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Do Chinese farmers benefit from farmland leasing choices? Evidence from a nationwide survey*

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Using China Family Panel Studies (CFPS), this study investigates factors associated with the choice of farmland leasing strategies and the impact of leasing options on farm performance. Particular attention is given to off-farm employment and farm subsidies. Additionally, the study applies a selectivity-based approach to assess the relationship between farmland leasing choices and farm businesses' performance. Off-farm employment, older and educated operators, large farms and old-age pension plans increase the likelihood of leasing out farmland. Part-time off-farm employment, grain subsidies and mechanised farms increase the likelihood of leasing in farmland. Finally, the selectivity correction terms in the value of crop production are significantly negative in the choices of farmland leasing, indicating the presence of sample selection effects. Accounting for selectivity is essential to ensure unbiased and consistent estimates.

Key words: farmland leasing, value of crop production, selectivity correction, Bourguignon-Fournier-Gurgand method.

1. Introduction

China has the world's largest population, and 35 per cent of China's population is employed in the agricultural sector. In recent years, rapid urbanisation has increased off-farm work opportunities for members of rural Chinese households. Many young people are migrating from rural to urban areas for better wages and income (Che 2016), which has significant effects on production agriculture. For example, women and the elderly, who tend to be

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less productive than younger and male workers, make up the majority of the labour force in agricultural production (Giles and Mu 2017). Additionally, migration has led to farmland being idle. Thus, there is potential to reconfigure farmland to operators with a relatively higher level of production efficiency through farmland lease market to guarantee sustainability, the viability of farming, food security and urban development.

To advance the development of the farmland leasing market, a series of actions have been taken by the Chinese government. Apart from farmland lease market, agricultural subsidies are provided to rural households to maintain the farmland. The effect of these related policies appears to be a rapid development of the farmland market in rural China in recent years. The rental rate of farmland in rural China had reached to 30.4 per cent in 2014 with an annual growth rate of 14.64 per cent in the last 18 years (Li 2016). This phenomenon has spawned increasing studies on factors affecting participation in farmland lease market and the benefit from it (Ito *et al*. 2016; Min *et al*. 2017).

Policies play a key role in the development of farmland lease market. Agricultural subsidies aim to stimulate leasing in farmland and maintain farming, while the policies of urbanisation and off-farm employment tend to encourage rural households to lease out farmland. Therefore, agricultural subsidies have received attention in the literature (Qian *et al*. 2018), but mainly focusing on food security and rural development. To the best of our knowledge, none has addressed the impact of agricultural subsidies on the choice of farmland leasing. Similarly, few studies have assessed the importance of off-farm employment on farmland leasing behaviour (Kung 2002; Huang *et al*. 2012; Che 2016). Che (2016) found that households with more members participating in either migration or local off-farm work are more likely to rent out land and less likely to rent in land. However, Che (2016) this study used 2003 survey data from six provinces of China and took agricultural tax into account, even though the Chinese government began eliminating the agricultural tax on rural Chinese in 2000.

The above studies fail to address some important issues. First, studies fail to model the simultaneous impact of agricultural subsidies and off-farm labour supply on the choice of farmland leasing behaviour of rural Chinese households. Second, studies also fail to address the impact of the choice of farmland leasing on the performance of agricultural production (measured by the value of crop production[1] in this study). Third, the sample size used in the above studies was small, and the surveys were conducted in the early 2000s and included agricultural taxes (Che, 2016), though these taxes have been eliminated in recent years. Finally, the above studies did not consider self-selection bias in their analysis of farmland leasing and its impact on farm performance.

Therefore, the objectives of this study are twofold. First, to assess the impact of grain subsidies and off-farm employment on farmland leasing

[1] This includes revenue from selling crops (e.g. rice, maize, wheat, etc) or the potential to receive money from selling it in the market.

choices of rural Chinese farmers; and second, to assess the impact of a farmland leasing choice on the value of crop production (a measure of farm performance). We account for selectivity bias in the observed value of crop production from a farmland leasing choice, recognising that Chinese farmers are aware of the land quality which is hardly be observed by others, and the managerial skills and educational level of rural households which are regarded as comparative advantage influences their participation of the farmland leasing market and non-farm activities. This study uses a large, nationally representative household survey data covering more than 6,000 rural Chinese households. Finally, we correct for the possible selection bias related to the choice of farmland leasing by applying the Bourguignon–Fournier–Gurgand (BFG) econometric method developed by Bourguignon *et al.* (2007).

The next section gives background on the farmland lease market in China. Section 3 presents the econometric framework and empirical specification. Section 4 provides details of the data and description of variables. The empirical results and discussion are presented in Section 5. Section 6 concludes the paper.

2. Background and literature review

Rights of farmland in rural China are regulated by China's Household Contract Responsibility System. Assigned rural households only have the original contractual and operational rights of farmland, not the ownership (Wang and Zhang 2017). The egalitarian principle of distributing and reallocating land use rights to rural households according to household size results in farmland fragmentation, which impedes the growth of agricultural production in China. Large-scale mechanised farming is one of the key pathways to modernising the agricultural sector and reallocating farmland from unsuccessful operators to more productive and successful operators (Deininger and Byerlee 2012). In the Property Law of the People's Republic of China promulgated in 2007, land use rights are defined not only as of the right to farm the land but also as contractors' rights to lease, exchange and swap land (Khantachavana *et al.*, 2013). The farmland leasing market is significant to China in general and to rural China, in particular. In 1996, just 2.3 per cent of rural households rented in land in some parts of China, especially in the Guizhou, Hunan and Yunnan provinces (Deininger and Jin, 2005). Under a series of market-oriented land rights reform, achieved by enhancing security and transferability program, land rental[2] markets developed gradually in recent years.

We focus on China's agricultural subsidies, farmland leasing and agricultural production. Figure 1 reveals an increasing trend in the number of workers migrating from rural to urban areas in recent years. For instance, the

[2] The land rental is characterized by oral and short-term rental contracts, as well as zero or low land rents that are below the average market price.

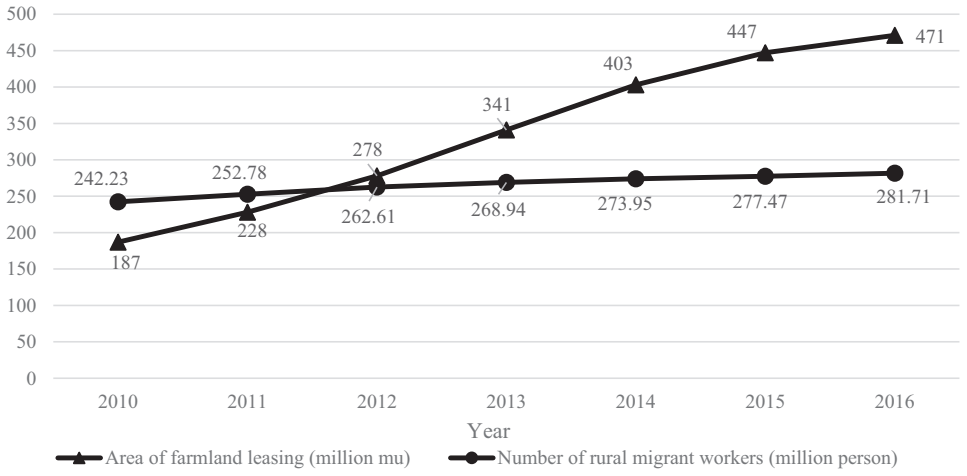

Figure 1 Area of farmland leasing and number of rural migrant workers, 2010 to 2016.
Note: Data were partly obtained from the National Bureau of Statistics of China and the China Statistical Yearbook published by the National Bureau of Statistics of China. The Report of Rural Migrant Workers Monitoring Survey of 2010–2017, from National Bureau of Statistics of the People's Republic of China, available at: http://www.stats.gov.cn/tjsj/zxfb/201804/t20180427_1596389.html

