

The potential of land rental markets in the process of economic development: Evidence from China

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Abstract

We develop a model of land leasing with agents characterized by unobserved heterogeneity in ability and presence of an off-farm labor market. In this case, decentralized land rental may contribute to equity and efficiency goals and may have several advantages over administrative reallocation. The extent to which this is true empirically is explored using data from three of China's poorest provinces. Land rental markets and administrative reallocation reallocate land to those with lower endowments but the former are more effective in doing so and have a bigger productivity-enhancing effect. Information on hypothetical market participation suggests that reducing transaction costs in land rental markets could help to realize significant additional productivity gains.

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1. Introduction

One of the stylized facts of development economics is that in the process of economic development, labor will leave the agricultural sector in favor of non-agricultural

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employment, often in the urban sector. This process has been particularly dramatic in China where agriculture's share in employment is estimated to have dropped from more than 70% in 1978 to less than 50% by 2000 (Johnson, 2002). Not surprisingly, a large literature has emerged to assess the factors that motivate households to move out of agriculture (de Brauw et al., 2002), the social and economic implications of such a move (Zhao, 2002), and the implications for labor market policy in view of recent challenges (Zhai and Wang, 2002). Such large-scale movements of labor have had profound consequences for household welfare (Yao, 2000). Continuing high levels of rural–urban migration, which may be further enhanced in the context of China's WTO accession (Ravallion and Chen, 2003), may contribute to higher levels of inequality between provinces (Liang et al., 2002) and between individuals (Fang et al., 2002).

The importance of land markets in this context derives from the fact that, whether a large-scale transfer of labor out of the agricultural sector will lead to greater inequality or the opposite will partly depend on the flexibility and effectiveness of operation by rural factor markets, especially those for land. Well-functioning land markets could allow those with higher agricultural ability who do not join the off-farm labor force to gain access to additional land, increase their operational farm size and thus their income, thus possibly lowering overall inequality. Traditionally, reallocations of land have been accomplished through administrative channels rather than rental transactions based on individual initiative (Kung and Liu, 1997); more recent data suggest however that, with the emergence of off-farm labor markets, land rental has become more active (Kung, 2002b). At the same time, there is evidence that better functioning of land rental markets could help the economy to realize considerable gains in productivity (Benjamin and Brandt, 2002). Despite the importance of the subject, only few studies have provided in-depth empirical evidence on the issue: Our study aims to contribute to the discussion by providing empirical evidence in three areas.

First, by describing the level and dynamics of rental market development in some of China's most backward regions and its relation to administrative processes of land reallocation, we aim to assess the extent to which non-market and market mechanisms substitute for or complement each other. We are particularly interested to assess the equity impact of land markets and to explore whether specific preconditions such as stronger individual land rights would be required for such markets to emerge or to reach their full potential.

Second, we use a measure of households' productive ability to assess the extent to which these markets transfer land to more productive producers and thus offer an opportunity to improve overall efficiency of resource use in rural areas.

Finally, by comparing households' desired level of land rental market participation to actually observed outcomes, we are able to identify the extent to which markets allow realization of the potential, the constraints that may prevent them from doing so, and the potential impact of removing some of the constraints on improved functioning of rental markets.

With rapid rural–urban migration, identifying mechanisms that would help to improve the functioning of factor markets and thus increase agricultural productivity will be of importance to ensure that the benefits from non-agricultural development reach the poorest parts of the population. This is particularly relevant because, contrary to some of its more

developed neighbors, China will not be able to subsidize its agricultural sector to help increase rural income levels (Ianchovichina and Martin, 2004). Exploring the contribution of land markets to rural productivity and economic growth will also hold lessons for other countries, especially in East Asia, where the movement of labor out of the agricultural sector is gathering pace.

The paper is structured as follows: Section 2 places the issue in the context of the literature and develops a model as well as an estimation strategy to analyze land rental market decisions in a framework with off-farm employment opportunities, transaction costs, and unobserved agricultural ability. Section 3 discusses data sources and provides descriptive statistics as well as evidence on the distribution of agricultural ability across producers. Section 4 discusses empirical results by comparing the determinants of administrative and market-based land reallocations, assessing the factors underlying hypothetical market participation, and quantifying the gains from better functioning of land rental markets. Section 5 concludes with policy implications.

2. Background, conceptual model, and estimation strategy

While the literature has long emphasized the importance of a possible investment disincentive effect that comes about through insecure land tenure, little attention has been devoted to the impact of tenure arrangements on the functioning of land markets. This section puts such arrangements into context, derives a model of agricultural production and land market participation, and outlines the strategy adopted to empirically investigate the underlying issues.

2.1. Chinese land tenure in international context

Land in China is owned by the state with households enjoying temporary use rights the duration of which has gradually been extended from initially 15 years. Land sizes are small; average per capita land endowment is less than one mu (one fifteenth of a hectare), generally split up into about 9–10 parcels (Wen, 1989). Following introduction of the household responsibility system in the late 1970s and early 1980s, land was de facto allocated on a per capita basis, leading to a very egalitarian structure of land ownership. Especially in rural areas, land continues to perform an important function as a social safety net and is often credited as a reason for comparatively high levels of social development (Burgess, 2001). To adjust for changes in population or to make land available for non-agricultural purposes, administrative reallocation was generally used and, according to most reports, seems to have commanded considerable support in the countryside (Dong, 1996; Kung, 2000; Kung, 2002a).

