observation	300	300
F-test	91.83***	85.59***
R-square (overall)	0.1010	0.0997

Notes: *, ** and *** represent significance at the 10%, 5% and 1% levels, respectively. Robust standard errors are in parentheses.

5. Concluding remarks

It is well known that land fragmentation is a serious impediment to farm productivity and agricultural development. Developing land rental markets is suggested as an effective and decentralized approach to consolidating fragmented land. The literature proposes that large numbers of land rental transactions are conducted by acquaintances within the villages, and that these transactions promote land fragmentation. It is also suggested that land rentals between acquaintances are often highly informal and inefficient.

We use household-level data from three provinces in China to assess the relationship between land rentals between acquaintances and defragmentation. The statistical evidence shows that 39.33 percent of land rentals between acquaintances and 36.99 percent between non-acquaintances are accompanied by decreases in land fragmentation, respectively. The econometric results further indicate that the impact of land rentals between acquaintances does not differ from that between non-acquaintances when considering the endogeneity problem. We also find that land rentals between acquaintances are more likely to result in defragmentation as land rents increase. Further evidence shows that the land rents between acquaintances and between non-acquaintances are converging in China's land rental markets, which is crucial to understanding the similar effects of land rentals conducted by different transaction partners. Several robustness checks verify the reliability of our analyses.

As suggested by the policies of many countries, land rental markets optimize land distribution and stimulate defragmentation. Land rental markets might work better than expected. First, because the farmers consolidate their land voluntarily based on the market principle, it is less costly than that through public intervention. Second, land consolidation both increases land scale and optimizes the distribution of factors. What is most remarkable is that land rentals between acquaintances, which are denounced by many researchers, also stimulate defragmentation in rural China, implying that some crucial transitions have emerged. In particular, with the development of the rural economy, the market ingredients have become embedded in farmers' daily interactions, thus greatly improving the spread of the market mechanism in rural areas. This paper demonstrates that once competition emerges between acquaintances and strangers, more and more individuals tend to transfer land for the sake of profit.

With the decreased growth rate of land transfers in China,¹¹ the market orientation of land rentals between acquaintances shows great potential to improve the efficiency of the land rental market. In other words, the government should pay more attention to the rental transactions within the villages rather than only subsidizing and encouraging land rentals by individuals from outside the village or economic organizations such as firms and cooperatives. Additionally, there are still large numbers of land rentals within the villages, which may be subject to public intervention if developing the land rental market remains a policy goal. To avoid the distortion of the land rental markets caused by public intervention, improving the functioning of prices inside the villages is an alternative to reducing land fragmentation in the short term, i.e., the government should encourage more lessees and lessors within the villages to participate in the land rental markets.

Moreover, family farms or smallholder farmers are still the main agriculture managers in China. If the large-scale management of agriculture is a long-term objective and there is no better way to realize this goal in the short term, encouraging smallholder farmers to rent land is an effective way to reduce land fragmentation and increase farm productivity. Furthermore, compared with the land rentals outside acquaintance networks, land rentals inside acquaintance networks have an advantage of reducing transaction costs. Improving the potential for land rentals between smallholder farmers may be an important approach to increasing farm efficiency in rural China.

However, it should be noted that rental transactions inside acquaintance networks are likely to result in other efficiency losses, even though the price mechanism is conducive to reducing land fragmentation. For example, the acquaintance networks may prevent outside villages or economic organizations from renting land, thereby reducing the capital in agriculture and farm efficiency because it is difficult for smallholder farmers in China to apply for large loans. Thus, more attentions should be paid to other potential influences of land rentals inside acquaintance networks in the future.

Additionally, whether the conclusion in this paper applies to other regions such as southwest China is ambiguous. This is because relation-oriented land rentals are likely to exist in poor regions, which may aggravate land fragmentation. However, the market orientation of land rentals between acquaintances is demonstrated by Qiu et al. (2018) using data from 29 provinces in China. Meanwhile, a recent research using data from five provinces (i.e., Yunnan, Guizhou, Sichuan, Chongqing, Guangxi) located in southwest China, which is regarded as less-developed regions of China, shows that no difference in land rents for different types of transaction partners after accounting for endogeneity, even though relation-oriented rental transactions are popular in less-developed regions. After excluding rent-free transactions, the land rents between kins are 677.143 yuan/mu per year on average (Qiu, Luo, Gen, & Zhu, 2020e). This evidence indicates that the increase of market-oriented land rentals has become a universal phenomenon in rural China, which has great potentials to lower land fragmentation.

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¹¹According to the SARRM, the land transfer rate in 2015 was 33.3 percent compared with 35.1 percent in 2016, meaning that the growth rate was much lower than that from 2008 (8.9 percent) to 2014 (30.4 percent).