number of rural workers migrating to urban areas for non-farm jobs increased from about 242 million in 2010 to about 282 million in 2016. Off-farm employment is one of the significant factors in rural Chinese households' choice of farmland leasing. Also, a study by Che (2016) using 2003 survey data[3] from six provinces in China showed an increasing number of household members participating in either migration or local off-farm work. Further, the author concluded that households are more likely to lease out the land and less likely to lease in the land. Figure 1 reveals that the area of farmland under leasing activities increased from about 187 million mu to about 471 million mu during the 2010–2016 period.

Table 1 shows that total agricultural subsidies in China's grain sector increased from about 138 billion yuan to about 165 billion yuan during the 2011–2015 period. Agricultural subsidies can be mainly divided into four groups. These include direct grain subsidy, high-quality seed subsidy, farm machinery subsidy and comprehensive input subsidy. Among the four types of subsidies, the direct grain subsidy, quality seed subsidy and comprehensive input subsidy are given directly to farmers who grow grain crops, and the machinery subsidy is given when farmers purchase agricultural machinery. The direct grain subsidy[4] is paid to the farmers who are mainly grow rice, wheat, soybean and corn; paid on the basis of the farmland area, but the subsidy standard varies in different places. Overall, the implementation of

[3] Che (2016) measured off-farm work as participation by household members in off-farm activities in a village group. Note that the Chinese government began eliminating agricultural tax on rural Chinese in 2000.

[4] See Huang *et al*. 2011 for details on the implementation of the grain subsidy to farmers.

Table 1 Subsidy, area of farmland and grains, and yield of grain, China 2011–2016

	2011	2012	2013	2014	2015	2016
Grain subsidies (billion Yuan)	138.1	166.8	166.9	167.3	165.2	—
Growth rate (%)		20.78	0.06	0.24	−1.26	—
Area of farmland (million hectares)	135.24	135.16	135.16	135.06	135.00	134.92
Area in grains (million hectares)	110.57	111.21	111.96	112.72	113.34	113.03

Note: Data of grain subsidies were collected from China Agricultural Development Report 2011 – 2016, available at: http://gb.oversea.cnki.net. Other data were collected from China Statistical Yearbook 2017, compiled by National Bureau of statistics of China, available at: http://www.stats.gov.cn/tjsj/ndsj/2017/indexch.htm.

agricultural subsidies by regions can be summarised into three types: (i) the amount of contracted farmland that a household was allocated during the late 1990s; (ii) the actual farmland area allocated to grains; and (iii) the taxable grain-sown area and production target for a normal year[5]. To date, most researchers found that the grain subsidy is based mostly on the amount of contracted households' land allocation during the late 1990s[6].

Farmland leasing allows rural households to adjust their farm size, which may improve labour productivity and efficiency of agricultural production. In a developing country case, Pender and Fafchamps (2006) analysed the farmland lease market and agricultural production efficiency in Ethiopia. The authors found no statistical significant difference in yields (or output value per hectare) between farmers who leased in land and farmers who leased out land. The advantage of participation in farmland leasing markets is: (1) it is profitable for rural households to lease out farmland and receive rents; and (2) leasing in farmland households can increase the size of the operation and exploit economies of scale. Moreover, large farms are better able to capture the advantages of technological progress and increasing returns to size.

The above studies fail to address a couple of issues central to the development of the farmland leasing market and policy discussion among policymakers in China. First, there is little or no evidence on the simultaneous impact of grain subsidies and off-farm employment on the choice of farmland leasing arrangements in China. Second, what is the effect of farmland leasing choices on the value of crop production? In other words, do smallholders benefit (economically) from leasing in farmland? Recall that rural Chinese households are aware of comparative advantages in farm and off-farm work. Households also know the quality of the originally contracted farmland, leading to significant variances in the choice of farmland usage. For example, rural Chinese households with higher farming skills may tend to

[5] Before 2004, agricultural tax levied on rural households was one source of revenue for the Chinese government. However, after 2004 agricultural tax law has been abolished (Wang and Zhang, 2017).

[6] Under HRS, farmers' land use rights expired within a certain number of years. From 1983 to 1997 the first round of a contract term for land use rights was 15 years. Subsequently the Government extended the contract term for another 30 years (from 1998 to 2028). In this period, farmers have a secure land use right.

lease in farmland, but those with lower farming skills may tend to seek off-farm opportunities and lease out farmland. Rural households self-select themselves into farmland leasing decisions; therefore, unobserved attributes may affect output and the value of crop production, in general.

3. Model and empirical specification

The rural Chinese household's choice of farmland leasing is based on utility maximisation among M alternatives, where V_{ij}^{*} depends on features of the leasing choices and the i^{th} farmer's attributes and finances. Farmland leasing choices are as follows: (1) non-participation; (2) farmland leased out; and (3) farmland leased in. Therefore, the utility of the rural household that chooses from M (j = 1,2,..M) mutually exclusive farmland leasing options depends on a set of observable exogenous variables, z estimated parameters α and unobservable stochastic component γ_{ij}. Specifically:

$$V_{ij}^{*} = Z\alpha_j + \gamma_{ij} \text{ where } i = 1, 2, ..., N; j = 1, 2, ...M \tag{1}$$

Recall that we observe whether a farmland leasing choice was chosen so that $V_j = 1$ if choice j is chosen and $V_j = 0$ otherwise. Given the choice of farmland leasing (the decision to use engage in farmland leasing), the value of crop production by the farmer can be shown as:

$$V_1 = X\beta_1 + \mu_1 \tag{2}$$

where X is a set of exogenous variables affecting the value of crop production from the farmland leasing option and β is the set of estimated parameters. μ_1 is the disturbance term and satisfies $E(\mu_1|X) = 0$ and Var $(\mu_1|X) = \sigma^2$. In the literature on selection bias correction based on a multinomial logit model, the approach initiated by Dubin and McFadden (1984) as well as the semi-parametric alternative proposed by Dahl (2002) is preferred to the most commonly used Lee (1983) method (Bourguignon *et al.* 2007). Because Lee's method is based on the Heckman two-stage selection model (Heckman 1979), the estimate of Heckman inverse Mills ratio in each group of rural households' value of crop production depends on the correlation between the disturbance term of each value equation γ_{ij} and the cumulative distribution of ε_M, where:

$$\varepsilon_M = \max\left(V_{ij}^{*} - \gamma_M\right),\ j \neq M \tag{3}$$

Note that the γ_j elements are independent and identically Gumbel distributed, the cumulative distribution function is $G(\gamma) = \exp(-e^{-\gamma})$ and the density function is given by $g(\gamma) = \exp(-\gamma - e^{-\gamma})$, leading to the multinomial logit model (MNL) model. The probability that the M^{th} alterative is preferred is given by:

$$P_M = \frac{\exp(Z\gamma_M)}{\sum_j \exp(Z\gamma_j)} \tag{4}$$

The MNL model offers a framework for dealing with selectivity effects in discrete choice models and has distinct theoretical and empirical advantages (see Basuroy and Nguyen (1998). Maximum likelihood can estimate the parameters of the MNL model, but the estimation of the equation for the value of crop production requires additional assumptions.[7] Bourguignon *et al.* (2007) pointed out that it would lead to unnecessary constraints of the selectivity correction when combined with information based on multiple logit models. The BFG method initiated by Bourguignon *et al.* (2007) considers the correlation between the disturbance terms μ_1 from each value equation and the disturbance terms γ_{ij} from each multinomial logit equation with the assumption that the expected value of μ_1 and γ_{ij}^* is linearly related for every j,

$$E[\mu_1|\gamma_1.....\gamma_M] = \sigma \sum_{j=1,...,M} q_j^* \gamma_{ij}^* \tag{5}$$

where q_j is the correlation coefficient between μ_1 and σ is the standard deviation of the disturbance term from the value of crop production equation. From the MNL model, BFG derive the conditional expectation of γ_{ij}^*. Therefore, given that the first option of farmland leasing ($j = 1$), the value equation of value of crop production (per mu), V_1, is given by:

$$V_1 = X\beta_1 + \sigma\left[q_1^* m(P_1) + \sum_{j=1,...,M} q_j^* m\left(P_j\right)\frac{P_j}{P_j - 1}\right] + w_1 \tag{6}$$

where P_1 is the probability that the first alternative is preferred, $m(P_1)$ is the conditional expectation of γ_{ij}^*, $m(P_j)$represents the conditional expectations of γ_{ij}^*, and $m\left(P_j\right)\frac{P_j}{P_j-1}$ is the expectations of γ_{ij}^* for all $j \neq 1$. The number of options of farmland leasing is equal to the number of bias correction terms in Equation (5). Note that each conditional expectation can be computed numerically. The residual error term is w_1 and is independent of the regressors. In the first stage, the discrete choice model from Equation (4) is estimated by maximum likelihood methods to obtain $\hat{\alpha}$. Given that farmland leasing option is chosen, the second stage as specified in Equation (6) is estimated by OLS, recognising that the disturbances are heteroskedastic and correlated across the sample observations. Finally, since the survey data used in this study come from a complex sample survey (see Appendix A1), the true

[7] BFG define standard normal variables, $\gamma_{ij}^* = \Phi^{-1}\left[G\left(\gamma_j\right)\right]$, where Φ is the standard normal cumulative distribution functions.

standard errors could be significantly underestimated (see Cameron *et al.,* 2008). To solve this issue, we compute the cluster-robust standard errors as proposed by Cameron and Miller (2015). Cluster-robust standard errors are now widely used, popularised in part by Rogers (1993), which incorporated the method in Stata (Wooldridge 2010). The assumption is that the clusters are drawn as a simple random sample from some population. The observations must be obtained within each cluster by some repeatable procedure (such as bootstrapping). Similar cluster-robust standard errors technique has been used by Ma, Renwick and Grafton (2018). In our case, we use the bootstrap-based cluster-robust standard errors to draw accurate cluster-robust standard inferences from our analysis. We use 400 bootstrap iterations, with replacement, at the community level (see Appendix A1).

The BFG approach for dealing with selectivity has advantages over current methods. The method identifies not only the direction of the bias related to the choice of a farmland leasing option but also which leasing plan is the source of the bias. This is accomplished by estimating a different selectivity term for each farmland leasing strategy, rather than following Lee's approach that estimates a single selectivity effect for all leasing strategies together. The selectivity correction accounts for all the correlations between the disturbance terms of the value of crop production equations and the unobservable stochastic components driving the choice of farmland leasing. Restrictive assumptions, required to implement commonly used selectivity methods, are relaxed. Finally, the option of leasing in or leasing out will be estimated using the BFG method, and the selectivity term will then be used in the value of the crop production equation.

4. Data and description of variables

This study employs data from the 2012 wave of the China Family Panel Studies (CFPS 2012) launched by Peking University. CFPS is a nearly nationwide, comprehensive, longitudinal social survey in contemporary China (Xie and Lu 2015). The baseline survey was conducted in 2010, covering 25 provinces of mainland China and representing 95 per cent of the Chinese population (14,798 families), and the follow-up survey in 2012 re-interviewed 13,316 families or about 90 per cent of the original sample (Xie and Zhou 2014). Except for the division of urban and rural areas, a continuously measured socioeconomic indicator (SEI) was used whenever possible for implicit stratification. The survey queries the household member (usually the head) who makes day-to-day decisions regarding farming.[8] Among the 6,084 rural households, 4,713 did not participate in the farmland

[8] Head of household (HH) in our study refers to one who makes day-to-day decision on farming and farm-related activities, including crops grow, inputs and finances. HH also has the knowledge of members of the household, including age, educational attainment and work on and off the farm.

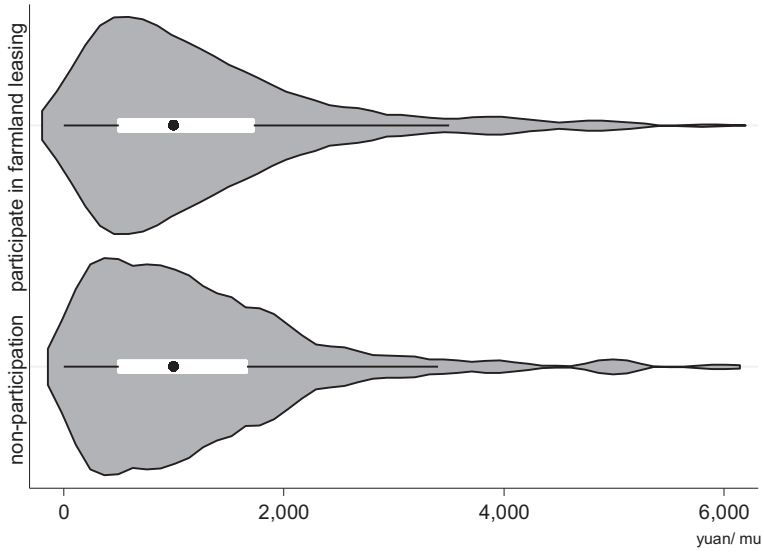

Figure 2 Participation of farmland leasing and value of crop production

leasing market, 306 leased out farmland, and 1,065 leased in farmland. The survey also collected information on the value of crops produced (per mu) for the last 12 months, a variable of interest in this paper. We use value of crop production (yuan/mu)[9] in the second stage because it is an indicator of farm performance that is widely used in the development economics literature (see Park, Mishra and Wozniak, 2014). Additionally, farms throughout Asia are predominantly small; Chinese rural households are no exception, and most of them are subsistence farms. Thus, it is hard to measure the market value of their production.

Figures 2 and 3 present violin plots of the value of crop production among various groups of rural households. Through a box plot with the visual information provided by a local density estimator and the basic summary statistics, the violin plot performs well in revealing the distributional structure in a variable. Moreover, it 'boxes' the data with mirrored density curves and labels the y-axis at the minimum, median and maximum observed data values. Figures 2 and 3 demonstrate that most rural households have small-scale farms. Second, compared to rural households that leased in farmland, rural households that leased out farmland had lower values of crop production.