Administrative redistribution can be subject to problems the impact of which is likely to become more pronounced as the number of transactions increases: first, the ability to redistribute one of the rural economy's main productive assets concentrates significant power in the hands of village leaders. If the rules and procedures governing use of such power are unclear, incentives for abuse may be high (Turner et al., 1998; Huang, 1999). Second, the discrete nature and relatively high transaction costs associated with

administrative reallocation implies that such a mechanism will rarely be flexible enough to quickly respond if external conditions change rapidly. Finally, especially once the amount of land available for redistribution increases, leaders may no longer be able to redistribute land in a way that would fully utilize the productive potential, especially if there are significant differences in producers' ability that cannot be easily observed by outsiders.¹ All of this could explain the finding of potentially very large productivity gains through more flexible mechanisms to reallocate land (Benjamin and Brandt, 2002). At the same time, supporters of redistribution rightly point out that an active role by village leaders in land allocation may be better suited to maintaining equity objectives than impersonal markets, especially as long as it is undertaken within an environment where transparency and accountability are high. All of this suggests that an empirical investigation of the underlying issues may be of great interest.

While more decentralized and market-based solutions may benefit from informational advantages enjoyed by participants, they will likely be affected by the presence of transaction costs and imperfections in other markets that are frequently encountered in rural areas of developing countries. Transaction costs include standard elements such as the effort required to obtain information on rental rates and market participants, the negotiation of contractual terms, and contract enforcement. In the Chinese context, households may also be reluctant to engage in land rental out of fear that renting out land will be taken as a signal by village leaders that a household has land which he cannot cultivate and which can be subjected to expropriation (Yang, 1997). In addition, restrictions on land market transactions that remain in place in a number of locations are likely to add to such transaction costs.

Market imperfections, in particular those related to credit may, in the presence of high risk, imply that transactions through land rental markets may not always lead to efficiency-enhancing outcomes. Where this is the case, households or producers may be willing to accept the efficiency losses associated with administrative land reallocation if outcomes attained by markets were found to be undesirable in other ways, e.g., because they would be incompatible with basic equity considerations. This, combined with lack of familiarity with market processes, appears to be a key reason for high levels of popular support for administrative land reallocation that is reported in many empirical studies (Kung and Liu, 1997; Liu et al., 1998). Similarly, it has often been argued that there are considerable economies of scale (Fleisher and Liu, 1992; Zhou, 2000) which can be realized only by some level of administrative intervention, implying that the productivity outcomes achieved by markets may be inferior to those that can be attained through administrative reallocation.

All of this suggests that whether, and under what conditions, market and administrative land transfers are substitutes for or complement each other is an issue that needs to be

¹ It is intuitive and easy to show analytically that, in the presence of large unobserved heterogeneity across producers, maintaining an egalitarian *operational* distribution of land could be hugely inefficient. Well-functioning rental markets would, in such a context, be strictly Pareto improving as the rental received by infra-marginal households who decide to rent out would be higher than what they could receive from own cultivation. Effective rental markets would thus help to combine the equity benefits of an egalitarian land ownership distribution with the efficiency advantages of an "optimal" operational distribution of land.

decided based on empirical evidence. This is of relevance in particular because, despite a large international literature on the investment impact of higher levels of land tenure security, many studies on this subject in China find significant but quantitatively small effects (Li et al., 1998; Jacoby et al., 2002; Benjamin and Brandt, 2002). It has been argued that, in a dynamic environment that is characterized by increasing levels of off-farm employment and rural–urban migration, the ability to transfer land will attain great importance (Carter and Yao, 2002). This is supported by evidence from Africa (Besley, 1995) where greater transferability enhanced incentives for investment (Deininger et al., in press) and participation in the off-farm economy (Deininger et al., 2003).

2.2. A model of agricultural production and land rental market participation

Suppose household i is endowed with a vector of household characteristics X (excluding agricultural ability), endowments of labor $\bar{L}_i$ and cultivated land $\bar{A}_i$ and agricultural production ability α_i . Assume that there is no farm labor market but that households have the opportunity to allocate their labor endowment between farming on their own plot and non-farming activities at a given wage $w(X)$, and that there are no restrictions on renting of land. This implies that household incomes can derive from three sources, farm, off-farm and rental incomes. Let household i 's agricultural production function be characterized as $\alpha_i f(l_i^a, A_i)$ where l_i^a represents labor used in agricultural production, and A_i , land used in agricultural production. To simplify the exposition, we will drop the subscript i in the subsequent discussion. Let f satisfy the standard assumptions: $f_{l^a} > 0$, $f_{A^a} > 0$, $f_{l^a l^a} < 0$, $f_{A A} < 0$, $f_{l^a A} > 0$ and $f_{l^a l^a} f_{A A} - f_{l^a A}^2 > 0$.

If the land rental market is perfect, that is that the rental rate faced by households is determined competitively and that there is no transaction cost associated with the renting in and renting out, household i will choose l^a as well as A by solving the maximization problem:

$$\max_{l^a, A} p \alpha_i f(l_i^a, A_i) + w l_i^o - (\bar{A}_i - A_i) r \quad (P)$$

where p is the price of agricultural goods, l^o is the amount of time allocated to off-farm labor ($=\bar{L}_i - l_i^a$), and all other variables are as defined above. Note also that, for any household, $\bar{A}_i - A_i > 0$ implies net renting out and $\bar{A}_i - A_i < 0$ implies net renting in. The optimal choices of l_i^{a*} , l_i^{o*} and A_i^* will solve the first order conditions (FOC) of problem (a), i.e.,

$$p \alpha_i f_{l_i^a}(l_i^a, A_i) = w. \quad (1)$$

$$p \alpha_i f_{A_i}(l_i^a, A_i) = r. \quad (2)$$

The interpretation of these conditions is intuitive: households choose the amount of labor to be used on and off-farm, l_i^{a*} , l_i^{o*} , and the amount of area to be cultivated, A_i^* , so that the marginal return to labor equals the wage rate and the marginal return to land equals to the market rental rate. To account for the fact that markets rarely function without friction, we add an area-based transaction cost T implying that households renting in land will pay more and those renting out will receive less than the competitive rental rate r . Without loss of generality, we assume T to be proportional to the area rented and to be