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References

- Abdulai, A., Owusu, V., & Goetz, R. (2011). Land tenure differences and investment in land improvement measures: Theoretical and empirical analyses. *Journal of Development Economics*, 96(1), 66–78.
- Aoki, M. (1986). Horizontal vs. vertical information structure of the firm. *American Economic Review*, 76(5), 971–983.
- Asanuma, B. 1988. *Japanese manufacture-supplier relationships in international perspective: The automobile case*. Kyoto University Working Paper. <http://hdl.handle.net/2433/37903>
- Bodea, C., & Hicks, R. (2015). International finance and central bank Independence: Institutional diffusion and the flow and cost of capital. *The Journal of Politics*, 77(1), 268–284.
- Cai, F. (2018). The great exodus: How agricultural surplus laborers have been transferred and reallocated in China's reform period? *China Agricultural Economic Review*, 10(1), 2–15.
- Carter, M. R., & Yao, Y. (2002). Local versus global separability in agricultural household models: The factor price equalization effect of land transfer rights. *American Journal of Agricultural Economics*, 84(3), 702–715.
- Cheung, S. N. S. (1974). A theory of price control. *Journal of Law & Economics*, 17(1), 53–71.
- Cheung, S. N. S. (1983). The contractual nature of the firm. *Journal of Law & Economics*, 26(1), 1–21.
- Deininger, K., & Jin, S. (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., & Jin, S. (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.
- Deininger, K., Savastano, S., & Carletto, C. (2012). Land fragmentation, cropland abandonment, and land market operation in Albania. *World Development*, 40(10), 2108–2122.
- Dixit, A. K. (2004). *Lawless and economics: Alternative modes of governance*. Princeton: Princeton University Press.
- Dorner, P. (1977). Land ownership and tenure. In E. R. Duncan (Ed.), *dimensions in world food problems*. Ames: Iowa State University Press. pp. 90–104.
- Feng, S., Heerink, N., Ruben, R., & Qu, F. (2010). Land rental market, off-farm employment and agricultural production in Southeast China: A plot-level case study. *China Economic Review*, 21(4), 598–606.

- Friedman, M., & Friedman, R. (1980). *Free to choose*. New York and London: Harcourt Brace Jovanovich.
- Fukuyama, F. (1995). *Trust: The social virtues and the creation of prosperity*. New York: Free Press Paperbacks.
- Ghebru, H., & Holden, S. (2015). Reverse-share-tenancy and agricultural efficiency: Farm-level evidence from Ethiopia. *Journal of African Economies*, 24(1), 1–25.
- Gregory, C. A. (2015). Estimating treatment effects for ordered outcomes using maximum simulated likelihood. *Stata Journal*, 15(3), 756–774.
- Hart, O. (2008). Economica Coase lecture: Reference points and the theory of the firm. *Economica*, 75(299), 404–411.
- Hart, O., & Moore, J. (2007). Incomplete contracts and ownership: Some new thoughts. *The American Economic Review*, 97(2), 182–186.
- Hart, O., & Moore, J. (2008). Contracts as reference points. *Quarterly Journal of Economics*, 123(1), 1–48.
- Holden, S., & Ghebru, H. 2005. *Kinship, Transaction Costs and Land Rental Market Participation*. https://www.researchgate.net/publication/228368790_Kinship_Transaction_Costs_and_Land_Rental_Market_Participation
- Imbens, G. W., & Rubin, D. B. (2015). *Casual inference for statistics, social, and biomedical sciences*. Cambridge: Cambridge University Press.
- Jia, L., & Petrick, M. (2014). How does land fragmentation affect off-farm labor supply: Panel data evidence from China. *Agricultural Economics*, 45(3), 369–380.
- Kajii, I. 1990. Bunsan kochisei kokufuku no kadai (Unresolved issues in overcoming land fragmentation), in Kaji, I. (ed), *Nojosei nogyo ni kansuru kenkyu (The Study of Large Scale Farming on Consolidated Farmland)*. Norin Tokei Kyokai, Tokyo. pp. 3–23.
- Kawasaki, K. (2010). The costs and benefits of land fragmentation of rice farms in Japan. *Australian Journal of Agricultural & Resource Economics*, 54(4), 509–526.
- Kimura, S., Otsuka, K., Sonobe, T., & Rozelle, S. (2011). Efficiency of land allocation through tenancy markets: Evidence from China. *Economic Development and Cultural Change*, 59(3), 485–510.
- King, R. L., and Burlton, S. P. 1982. Land fragmentation, a fundamental rural spatial problem. *Profess in Human Geography*, 6: 475–494.
- Kreps, D. M. (2013). *Microeconomic foundation I: Choice and competitive markets*. Princeton: Princeton University Press.
- Lipton, M. (1968). The theory of the optimising peasant 1. *Journal of Development Studies*, 4(3), 327–351.
- Liu, Y., Wang, C., Tang, Z., & Nan, Z. (2018). Will farmland transfer reduce grain acreage? Evidence from Gansu province, China. *China Agricultural Economic Review*, 10(5), 277–291.
- Liu, Y., Yang, R., Long, H., Gao, J., & Wang, J. (2014). Implications of land-use change in rural China: A case study of Yucheng, Shandong province. *Land Use Policy*, 40(40), 111–118.
- Luenberger, D. (1995). *Microeconomic theory*. New York: McGraw-Hill.
- Ma, X., Heerink, N., Feng, S., & Shi, X. (2015). Farmland tenure in China: Comparing legal, actual and perceived security. *Land Use Policy*, 42, 293–306.
- Ma, X., Heerink, N., van Ierland, E., van den Berg, M., & Shi, X. (2013). Land tenure security and land investments in Northwest China. *China Agricultural Economic Review*, 5(2), 281–307.
- Macours, K., De Janvry, A., & Sadoulet, E. (2010). Insecurity of property rights and social matching in the tenancy market. *European Economic Review*, 54(7), 880–899.
- Matsuoka, A. 1995. An economic study on the fragmented agricultural holdings in Japan (In Japanese). *Memoirs of the College of Agriculture, Ehime University*, 39: 207–307.
- Nguyen, T., Cheng, E., & Findlay, C. (1996). Land fragmentation and farm productivity in China in the 1990s. *China Economic Review*, 7(2), 169–180.
- Ntihinyurwa, P. D., de Vries, W. T., Chigbu, U. E., & Dukwiyimpuhwe, P. A. (2019). The positive impacts of farm land fragmentation in Rwanda. *Land Use Policy*, 81, 565–581.