Table A1 shows that the value of crop production was about 1,897 yuan for rural households that did not participate in farmland leasing activities. However, the value of crop production was about 2,780 yuan for rural

[9] We realize the problem of overestimation or underestimation of the value of crop production. However, in China, anecdotal and empirical evidence suggests that rural households tend to underestimate the value of crop production (see Xianchun 2014; Zhang *et al*. 2018).

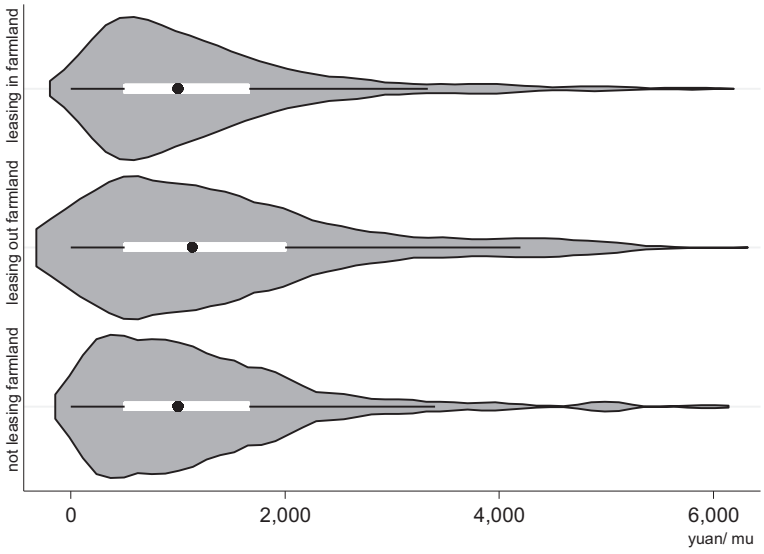

Figure 3 Farmland leasing choice and value of crop production

households that lease out farmland and 1,778 yuan for rural households that leased in farmland. Table A1 reports that, compared to the rural households that leased out farmland, rural households that leased in farmland tend to have younger heads of household (HH), and most of them (63 per cent) are male-headed households. The size of rural households that leased out farmland was smaller (4.0 members) than that of rural households that leased in farmland (4.2 members). Turning our attention to labour force participation, Table A1 shows that about 17 per cent of rural households not participating in farmland leasing markets had members working part-time off-farm jobs. Interestingly, the share of part-time workers in rural households that lease out farmland was lower (11.8 per cent) than in rural households leasing in farmland (20.6 per cent). However, the share of full-time workers with off-farm jobs was highest for rural households leasing out farmland (14.9 per cent). Table A1 reveals that rural households that leased in farmland held less land area allocated in initially contracted farmland, but they owned higher values of agricultural machinery than rural households that leased out farmland. Between 68 per cent and 76 per cent of rural farms in the sample, regardless of their farmland leasing choice, received grain subsidies. Table A1 reports that about 29 per cent of rural households that leased out farmland had pension plans, but only 8 per cent of rural households that leased in farmland had pension plans.

5. Results and discussion

We will present the results in two parts. In the first part, we will discuss the multinomial logit (MNL) weighted estimation results of factors affecting the

choice of farmland leasing (Table 2), followed by a discussion of the Wald tests (Table A2) and then the regression results of the impact of choice of farmland leasing on the value of crop production (Table 3). Due to the sampling design, we use the CFPS sampling weights in the empirical estimation. We also show results when calculating cluster-robust standard errors at the household level (Table A3). Note that compared to the estimates and significance of variables obtained in Table 2, results in Table A3 are similar, but standard errors show some differences. Similar conclusions are drawn for the parameter estimates and standard errors when comparing Table 3 and Table A4. Findings reveal the importance of estimating accurate cluster-robust standard when drawing inferences from complex stratified surveys.

Table 2 MNL weighted estimates of factors affecting the choice of farmland leasing, China

Variable	Leasing out farmland		Leasing in farmland	
	Coefficient	MEs	Coefficient	MEs
Part-time worker	−0.732**	−0.038***	0.304*	0.047**
	(0.308)	(0.015)	(0.168)	(0.023)
Full-time worker	0.124	0.010	−0.452*	-0.063**
	(0.364)	(0.018)	(0.239)	(0.033)
Farm subsidy	0.356*	0.015*	0.253**	0.032**
	(0.190)	(0.009)	(0.103)	(0.014)
Age (ln)	0.196	0.013	−0.505**	−0.071***
	(0.413)	(0.020)	(0.204)	(0.028)
Gender	−0.361**	−0.019**	0.151	0.024*
	(0.163)	(0.008)	(0.096)	(0.013)
Education_02	0.170	0.007	0.210*	0.028*
	(0.198)	(0.010)	(0.116)	(0.016)
Education_03	−0.0787	−0.003	−0.103	−0.013
	(0.213)	(0.010)	(0.125)	(0.017)
Education_04	0.424	0.022*	−0.141	−0.023
	(0.276)	(0.013)	(0.171)	(0.023)
Insurance	0.823***	0.044***	−0.482***	−0.073***
	(0.206)	(0.010)	(0.172)	(0.023)
Household size	−0.065	−0.003	−0.026	−0.003
	(0.0451)	(0.002)	(0.026)	(0.004)
Contracted land (ln)	0.339***	0.018***	−0.191***	−0.029***
	(0.0812)	(0.004)	(0.061)	(0.008)
Machinery (ln)	−0.0590**	−0.004***	0.119***	0.017***
	(0.0231)	(0.001)	(0.013)	(0.002)
V_ traffic	0.487***	0.022***	0.163*	0.019
	(0.185)	(0.009)	(0.099)	(0.013)
V_center_time	−0.167**	−0.008**	−0.068	−0.008
	(0.0788)	(0.004)	(0.053)	(0.007)
Constant	−3.594**		0.691	
	(1.669)		(0.840)	
Province dummy	YES		YES	

Number of observations = 6,084; Wald chi^2 = 332.11 Pseudo R^2 = 0.10 Log pseudo-likelihood = −1.233e + 08

Note: Parenthesis reports cluster-robust standard errors, at the community. ME (dy/dx) for factor levels is the discrete change from the base level. Non-participation of farmland leasing is the base outcome.
*P < 0.10, **P < 0.05, ***P < 0.01.