equal for those renting in and renting out. As a consequence of transaction costs, some households who would have participated in rental markets earlier will now remain in autarky. The equilibrium conditions for households who do not participate in rental markets are:

$$p\alpha_i f_{l_i^a}(l_i^a, \bar{A}_i) = w \quad (3)$$

$$r - T < p\alpha_i f_{A_i}(l_i^a, \bar{A}_i) < r + T. \quad (4)$$

These conditions define two cut-off points in terms of households' agricultural ability, α_l and α_u ,² such that households with $\alpha_i \in [\alpha_l; \alpha_u]$ will not participate in land rental markets. Households with $\alpha_i < \alpha_l$ will rent out land with the amount of land rented satisfying the new first order conditions:

$$p\alpha_i f_{l_i^a}(l_i^a, A_i) = w \quad (5)$$

$$p\alpha_i f_{A_i}(l_i^a, A_i) = r - T. \quad (6)$$

Similarly, households with $\alpha_i > \alpha_u$ will rent in land from others and their decision rules follow their respective modified first order conditions:

$$p\alpha_i f_{l_i^a}(l_i^a, A_i) = w \quad (7)$$

$$p\alpha_i f_{A_i}(l_i^a, A_i) = r + T. \quad (8)$$

Using Eqs. (5)–(8), we can derive three propositions (see Appendix for a more detailed derivation).

Proposition 1. *The amount of land rented in is strictly increasing in households' agricultural ability, α , and strictly decreasing in their land endowment $\bar{A}$. To the degree that, in an agrarian economy, land is the main source of wealth, rental markets would therefore transfer land to "poor but efficient" producers. To the extent that village leaders do not observe α (or base their reallocation decisions on criteria other than productive efficiency), we would expect that land rental markets would do so more effectively and flexibly (though possibly less equitably) than administrative reallocation, something that will be explored in the empirical analysis.*

Proposition 2. *Presence of transaction costs drives a wedge between those renting in and those renting out with any increase in T decreasing α_l and increasing α_u , thereby expanding the range of producers who remain in autarky, reducing the number of households who participate in rental markets and the amount of land transacted through rental markets. Compared to the perfect market case this would imply lower social welfare, with the extent of losses increasing in the dispersion of α across producers.*

² $\alpha_l = \frac{r-T}{pf_{A_i}(l_i^a, \bar{A}_i)}$, $\alpha_u = \frac{r+T}{pf_{A_i}(l_i^a, \bar{A}_i)}$ where l_i^a can be solved from Eq. (4).

Proposition 3. *Increases of the exogenously given wage for off-farm employment will increase the amount of land transacted in rental markets by increasing the amount rented out by households with low agricultural ability (who join the off-farm labor force) and the amount rented in by those with high-ability (who specialize in agricultural production). This will be associated with a decrease in the equilibrium rental rate which, in a risk-free environment, will make everybody better off.*

2.3. Estimating agricultural ability

A key variable in our model and in terms of the impact of land rental markets on efficiency of production is households' agricultural ability. To recover this variable, we make use of the availability of household level panel data on production. Let all households use the same Cobb–Douglas technology represented by the production function

$$Q_{jit} = \exp(\alpha_j + \alpha_i) A_{jit}^{\theta_1} L_{jit}^{\theta_2} K_{jit}^{\theta_3} \quad (9)$$

where Q_{jit} is agricultural output produced by producer i in village j in year t ; A_{jit} , L_{jit} and K_{jit} are land, labor and capital used by producer i in village j in year t to produce output Q_{jit} , and $\exp(\alpha_j + \alpha_i)$, is the efficiency parameter which has a household- and a village-specific element and θ_1 , θ_2 , and θ_3 are technology coefficients common to all producers. Taking logarithms of both sides of Eq. (9), adding a time trend and an iid. error term, and letting q , a , l , and k respectively be the logarithm of Q , A , L and K , and $\alpha_{ji} = \alpha_j + \alpha_i$, we obtain an estimable equation for production by producer i in village j at time t as follows.

$$q_{jit} = \alpha_{ji} + \theta_1 a_{jit} + \theta_2 l_{jit} + \theta_3 k_{jit} + \phi t + \varepsilon_{jit}. \quad (9a)$$

Availability of multiple observations per household in the panel allows us to estimate this equation using household fixed effects.

$$q_{jit} - \bar{q}_{ji} = \alpha_{jti} - \bar{\alpha}_{ji} + \theta(\mathbf{Z}_{jit} - \bar{\mathbf{Z}}_{ji}) + \phi(t - \bar{t}) + (\varepsilon_{jit} - \bar{\varepsilon}_{ji}) \quad (9b)$$

where $\mathbf{Z}$ is a vector consisting of a , l , k and θ is a coefficient vector including θ_1 , θ_2 , and θ_3 . The composite efficiency parameter α_{ji} can then be recovered for each producer. Obviously, this parameter will include other unobservable characteristics many of which are village-specific. As land markets tend to be localized, such village characteristics which, intuitively, can be thought to be related to infrastructure and market access, soil quality, climate, etc., should not affect operation of markets. To eliminate them, we apply a similar estimation procedure by re-estimating the production function using village level fixed effect to obtain α_j which, by subtracting, allows us to recover α_i for each producer in the sample.