- Qiu, T., Choy, S. T. B., He, Q., Li, Y., & Luo, B. (2020d). The impact of land renting-in on farm productivity: Evidence from in maize production China. *China Agricultural Economic Review, Online*, 13(1), 78–95.
- Qiu, T., Luo, B., Choy, S. T. B., Li, Y., & He, Q. (2020c). Do land renting-in and its marketization increase labor input in agriculture? Evidence from rural China. *Land Use Policy*, 99, 104820.
- Qiu, T., Luo, B., Choy, S. T. B., Ma, X., & He, Q. (2020b). Do the transactions between strangers have demonstration effect on those among acquaintances? Evidence from land rentals in rural China. *Applied Economics*, 52(43), 4780–4793.
- Qiu, T., Luo, B., Gen, P., & Zhu, M. (2020e). Market-oriented land rentals in the less-developed regions of China. *Applied Economics Letters, Online*. doi:10.1080/13504851.2020.1786492
- Qiu, T., Luo, B., & He, Q. 2018. Are land rents lower in transactions between acquaintances? New evidences from rural China. SSRN Working Paper. SSRN: <https://ssrn.com/abstract=3269680>
- Qiu, T., Luo, B., & He, Q. (2020a). Does land rent between acquaintances deviate from the reference point? Evidence from rural China. *China & World Economy*, 28(3), 29–50.
- Rahman, S., & Rahman, M. (2009). Impact of land fragmentation and resource ownership on productivity and efficiency: The case of rice producers in Bangladesh. *Land Use Policy*, 26(1), 95–103.
- Rozelle, S., & Li, G. (1998). Village leaders and land-rights formation in China. *American Economic Review*, 88(2), 433–438.
- Tan, S., Heerink, N., & Qu, F. (2006). Land fragmentation and its driving forces in China. *Land Use Policy*, 23(3), 272–285.
- Wan, G., & Cheng, E. (2001). Effects of land fragmentation and returns to scale in the Chinese farming sector. *Applied Economics*, 33(2), 183–194.
- Wang, Y., Li, X., Li, W., & Tan, M. (2018). Land titling program and farmland rental market participation in China: Evidence from pilot provinces. *Land Use Policy*, 74, 281–290.
- Wang, H., Riedinger, J., & Jin, S. (2015). Land documents, tenure security and land rental development: Panel evidence from China. *China Economic Review*, 36, 220–235.
- Wang, H., Tong, J., Su, F., Wei, G., & Tao, R. (2011). To reallocate or not: Reconsidering the dilemma in China's agricultural land tenure policy. *Land Use Policy*, 28(4), 805–814.
- Zhang, D. (2016). Understanding China from a household's perspective: Studies based on the China Household Finance Survey (CHFS). *Emerging Markets Finance & Trade*, 52(8), 1725–1727.
- Zhou, Y., Shi, X., Heerink, N., & Ma, X. (2019). The effect of land tenure governance on technical efficiency: Evidence from three provinces in Eastern China. *Applied Economics*, 51(22), 2337–2355.