Table 3 Weighted estimation of factors affecting the value of crop production (yuan/mu), China

Dependent variable = value of crop production (ln)						
Variable	OLS			BFG		
	Not leasing	Lease out	Lease in	Not leasing	Lease out	Lease in
Farm worker	0.109*	−0.013	0.286***	0.107**	0.177	0.289**
	(0.064)	(0.186)	(0.111)	(0.051)	(0.205)	(0.120)
Operated land (ln)	−0.859***	−1.093***	−0.750	−0.900***	−0.908***	−0.836**
	(0.127)	(0.344)	(0.478)	(0.105)	(0.295)	(0.384)
Operated land squared (ln)	0.278***	0.354***	0.250	0.289***	0.272**	0.252
	(0.050)	(0.133)	(0.212)	(0.039)	(0.113)	(0.168)
Fertiliser and seed	0.651***	0.706***	0.644***	0.636***	0.612***	0.614***
	(0.029)	(0.059)	(0.053)	(0.017)	(0.058)	(0.050)
Age (ln)	−0.106	−0.126	−0.053	−0.020	0.071	−0.005
	(0.085)	(0.265)	(0.130)	(0.083)	(0.364)	(0.154)
Gender	0.071*	−0.024	−0.024	0.059	−0.079	0.125
	(0.042)	(0.121)	(0.071)	(0.036)	(0.206)	(0.097)
Education_02	0.080*	0.094	0.107	0.054	−0.048	0.009
	(0.046)	(0.147)	(0.095)	(0.039)	(0.167)	(0.093)
Education_03	0.037	0.172	0.036	0.070	0.034	0.058
	(0.046)	(0.173)	(0.107)	(0.044)	(0.228)	(0.107)
Education_04	0.117**	0.178	0.285**	0.129***	0.042	0.106
	(0.056)	(0.171)	(0.121)	(0.045)	(0.188)	(0.120)
Household size	0.022**	−0.014	−0.043	0.021**	0.002	−0.015
	(0.010)	(0.029)	(0.031)	(0.009)	(0.039)	(0.027)
V_ traffic	0.011	0.172	0.045	0.025	0.082	−0.052
	(0.037)	(0.120)	(0.075)	(0.040)	(0.214)	(0.089)
V_center_time (ln)	−0.036*	−0.087	−0.024	−0.023	−0.113	−0.010
	(0.021)	(0.091)	(0.038)	(0.017)	(0.108)	(0.045)
V_Development_02	−0.036	−0.036	−0.015	−0.014	0.046	0.058
	(0.044)	(0.140)	(0.082)	(0.025)	(0.143)	(0.071)
V_Development_03	0.024	0.146	0.184**	0.034	0.403***	0.113
	(0.042)	(0.139)	(0.087)	(0.027)	(0.155)	(0.080)
Selectivity terms						
_m0 (not leasing)				−0.900	−2.525	−1.640
				(1.614)	(4.597)	(1.736)
_m1 (lease out)				−1.436	−1.072	−4.218**
				(1.745)	(0.786)	(1.730)
_m2 (lease in)				−2.150	−5.328*	−1.187***
				(1.776)	(2.747)	(0.381)
Province dummy	YES	YES	YES	YES	YES	YES
Number of obs.	4,713	306	1,065	4,713	306	1,065

Note: Parentheses report bootstrap-based cluster-robust standard errors. _m0, _m1 and _m2 are the BFG equivalents for the Mill's ratio, related to the choice of non-participation in farmland leasing, leasing out farmland and leasing in farmland, respectively.
*$P < 0.10$, **$P < 0.05$, ***$P < 0.01$.

5.1 Factors affecting the choice of farmland leasing

Table 2 presents the weighted MNL model estimates and marginal effects of the factors affecting the choice of farmland leasing options. The reference category in the MNL model is non-participation (Category 1). Findings in Table 2 show that off-farm employment, both part time and full time, has a

significant effect on a rural household's choice of farmland leasing. For instance, the coefficient on *part-time workers* is negative and statistically significant for leasing out farmland but is positive and statistically significant for leasing in farmland. Findings indicate that a 1 per cent increase in the share of part-time off-farm workers reduces the likelihood of leasing out farmland by about 3.8 per cent, but increases the likelihood of leasing in farmland by about 4.7 per cent. The *full-time worker* variable has a negative and significant impact on leasing in farmland, suggesting that rural households with a higher share of full-time off-farm workers are less likely to lease in farmland (6.3 per cent). Our finding is consistent with Yan and Huo (2016), who found that the likelihood of participation in farmland leasing in decreases with the total number of household members' off-farm work days. Moreover, our finding is in line with Che (2016) and Kung (2002), who found that local off-farm work by members decreased the likelihood of leasing in and increased the likelihood of leasing out farmland.

Table 2 shows that the *farm subsidy* variable has a positive and significant effect for both farmland leasing-in and leasing-out choices, suggesting that rural households that receive grain subsidies are more likely to lease out (1.5 per cent) and lease in farmland (3.2 per cent). A plausible explanation is that government subsidies encourage large farms and farmers in China cannot buy additional farmland to expand their farms. Hence, they tend to lease in more land. Financially savvy renters may also want to take advantage of economies of scale that can be gained by farming more acres. Additionally, government payments in the form of grain subsidies provide income stability and reduce variability in crop income (Mishra and Sandretto 2002). Our finding is consistent Goodwin *et al.* (2003, 2011) in the United States and Breustedt and Habermann (2011) in Germany. Table 2 shows that the coefficient of the age of the head of household (HH) is negative and significant for leasing in farmland. Findings reveal that an additional year in the age of HH decreases the likelihood of farmland leasing in by about 7.1 per cent. Farming is hard and labour intensive activity, and ageing operators would not want to lease in additional land.

There is a negative and significant relationship between the gender of the HH and leasing out farmland, suggesting that male HHs are less likely HHs (2.3 per cent) to lease out farmland than female. Moreover, the marginal effect reveals that male-headed households are more likely to lease in farmland (2.4 per cent). Also, the marginal effect of *Education_04* suggests that HHs with more than junior high schooling are more likely, by about 2 per cent, to lease out farmland than HHs with no education. A plausible explanation for this may be that HHs with higher educational attainment have increased opportunities in off-farm jobs (Mishra and Goodwin 1997). Table 2 reveals that farm operators (contracted owner) with pension plans are more likely (4.4 per cent) to lease out farmland and less likely (7.3 per cent) to lease in farmland than farm operators without pension plans. Perhaps findings here highlight farmland's importance as old-age livelihood security.

Findings imply that an old-age insurance program in China can be an impetus for the development of the farmland leasing market, thereby increasing the productivity and efficiency of China's agricultural sector.

The coefficient on *contracted land* is significantly positive for the choice of farmland leasing out but is negative for the choice of farmland leasing in. Findings suggest that additional acreage (measured in *mu*) of contracted farmland increases the likelihood of leasing out farmland by about 1.8 per cent and decreases the likelihood of farmland leasing in by about 2.9 per cent. A possible explanation is that the original farmland allocation is based on family size, but off-farm employment opportunities mean not all family members work and live on the land, resulting in decreased family labour. In such cases, owners of contracted acres look for additional income by leasing out farmland. Over the long run, such displacement of labour leads to a readjustment of farmland resources by village leaders. The variable *machinery* also has a significantly negative impact on farmland leasing. Findings suggests that an additional value of agricultural machinery owned by a household decreases the probability of leasing out farmland by about 0.4 per cent and increases in the probability of leasing in farmland by about 1.7 per cent. Our findings are consistent with the transaction cost theory (Williamson 1987), because agricultural machinery is a kind of fixed and specific investment, and the increased levels of asset specificity may cause the 'lock-in' effect for operators. Our findings are consistent with Yan *et al.* (2016).[10]

Finally, the coefficient on *V_ traffic* (a proxy for local transportation services) is positive and significant for farmland leasing out (Table 2). The finding suggests that, compared to rural households located in villages without bus stations near their dwellings (less accessible), households living in villages near bus stations are about 2.2 per cent more likely to lease out farmland. A plausible explanation is that local transportation services provide easier access to agricultural supplies and output markets and reduce post-harvest crop losses (Laurance *et al.* 2014). As a result, these villages may attract more operators, investors in the value chain, and cooperatives, which may increase the likelihood of leasing out farmland. Moreover, good local transportation services may provide easier access to off-farm employment opportunities, which increases the likelihood of leasing out farmland. Our finding is consistent with Zou *et al.* (2018). Simultaneously, the variable *V_center_time* has a significantly negative impact on the choice of leasing out farmland, suggesting that rural households who lived in the village far away from the commercial centre are less likely to lease out their farmland.