2.4. Determinants of market and non-market transfers of land

To empirically test the predictions from our model, we specify a reduced form regression for receipt of land through reallocation as well as for participation in land rental

markets (renting in or renting out). Key right hand side variables included relate to a household's agricultural ability, its endowments of land, labor, and other factors of production, availability of off-farm opportunities, and the transaction costs of land rental. Formally, we estimate

$$R_i = \beta_0 + \beta_1 \alpha_i + \eta \mathbf{X}_i + \delta \mathbf{O}_i + \gamma \mathbf{T}_i + \varepsilon_i \quad (10)$$

where R_i is a dummy for renting in/out or the actual amount of area rented in/out, α_i is household's agricultural ability, $\mathbf{X}_i$ is the vector of other household characteristics including its land endowment and level of agricultural and non-agricultural assets, $\mathbf{O}_i$ denotes off-farm opportunities available to household i , and $\mathbf{T}_i$ is a vector of characteristics affecting the transaction cost of land rental. Moreover, by replacing R_i with a dummy of whether or not land was received through reallocation or the amount of such land received, we can estimate similar regressions for the cases of administrative reallocation. Variables and expected signs are explained below. To facilitate comparison between administrative and market-based reallocation of land, we estimate similar equations (excluding past land market participation) for receipt of land through administrative mechanisms and market participation.³

As ability cannot be transferred across households, we expect that, other factors constant, markets will transfer land to producers with higher ability, i.e., $\beta > 0$ in the rent in and $\beta < 0$ in the rent out equation. The vector $\mathbf{X}$ includes household characteristics such as per capita land endowment, the number of members by age group, the level of farm and non-farm assets, and the age and education of the household head. Without economies of scale in agricultural production, rental markets would tend to equalize operational land holdings, implying a negative coefficient on the per capita land endowment. Also, with imperfections in asset markets (Rosenzweig and Wolpin, 1993), households with higher levels of asset ownership will be more likely to rent in land. Finally, in line with the literature (Reardon et al., 2001), improved off-farm opportunities associated with the households' level of educational attainment, the stocks of non-agricultural fixed assets owned, and share of household members with past migration experience, all would decrease the propensity to rent in and increase the probability to rent out, respectively.

The survey asked village leaders to indicate whether in the village under concern land rental is possible without restrictions, with some restrictions, or completely prohibited. Such restrictions at the village level constitute a constraint that is completely exogenous to individual households' decisions on market participation and hence will increase the transaction cost of land rental. In addition, in areas where rental is already practiced, it will be easier to obtain information on rental prices, enforce contracts, and fend off attempts by bureaucrats attempting to use land transactions as a signal to redistribute a household's land to others. To proxy for such transaction costs faced by others, we include the share of households participating in rental markets (excluding the household under concern) at the village level. Past participation in rental markets will also allow

³ As the data set does not contain sufficient observations of households who lost land through reallocation, partly because land loss seems to be correlated with out-migration, we are forced to restrict attention to those who received land through administrative means.

individual households to build reputation and become familiar with the processes, thus positively contributing to renting in and renting out and we include a similarly defined variable for past rental market participation by the household in a second specification of the regression. While the level of grain quotas may have an impact on farmers land rental market participation decision (Kung, 2002c), especially if shifting of rents between households is impossible (Lohmar et al., 2001), quotas were found to be not relevant in the study area for the time period for which our data were collected and are therefore not included in the empirical analysis.

2.5. Determinants and impact of hypothetical market participation

Changing R_i from actual to hypothetical rental market outcomes under current or changed prices (both with respect to participation and area transacted) allows to better describe households' rental demand. Similarly, we can identify the characteristics of households whose market participation is currently constrained, something that allows us to identify those who are likely to gain from better market functioning, thus developing an improved appreciation of the potential and limitations of markets, of factors that might preclude realization of this potential, and of possible measures (as well as their relative importance) to more fully realize this potential. The justification for assuming lower prices is that better development of off-farm labor markets, as well as liberalization of grain markets in China both are likely to reduce rental prices. On the one hand, development of off-farm labor markets would lead a greater share of households with low ability to exit agriculture, thus increasing the supply of land to the rental market. On the other hand, it is quite likely that liberalization of grain markets would reduce grain prices and thus returns from most of agricultural cultivation (Johnson, 2000; Anderson et al., 2002; Huang and Rozelle, 2002) and thus the equilibrium rental rate.

In our model, market participation is driven by ability and access to opportunities outside the farm sector. Better functioning of markets (or a reduction in transaction costs) would increase the amount rented out by those with low agricultural ability while increasing the amount rented in by high ability individuals. Higher levels of education, a history of off-farm employment, and possession of non-agricultural enterprise assets all increase the opportunities open to individuals outside the agricultural sector, thus increasing supply of land to the market and reducing the propensity to rent in land. In addition, we use the data on desired land rental participation to identify factors that cause households to be constrained in the rental market.

Results from our estimations can also be used to assess the impact of actual and hypothetical land market participation as compared to alternative scenarios. To do so, we use households' predicted rental market participation for each scenario, assume that the area rented corresponds to the mean observed in the sample, and use the estimated production function to compute predicted production. Subtracting input costs as well as the land rental (which, for simplicity, is assumed to equal the opportunity cost of the land) yields the social benefit from such a land transfer. Comparing these to the base case provides an opportunity to make inferences on the impact of better functioning of rental markets, as discussed in more detail below.

3. Data and descriptive statistics

Our data combine panel information from the regular household survey conducted by China's State Statistical Bureau (SSB; now the National Bureau of Statistics, NBS) with a specific re-survey of the same households. The latter, which was combined with a community survey, aimed to obtain detailed data on production, land accumulation history, and actual and potential market participation. Descriptive statistics illustrate the rapid evolution of land rental markets and point towards considerable unsatisfied demand for land and supply of land to the market. We also encounter considerable variation in ability of producers, implying that better development of rental markets might offer an opportunity to realize significant gains in productivity.

3.1. Data sources and key variables

To estimate the relationships discussed above, we combine a 3-year panel (covering 1997, 98, and 99) from the regular household survey conducted by China's State Statistical Bureau (SSB) in three provinces with information from a re-survey of the same households, conducted jointly by SSB, the China Center for Economic Research, the World Bank, and the University of Wisconsin, in May and June of 2001. The re-survey covered 1001 households from 110 villages in three of China's poorest provinces, Guizhou, western Hunan and Yunnan. These provinces are characterized by significant differences in tenure rules and the length of time for which use rights are assigned but also the extent of out-migration (Deininger and Jin, 2003). Even though the SSB master sample is considered to be representative of the population at large (Jalan and Ravallion, 1999), there is a slightly higher chance for households who migrated out or who had an educated member migrate out to be dropped from the panel. As all of these have a higher probability of engaging in land transactions, this would imply that estimates for the level of land market activity from our sample may be biased downward, i.e., the level of land market transactions may be even higher than reported here.⁴

The SSB survey uses diaries to provide a very accurate record of household consumption (Jalan and Ravallion, 2001). It also includes a wide array of other variables, especially asset endowments and production data that allows to estimate a fixed effect production function as discussed above. The 2001 re-survey obtained detailed information on initial land endowments and changes therein through administrative reallocation, rental, and non-market processes, as well as past off-farm employment and hypothetical participation in land rental markets, over and above the variables included in standard multi-purpose household surveys (household characteristics, expenditures, assets, income sources, and agricultural production).

Table 1 provides basic descriptive statistics. It illustrates that in the 1995–2000 period, 5.4% of producers in the sample received land through administrative reallocation, varying

⁴ While we are still able to produce econometric estimates for households who rented out, coverage of households who lost land through administrative reallocation is very thin; most likely because many of these may no longer reside in the village. Other types of data will be required for an in-depth analysis of this phenomenon.

from less than 1% in Guizhou to 22.4% in Hunan. The fact that this figure is much lower than what had been obtained in earlier studies (Rozelle et al., 2002) could be due to provincial factors or indicate that the extent of land redistribution has indeed decreased over time. While our data cannot prove this, they do indicate that land rental markets have emerged rapidly in recent years; in fact historical information indicates that such markets had been virtually non-existent 5 years ago but are now utilized by almost 10% of households (6% in Guizhou and about 14% in the other two provinces). With an additional 3% of households receiving land for free, this implies that decentralized exchange of land has become an important feature of China's rural economy. Both in terms of quantity of land transacted and the number of participants, land rental markets have emerged as main form of land reallocation even in areas where administrative reallocation continues to be widespread. In fact, even where land redistribution has traditionally been the main form of adjusting to population growth such as Hunan, the area transacted through rental in 2000 is bigger than what had been reallocated administratively over the 6-year period from 1995

Table 1
Descriptive evidence on households' rental market participation

	Total	Hunan	Guizhou	Yunnan
1. Participation in rental markets	(%)			
Share of households benefiting from redistribution (1995–2001)	5.4	22.4	0.7	3.1
Share who rented in land 5 years ago (1996)	2.3	3.8	1.6	2.7
Share who rent in land now	9.4	14.3	6.1	13.2
Share willing to rent in at current rental	22.4	30.5	17.1	28.9
Share willing to rent in at 2/3 of current rental	34.8	40.5	29.4	44.2
Share renting out land	3.2	3.8	4.1	0.0
Share willing to rent out land at current rental	13.9	14.3	15.9	8.1
Share willing to rent out land at 3/2 of current rental	25.5	22.9	0.0	15.7
Share of villages without restrictions on rental	84.3	96.2	87.4	61.8
Share of households who are constrained in participating in rent in	9.9	8.1	8.6	15.2
Share of households who are constrained in rent in quantity	13.2	11.0	11.7	19.8
Share of households who are constrained in participating in rent out	9.0	9.0	9.6	7.6
Share of households who are constrained in rent out quantity	10.5	10.5	11.5	7.6
2. Area transacted (mu)				
Area change through reallocation (1995–2001)	0.088	0.294	0.016	0.071
Area actually rented in	0.191	0.350	0.126	0.204
Area willing to rent in at current rental	0.663	0.904	0.447	1.013
Area willing to rent in at 2/3 of current rental	1.509	1.576	1.088	2.625
Area actually rented out	0.055	0.060	0.072	0.000
Area willing to rent out at current rental	0.345	0.322	0.403	0.230
Area willing to rent out at 3/2 times current rental rate	0.743	0.604	0.891	0.476
3. Inequality of the land distribution				
Gini before adjustment	0.3751	0.3462	0.3796	0.3877
Gini after adjustment	0.3658	0.3195	0.3755	0.3793
Gini of operated land	0.3713	0.3180	0.3871	0.3724
Gini of desired operated land	0.3940	0.3414	0.4078	0.3995
Gini of desired operated land at low rental price	0.3864	0.3224	0.3714	0.4586
Number of observation	962	210	555	197

to 2001 (panel 2 of Table 1).⁵ The survey also indicates that land rental is relatively unrestricted in the large majority of villages; in fact only 16% of village leaders reported to have imposed restrictions on operation of rental markets.

One interpretation of this evidence is that land reallocation through administrative means and operation of rental markets are driven by off-farm development and labor migration out of agriculture. At a descriptive level, this is supported by the fact that Hunan, which experienced the highest incidence of land reallocation (with 24% of households affected as compared to 0.7% in Guizhou and 3% in Yunnan), also has the most active rental market. Moreover, the fact that rental activity is lowest in Guizhou, the first province to introduce longer-term property rights to land (Deininger and Jin, 2003), suggests that, at least *prima facie*, land rental does not depend on improved or better enforceable property rights alone.

Concerning hypothetical land rental market participation, more than double the share of rental market participants (22%; from 17% in Guizhou to 31% in Hunan) would be willing to rent in land at current prices, pointing towards considerable unsatisfied demand for land rental. With a reduction of rental rates by one-third, another 12% would be willing to do so, which would bring the overall share of renting households to 35%. The data indicate an even larger increase of those who would be willing to rent out land at current prices, from 3% to 14% of households at current prices and another 12% who would do so at higher rental rates. This big increase suggests that the relatively low level of transactions observed is not primarily due to low supply. Land markets could thus become of even greater importance in the future with further non-agricultural development.