[10] The authors also argue that China has seen rapid development of farm mechanisation services that combines large harvesting machineries and specialised labour.

5.2 Impact of farmland leasing choice on the value of crop production

Next, we present the results of the weighted model assessing the impact of choice of farmland leasing on the value of crop production. Recall these estimates are conditional on the rural household's choice of farmland leasing. To explore the importance of self-selection and provide a comparative analysis, we report both OLS and BFG estimates for both choices of farmland leasing. Table A2 presents the Wald tests for combining choices of farmland leasing, and the null hypothesis of the Wald test is that all coefficients, except the intercepts, associated with a given pair of outcomes, are equal to 0. Interestingly, the Wald test suggests that the categories cannot be collapsed. The results of OLS and BFG weighted estimates are reported in Table 3. The three choices of farmland leasing (leasing out, leasing in and non-participation) generate three selectivity terms, and we focus on the results from the value of crop production from leasing-in and leasing-out activities. The selectivity correction terms in the farmland leasing model are negative in the choices of leasing out and leasing in farmland, indicating the presence of sample selection effects.

Accounting for selectivity is essential to ensure unbiased and consistent estimates of the coefficients in the value of crop production. A negative selectivity coefficient in the leasing-out choice indicates the lower value of crop production (per mu) for the smallholder; a positive selectivity coefficient indicates a higher value, relative to a randomly chosen value of crop production per mu of the rural households that did not participate in farmland leasing. The significance of the selectivity correction terms implies that the BFG method is the appropriate estimation method for these equations. Therefore, we focus on describing results from the BFG estimates. The BFG estimates show that the leasing-out (_m1) selectivity correction coefficient is negative in the leasing-in equation (Column 7, Table 3) and the leasing-in (_m2) selectivity correction coefficient is negative in the leasing-out equation (Column 6, Table 3). Perhaps the most plausible explanation of this finding is that farmland leasing out may lead to an inefficient distribution of resources among rural households in that smallholders who would have been better off with farmland leasing out instead chose farmland leasing in; smallholders who would have been better off with leasing in instead chose farmland leasing out. On the other hand, smallholders leased in farmland to reach economies of scale, and rural households leasing in farmland would have matched their household labour force with farmland if they leased out farmland. In addition, the negative leasing-in (_m2) selectivity correction coefficient in the farmland leasing-out equation (Column 6, Table 3) highlights a downward bias of leasing in due to the reallocation of land with better-unobserved attributes of leased-out farmland.

Turning our attention to inputs in agriculture, the coefficient on *Farm worker* indicates that an increase in the share of full-time farm workers in the family increases the value of crop production. However, the magnitude of the

coefficient is larger for smallholders who lease in farmland. These findings are consistent with Jin and Jayne (2013), who concluded that family workers make a larger contribution to the agricultural output of households that leased in farmland than households that leased out farmland. This finding also underscores the importance of family labour in achieving higher output and efficiency (Deininger and Feder, 2001). This finding makes sense as hired labour shortages are becoming a problem for Chinese farmers. Additionally, family workers have lower supervision costs and free of the principal-agent problem (see Deininger and Feder, 2001). An interesting finding is that the coefficient on *operated land* is negative and statistically significant for all equations. Results imply that an increase in farm size would lower the value of crops produced,[11] albeit significantly more for rural households that leased in farmland than for households that did not participate in land leasing activity. The coefficient on *fertiliser and seed* reveals that increased quantity of fertilizer and seeds increases the value of crop output. Our finding is consistent with production theory.

The coefficients for *Education_04*, *Household size* and *V_Development_03* are positive and statistically significant in the BFG equation for non-participating rural households. Results indicate that increases in the educational attainment (above junior high school) of operators and increases in household size increased the value of crop products per mu. Findings suggest the importance of human capital, perhaps through better allocation of resources and increased use of affordable family labour for smallholders in rural China. Our finding is consistent with Huffman (1985), who found that human capital increases resource use efficiency and technical efficiency of farmers. Recall that subsistence production systems like those in rural China require high levels of family labour, which is cheaper and costs less to monitor than hired labour. Policymakers could focus on designing policies that increase human capital and family labour involvement in farming. Lastly, in the non-participation equation, farms located in villages with higher economic development (higher per capita income, low poverty levels, better public facilities and construction of public facilities) have higher values of crop production (per mu) than rural households whose farms are located in villages with low economic development (lower per capita income, high poverty in the population, and low-quality public facilities). Farms located in villages with high economic development provide smallholders with access to inputs and output markets, information and market situations, extension

[11] The estimate on farm size should be interpreted with caution as rural households may underreport or overreport area of farmland, resulting in biased estimates (Abay *et al*. 2019). The focus of this study is to assess the choice of farmland leasing on the value of crop production; since farmland in rural areas is allocated to rural households by village leadership, the measurement error in the operated land acreage may be very small. Additionally, following Xianchun (2014); Zhang *et al*. (2018), we believe that our estimates may be downward biased, if any. The issue of inverse relationship between farms size and productivity is beyond the scope of this paper and is a topic for further research.

services and the convenience of having part-time jobs for family members. Hence, it is plausible that these smallholders benefit from both the farming and non-farming sectors in achieving the stable and higher value of crop production.

6. Conclusions and policy implications

In 2018, China released a package of policies under the '*No. 1 central document'* that provided a roadmap for rural vitalisation. This document highlights the cultivation of larger-sized family farms and the formation of agricultural cooperatives. As a result, farmland leasing has become important in rural China. Despite the increasing trend in farmland leasing, studies fail to show whether farmland leasing has any impact on the value of output or farm income. There is little doubt that unobserved farmland attributes play essential roles in farmland markets and in households' choice of leasing in and leasing out farmland. Failure to adequately account for self-selection on farmland leasing activities may, in turn, confound the correct estimation of returns to farmland leasing and hence provide a false picture of the successful farmland allocation of resources towards their most productive usage.

In this study, we explore the link between rural households' choice of farmland leasing (leasing in; leasing out; non-participation) and the value of crop production in China. To study this, we used 2012 CFPS household-level survey data covering 6,084 rural households of 25 provinces in China and the BFG econometric method to correct for selection bias in the choice of farmland leasing. Results from the discrete model (multinomial logit model) highlight variables that may influence Chinese smallholders' choice of leasing farmland. Households with off-farm employment, older and educated operators, large farms and operators with old-age pensions are more likely to lease out farmland than those without such advantages. Male operators and mechanised farms are less likely to lease out farmland than female operators and farms without mechanisation. On the other hand, households with part-time off-farm employment, farms receiving grain subsidies, and mechanised farms are more likely to lease in farmland than households without such advantages. Finally, households with full-time off-farm employment, older operators, operators with old-age pensions, and large farms (more contracted land) are less likely to lease in farmland than households without such employment or pensions, with younger operators, and with smaller farms.