Information on the Gini coefficients of owned land before and after land redistribution and of operated area under actual as well as hypothetical land rental (panel 3 of Table 1) suggests that, while reallocation has indeed led to a slight decrease in inequality, operation of rental markets is unlikely to have a large disequalizing impact, consistent with other studies which found that, at the low levels of income observed in rural China sample, higher off-farm employment does not contribute to a measurable increase in income inequality (Kung and Lee, 2001).

3.2. Ability and its relation to actual and desired land rental market participation

While space considerations prevent us from reporting results from the panel production function estimation (which are available upon request), a graphical representation of the estimates of α_i for the three provinces is provided in Fig. 1, with the normal distribution plotted for purposes of comparison. Our model predicts that land rental markets, together with off-farm opportunities, would reduce the dispersion of ability. Indeed, we find that dispersion of ability is greatest in Guizhou and Yunnan where rental markets are least active and smallest in Hunan where rental and off-farm labor markets are quite active.

⁵ Only 0.19 mu of arable land was actually rented in on average for the entire sample, compared to 0.66 mu and 1.5 mu that would be willing to be rented in at current or 2/3 of current rental rate. Hunan has most active real rental market, 14% households in Hunan rented in land in 2000 and 0.35 mu of land on average were rented in. By contrast, only 6% households in Guizhou rented in land in 2000 and the amount rented in is 0.13 mu.

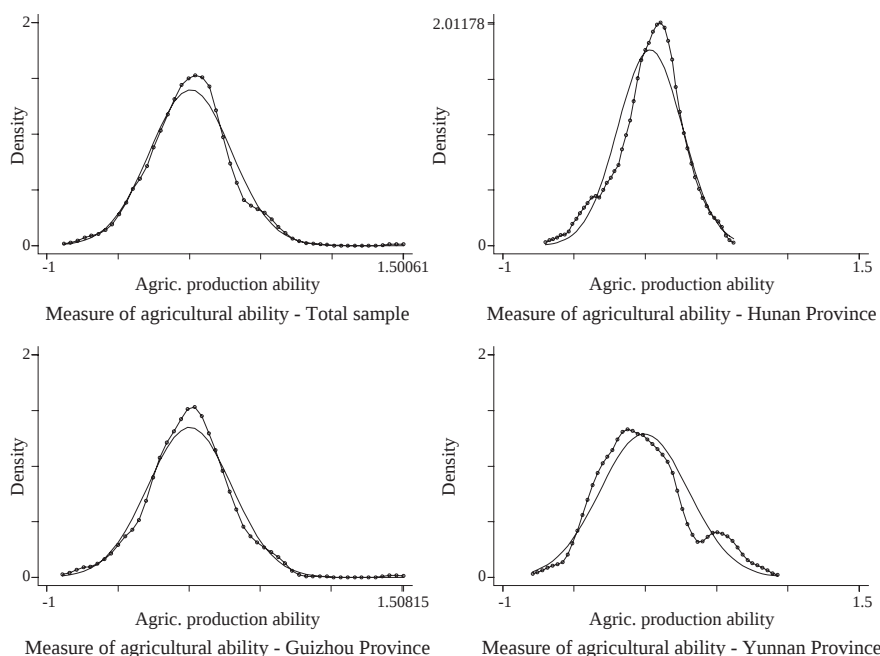


Fig. 1. Distribution of agricultural ability in different provinces. The plots describe kernel density estimates of the distribution of producers' ability as derived from the panel production functions. As described in the text, one would expect this distribution to be more dispersed where less non-farm (migration) opportunities are available and land markets are relatively inactive, as in Yunnan and Guizhou. For comparison purposes, the normal distribution is denoted by the straight line.

Correlation coefficients between α and some of the household characteristics of interest suggest that agricultural ability is significantly and positively correlated with education ($\rho=0.10$), cultivated area ($\rho=0.10$), and farm and non-farm assets ($\rho=0.18$ and $\rho=0.09$, respectively). It is negatively correlated with past migration by the household head ($\rho=-0.08$), suggesting that it is indeed those with lower agricultural ability who migrate out and transfer their land to better cultivators.

Non-parametric regressions of the actual and hypothetical amount of land rented in against households' per capita land endowment and their estimated ability provide a graphical illustration of the hypothesized relationships between actual and hypothetical demand and ability or households' initial land endowment. Fig. 2 shows that the amount of land rented in declines as households have access to more own land. Desired land rental (at actual prices) is significantly higher than actual land rental for everybody and also decreases more quickly with land size, implying that any interventions that could increase activity and improve functioning of land rental markets would provide clear benefits to those with lower land endowments. Fig. 3 illustrates that better functioning of land rental markets will provide even greater benefits to those with higher levels of agricultural ability; by allowing them to translate notional into actual demand as can be seen by comparing the slope of the line for actual and hypothetical rental. 5% confidence bands are given in both cases to illustrate the fact that the precision of the estimates is comparatively

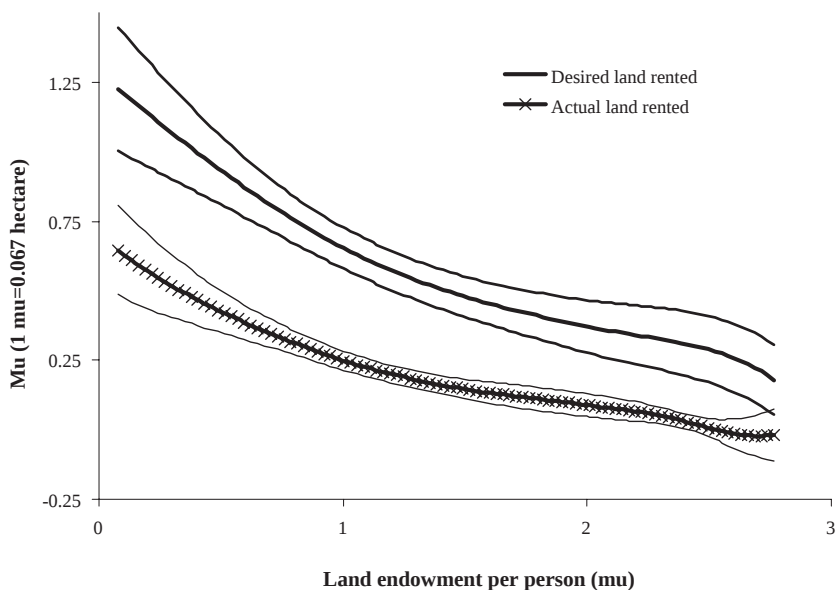


Fig. 2. Demand for actual and desired land rental as a function of land endowment, China. The graph depicts results from non-parametric regressions for all producers included in the sample. Bootstrapped confidence intervals are given for each of the lines.