The significance of the selectivity coefficients in the value of crop production model suggests that the BFG method is appropriate for estimating farmland leasing's impact on the value of crop production (yuan/mu). Unlike most literature on farmland leasing in China, we are not able to attribute a positive (negative) selection bias to the individual household's choice of farmland leasing with worse (better) unobserved characteristics in a respective leasing-out or leasing-in choices, but also link

this selection bias to the allocation of farmland to leasing-in or leasing-out markets. For instance, the methodology used in this study allows us to identify whether a negative land leasing-out bias arises from the reallocation of farmland with worse unobserved characteristics into either idle farmland or presumably more productive farming households. This finding is qualitatively different from other studies bearing on the future of structural reforms in Chinese agriculture. The value of crop production through leasing in farmland is downward biased since leased-in farmland caused a less efficient distribution of resources among the rural households, and consequently, a lower value of production, than if they had leased out farmland to reach economies of scale. Rural households leasing out farmland matched their household labour force by leased-in farmland.

Findings here suggest a reconsideration of farmland lease policy. The Chinese government introduced the policy to encourage farmland leasing, aiming to create a favourable environment for the modernisation of agriculture and the adoption of agricultural technology by transforming agriculture from small farms to large farms. However, the spontaneous participation of rural households in farmland leasing has not significantly changed the scale of farms; the average plot size per rural household is only 0.16 hectares according to the National Bureau of Statistics of China. Policymakers could support the development of land cooperatives to implement the unified management of larger farmland and reduce the inefficiency of small farms. Furthermore, mechanisation of agriculture and increased participation of agricultural service organisations in production agriculture could help solve the problem of an insufficient labour force in production agriculture.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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Appendix

The China Family Panel Studies (CFPS)

There are three stages of sampling operations (Figure 2). The first-stage sampling included four large provinces, Shanghai and all cities or administrative equivalents within a province; mainly rank ordered by an SEI. Each city or administrative equivalent consisted of three sections, including districts (if urban), country-level cities, counties (if rural). All of them were listed in descending order by an SEI. Finally, 64 primary sampling units (PSUs) were selected from four large province and 32 PSUs were selected from Shanghai. For the 20 small provinces, districts or counties in all these provinces jointly constituted a large sampling frame where 80 PSUs were selected by using the similar method. At stage two, either two (in the case of Shanghai) or four (for the other 24 provinces) communities were selected in a selected PSU by a systematic PPS method, and finally obtained 640 communities/villages. Between 28 and 42 households were randomly drawn in each onsite sampling frame at stage three, and 19,986 households were selected.

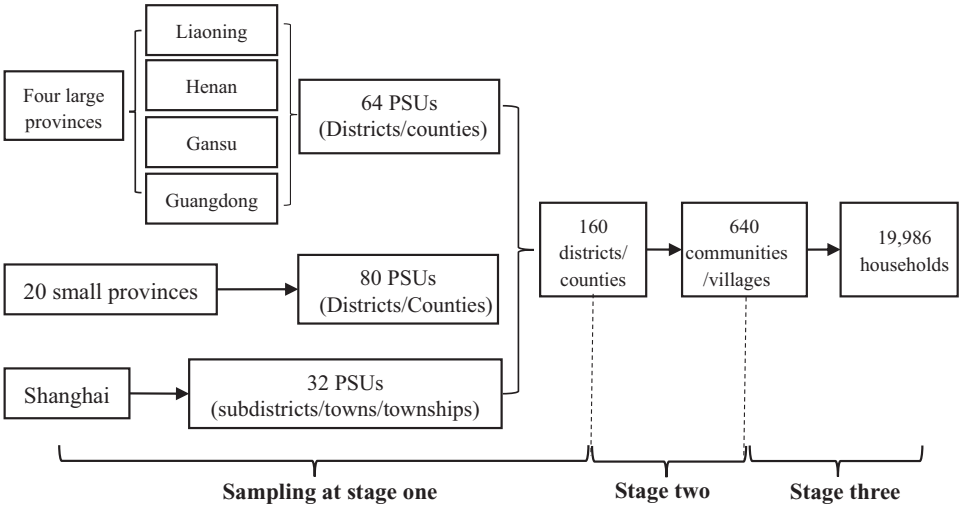

Figure 4 Three stages of CFPS sampling

Table A1 Definition and summary statistics of variables, weighted

Variable	Description	Non-participation	Lease out	Lease in
		Mean (SD)	Mean (SD)	Mean (SD)
Value	Value of crop production, 12 months (yuan/mu)	1,897.24 (4,038.12)	2,779.91 (5,465.16)	1,777.91 (2,482.85)
Age	Age of head of household (years)	50.819 (11.63)	54.044 (13.37)	47.973 (10.68)
Gender	=1 if head household (HH) is male; 0 otherwise (base group)	0.595 (0.491)	0.560 (0.497)	0.632 (0.482)
Education_01	=1 if HH is illiterate, 0 else (base group)	0.365 (0.481)	0.392 (0.489)	0.293 (0.456)
Education_02	=1 if education of HH is primary school, 0 otherwise	0.270 (0.444)	0.293 (0.456)	0.338 (0.473)
Education_03	=1 if education of HH is junior high school; 0 otherwise	0.275 (0.447)	0.209 (0.407)	0.281 (0.450)
Education_04	=1 if education of HH is above junior high school; 0 otherwise	0.090 (0.287)	0.105 (0.307)	0.089 (0.285)
Insurance	=1 if the contracted owner of the farmland has pension; 0 otherwise (base group)	0.149 (0.356)	0.290 (0.455)	0.081 (0.274)
Household size	Number of members lived together of the household (person)	4.147 (1.775)	3.999 (1.881)	4.194 (1.608)
Part-time worker	Share of part-time workers to total family labour with off-farm job	0.168 (0.267)	0.118 (0.222)	0.206 (0.275)
Full-time worker	Share of full-time workers to total family workers with off-farm job	0.134 (0.210)	0.149 (0.225)	0.110 (0.184)
Farm worker	Share of full-time farm workers to total family workers	0.698 (0.291)	0.732 (0.279)	0.684 (0.294)
Contracted land	Area of original contracted farmland (mu)	9.502 (38.323)	9.679 (17.755)	7.926 (13.148)
Operated land	Area of total operated farmland (mu)	9.632 (38.519)	6.505 (16.374)	17.913 (48.003)
Machinery	Total value of the agricultural machinery owned by the household (yuan)	1,109.41 (4,669.23)	388.77 (1,194.20)	2,910.63 (9,645.97)
Farm subsidy	=1 if the household received agricultural subsidies; 0 otherwise	0.677 (0.468)	0.759 (0.428)	0.757 (0.429)
Fertiliser and seed	Fertiliser and seed input per mu *(yuan)*	592.22 (1,501.08)	698.76 (1,256.00)	539.94 (909.85)
V_ traffic	=1 if bus station near household's dwelling; 0 otherwise	0.662 (0.473)	0.744 (0.437)	0.688 (0.463)
V_center_time	Travel time between dwelling and commercial centre, by bus (one-way) (minute)	3.122 (0.905)	3.062 (0.760)	3.033 (0.815)

Table A1 (*Continued*)

Variable	Description	Non-participation	Lease out	Lease in
		Mean (SD)	Mean (SD)	Mean (SD)
V_Development_L	=1 if village economic development is low; 0 otherwise	0.355 (0.478)	0.367 (0.483)	0.359 (0.480)
V_Development_M	=1 if village economic development is medium; 0 otherwise	0.335 (0.472)	0.376 (0.485)	0.350 (0.477)
V_Development_H	=1 if village economic development is high; 0 otherwise	0.311 (0.463)	0.257 (0.438)	0.291 (0.455)

Note: Means are weighted means. SD reports bootstrapped standard errors considering sampling weights.