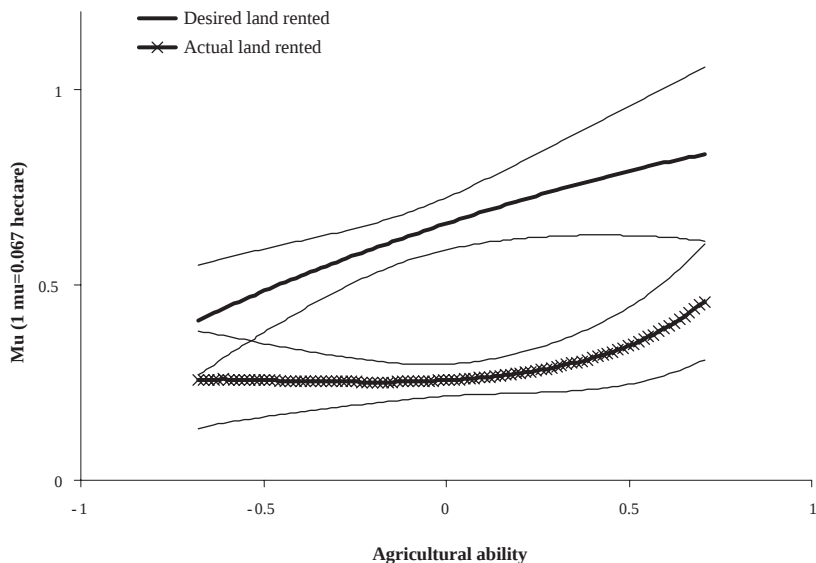


Fig. 3. Demand for actual and desired land rental as a function of agricultural ability, China. The graph depicts results from non-parametric regressions for all producers included in the sample. Bootstrapped confidence intervals are given for each of the lines.

high, and that in both cases, the difference between actual and desired land rental market participation is statistically significant.

4. Econometric evidence

We find that in our sample, markets transfer land to small but efficient producers in a way that is, as far as productive efficiency is concerned, superior to administrative reallocation and almost indistinguishable to it with respect to equity. Higher levels of participation in non-agricultural labor markets contribute to the development of land rental. Removal of other obstacles to the functioning of land rental markets could have a very beneficial impact. An attempt at quantification of these gains suggests that unconstrained operation of rental markets at current or reduced rentals would allow to increase participation between two- and three-fold, respectively, with the net social gains in production increasing between two and six-fold.

4.1. Comparing market and non-market based adjustments

Table 2 reports the results of comparing the determinants of receiving land through either administrative mechanisms or through the land rental market.⁶ Columns (1) and (4) include results of probit and tobit regressions for administrative reallocation while the remainder of the columns reports regressions for land market participation. In columns 3 and 6, we further include past rental market experience at the household level together with current rental activity in the village, as a proxy for lower transaction costs (e.g., with respect to information or enforcement of contracts). There are a number of results of interest.

First, the direction in which land is redistributed, namely from households with higher endowments to those with lower ones, is very similar between administrative reallocation and land rental. As indicated by the negative sign and high statistical significance of households' land endowment in all regressions, both processes increase the amount of land available to the land-poor. This can allay fears that, for example, due to the presence of economies of scale, liberalization of land rental markets would lead to large-scale land concentration, thereby leaving the poor without access to land. Quite surprisingly, the fact that the coefficient on the per capita land endowment is much larger in column (2) than in column (1) suggests that markets are more effective than administrative processes of reallocation in allowing land-poor producers to gain access to land. Comparing this with the tobit regression suggests that village leaders transfer larger areas, something that would be in line with the presence of relatively high fixed costs in the case of administrative reallocation which lead to land being reallocated in larger and lumpy chunks. Even though other factors that are not directly observable may come into play, this suggests that markets do not perform systematically worse than administrative processes on equity grounds.

⁶ Note that the coefficients for the probit regression are marginal effects evaluated at the mean of all other variables.

Table 2
Determinants of receipt of land through administrative vs. market-based reallocation