Table A2 Wald tests for combining alternatives (N = 6,084)

	chi^2	df	$P > chi^2$
0 & 1	103.115	21	0.000
0 & 2	222.837	21	0.000
1 & 2	164.177	21	0.000

H_o: All coefficients except intercepts associated with a given pair of outcomes are 0 (i.e. alternatives can be combined).

Table A3 Parameter estimates of factors affecting the choice of farmland leasing, China

Variable	Leasing out farmland		Leasing in farmland	
	Coefficient	MEs	Coefficient	MEs
Part-time worker	−0.730**	−0.038**	0.421**	0.064***
	(0.334)	(0.016)	(0.172)	(0.024)
Full-time worker	0.336	0.019	−0.445*	−0.064*
	(0.381)	(0.018)	(0.249)	(0.034)
Farm subsidy	0.367*	0.015	0.277**	0.035**
	(0.199)	(0.009)	(0.108)	(0.015)
Age (ln)	0.135	0.011	−0.532**	−0.075**
	(0.437)	(0.020)	(0.215)	(0.029)
Gender	−0.371**	−0.019**	0.184*	0.028**
	(0.171)	(0.008)	(0.099)	(0.014)
Education_02	0.185	0.007	0.209*	0.027*
	(0.214)	(0.010)	(0.121)	(0.017)
Education_03	−0.005	0.000	−0.065	−0.009
	(0.228)	(0.011)	(0.128)	(0.018)
Education_04	0.532*	0.027**	−0.213	−0.034
	(0.290)	(0.014)	(0.180)	(0.025)
Insurance	0.864***	0.045***	−0.525***	−0.080***
	(0.222)	(0.011)	(0.178)	(0.024)
Household size	−0.038	−0.001	−0.036	−0.005
	(0.046)	(0.002)	(0.027)	(0.004)

Table A3 (*Continued*)

Variable	Leasing out farmland		Leasing in farmland	
	Coefficient	MEs	Coefficient	MEs
Contracted land (ln)	0.399***	0.020***	−0.132*	−0.021**
	(0.097)	(0.005)	(0.069)	(0.009)
Machinery (ln)	−0.061**	−0.004***	0.124***	0.018***
	(0.025)	(0.001)	(0.014)	(0.002)
V_ traffic	0.428**	0.019**	0.180*	0.022
	(0.196)	(0.009)	(0.103)	(0.014)
V_center_time	−0.165*	−0.007*	−0.055	−0.006
	(0.085)	(0.004)	(0.055)	(0.008)
Constant	−3.584**		0.658	
	(1.768)		(0.880)	
Province dummy	YES		YES	
Number of observations = 5,585; Wald chi^2 = 327.32; Pseudo R^2 = 0.076; Log pseudo-likelihood = −1.117e + 08				

Note: Non-participation of farmland leasing is the base outcome. Parentheses report bootstrap-based cluster-robust standard, at the household level. ME (dy/dx) for factor levels is the discrete change from the base level.
*P < 0.10, **P < 0.05, ***P < 0.01.

Table A4 Parameter estimates of choice of farmland leasing and impact on the value of crop, China

Variable	OLS			BFG		
	Not leasing	Lease out	Lease in	Not leasing	Lease out	Lease in
Farm worker	0.127**	−0.153	0.308***	0.138**	0.132	0.362***
	(0.064)	(0.168)	(0.116)	(0.055)	(0.217)	(0.131)
Operated land (ln)	−0.772***	−1.125***	−0.896*	−0.869***	−1.024***	−0.907**
	(0.143)	(0.339)	(0.539)	(0.118)	(0.338)	(0.413)
Operated land squared (ln)	0.246***	0.356***	0.306	0.275***	0.287**	0.267
	(0.055)	(0.132)	(0.240)	(0.045)	(0.120)	(0.182)
Fertiliser and seed	0.611***	0.701***	0.627***	0.609***	0.616***	0.596***
	(0.036)	(0.058)	(0.064)	(0.022)	(0.063)	(0.061)
Age (ln)	−0.093	−0.150	−0.042	−0.039	0.109	0.073
	(0.091)	(0.250)	(0.136)	(0.080)	(0.433)	(0.157)
Gender	0.057	0.011	−0.027	0.053	−0.100	0.117
	(0.044)	(0.109)	(0.075)	(0.038)	(0.205)	(0.100)
Education_02	0.080*	0.098	0.113	0.050	−0.041	0.013
	(0.048)	(0.127)	(0.103)	(0.041)	(0.182)	(0.086)
Education_03	0.057	0.194	0.048	0.082**	0.055	0.062
	(0.046)	(0.162)	(0.113)	(0.040)	(0.243)	(0.106)
Education_04	0.153***	0.273*	0.277**	0.155*	0.126	0.091
	(0.059)	(0.165)	(0.133)	(0.060)	(0.219)	(0.122)
Household size	0.024**	−0.009	−0.040	0.023	−0.001	−0.012
	(0.010)	(0.027)	(0.032)	(0.009)	(0.046)	(0.029)
V_ traffic	0.006	0.089	0.024	0.028	0.051	−0.029
	(0.038)	(0.119)	(0.078)	(0.036)	(0.203)	(0.091)
V_center_time (ln)	−0.036*	−0.057	−0.02	−0.014	−0.073	0.021
	(0.022)	(0.076)	(0.038)	(0.019)	(0.111)	(0.042)
V_Development_02	−0.016	−0.059	−0.032	−0.002	0.015	0.048
	(0.045)	(0.131)	(0.087)	(0.031)	(0.137)	(0.074)

Table A4 (*Continued*)

Variable	OLS			BFG		
	Not leasing	Lease out	Lease in	Not leasing	Lease out	Lease in
V_Development_03	0.035	0.034	0.137	0.033	0.329	0.081
	(0.044)	(0.123)	(0.091)	(0.030)	(0.169)	(0.082)
Selectivity terms						
_m0 (not leasing)				−1.037	−1.890	−1.348
				(1.365)	(5.089)	(1.740)
_m1 (lease out)				−1.933	−1.165	−4.251**
				(1.467)	(0.796)	(1.880)
_m2 (lease in)				−2.379	−5.470*	−1.272***
				(1.517)	(3.019)	(0.453)
Province dummy	YES	YES	YES	YES	YES	YES
Number of obs.	4,321	275	989	4,321	275	989

Note: Parentheses report bootstrap-based cluster-robust standard, at the household level. _m0, _m1 and _m2 are the BFG equivalents for the Mill's ratio, related to the choice of non-participation in farmland leasing, leasing out farmland and leasing in farmland, respectively.
* $P < 0.10$, ** $P < 0.05$, *** $P < 0.01$.