	Participation (probit)			Area received (tobit)		
	Admin.	Market		Admin.	Market	
Per capital arable land endowment	−0.014*** (4.06)	−0.059*** (3.75)	−0.045*** (3.76)	−2.380*** (4.18)	−1.306*** (3.35)	−1.147*** (3.05)
Agric. production ability	0.011** (2.10)	0.097*** (3.08)	0.069*** (2.91)	1.330* (1.89)	2.261*** (3.61)	1.840*** (3.22)
Head's age (log)	0.214 (1.24)	1.954 (1.40)	1.629 (1.55)	26.557 (0.92)	45.313 (1.60)	45.673* (1.69)
Head's age squared (log)	−0.031 (1.32)	−0.280 (1.49)	−0.232* (1.65)	−3.838 (0.99)	−6.392* (1.69)	−6.386* (1.76)
Household head's education	0.001* (1.92)	−0.003 (0.88)	−0.004 (1.29)	0.177** (2.07)	−0.075 (1.02)	−0.097 (1.37)
HH population 14–60 years old	−0.003** (2.29)	−0.007 (0.78)	−0.002 (0.24)	−0.441 (1.63)	−0.094 (0.44)	0.033 (0.17)
HH population >60 years	−0.002 (0.81)	−0.006 (0.29)	0.005 (0.31)	−0.085 (0.21)	−0.092 (0.23)	0.170 (0.46)
HH population <14 years	−0.004 (1.62)	−0.011 (0.90)	−0.011 (1.27)	−0.461 (1.53)	−0.168 (0.63)	−0.218 (0.86)
Value of draft animals & agric assets (log)	0.000 (0.32)	0.004 (1.34)	0.005* (1.73)	0.033 (0.44)	0.113* (1.70)	0.133** (2.12)
Value of non-farm assets (log)	0.000 (0.59)	−0.003 (0.76)	−0.006** (2.27)	0.066 (0.89)	−0.054 (0.73)	−0.129* (1.81)
Share of household members with migration experience	0.010 (1.54)	−0.205*** (3.41)	−0.105** (2.27)	0.767 (0.73)	−4.879*** (2.90)	−3.145** (2.03)
Renting allowed by village leader		0.064*** (2.87)	0.051*** (3.42)		1.683** (2.17)	1.608** (2.14)
Share of hhs in village renting		0.359*** (9.05)	0.174*** (5.28)		7.000*** (6.91)	3.589*** (3.97)
Past rental experience			0.185*** (9.28)			4.241*** (8.97)
Guizhou dummy	−0.102*** (7.48)	−0.056*** (3.21)	−0.025 (1.49)	−5.318*** (5.92)	−1.334*** (2.72)	−0.743 (1.63)
Yunnan dummy	−0.013*** (4.42)	−0.024 (1.21)	0.005 (0.27)	−3.240*** (4.81)	−0.811 (1.37)	−0.143 (0.26)
Observations	902	902	902	902	902	902
Pseudo- R^2	0.41	0.21	0.39	0.28	0.14	0.24
Log likelihood	−124.10	−274.90	−212.58	−206.96	−479.19	−423.28

Robust z statistics with the correction of cluster heterogeneity in parentheses.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

A second finding of interest is that both markets and administrative reallocation transfer land to producers with higher levels of ability, thereby promoting productive efficiency. However, and in line with our hypothesis that (at least after a certain threshold), it will be more difficult for a “central planner” or village leader to observe producers’ ability than for participants in decentralized markets, both the magnitude and significance of the respective coefficients suggest that market-based processes are superior to administrative redistribution as concerns the transfer of land to more efficient producers. For administrative reallocation, the coefficients on producers’ ability, while positive, are of very low magnitude in the probit equation (column 1) and significant only at 10% in the tobit equations (column 4). While population has some impact, as illustrated by the negative coefficient on the number of 14- to 60-year-old members in the household, other characteristics are relevant as well. By comparison, for markets, coefficients of agricultural ability in both the tobit and the probit equations (columns 2, 5, and 3, 6, respectively) are not only significant at the 1% level but also quantitatively much larger than for redistribution.

To interpret the magnitude of the coefficients, we compare the probability of participation between the least efficient and the most efficient producer in the sample, holding everything else constant. For reallocation, this difference is, with 4 percentage points, quite low, supporting the notion that productive efficiency is not the main motivation for such redistribution. By comparison, the probability of the most efficient producer receiving land in rental markets is between 28% (column 3) and 40% (column 2) percentage points higher than that for the least efficient producer. This would be consistent with the fact that village leaders either have other criteria for allocating land, in addition to ability, or that they observe ability only with some error (Lanjouw, 1999). If the latter is the case, reliance on rental markets would be associated with more productive use of the economy’s resources.

Interestingly, the data support the hypothesis that better definition of land rights as an isolated policy measure, without concomitant increase in non-agricultural opportunities, is unlikely to lead to better functioning of land markets. This can be seen from the negative coefficient on the provincial dummy for Guizhou (columns 2 and 5), the province that has arguably taken most steps to improve security of land rights. At the same time, the highly significant and negative coefficient of the share of family members with past migration experience lends credence to the hypothesis of a strong link between development of non-agricultural opportunities and the activation of land rental markets.

We also find that all three variables relating to transaction costs, i.e., presence of restrictions on such transactions, the share of households in the village participating in rental markets, and the household’s past rental experience, are highly significant and of large magnitude throughout. Lifting remaining restrictions on transferability at the village level would, at the mean of all other variables, increase the probability of participating in rental market by about 6 percentage points (columns 2 and 3). Having one-fourth of households in the village participate in rental markets would increase the probability of rental market participation by between 4.5 to 9 percentage points (columns 2 and 3) while households who had rented land in the past are 19% more likely to be observed renting again in the present. The equations also suggest that both administrative and market reallocation of land provide land to younger households, something that is easily explained given that age is easily observable. One notes, however, that markets may do so more

effectively. Land markets also appear to transfer land to those with higher levels of agricultural assets. Over and above these factors, few of the household level variables included in the regressions are significant.

Table 3 reports the results from estimating corresponding equations for households' participation on the supply side of the rental markets and the area rented out, respectively. In general terms, we note that in many respects the coefficients are a mirror image of what is observed for renting in.

First, and in line with what emerged from the renting-in equations, we find that it is indeed households with higher per capita endowments and lower productive efficiency who tend to rent out land. This suggests that under China's current policy regime, incentives for accumulation of unproductive land are limited, contrary to what is often observed in other countries. Second, while most of the other variables relating to household composition and education of the head are insignificant, we note that households with higher levels of non-agricultural assets are more likely to rent out their

Table 3
Determinants of renting land out

	Specification			
	Participation (probit)		Area rented out (tobit)	
Per capital arable land endowment	0.008 (1.41)	0.009 (1.57)	0.768 (1.59)	0.776 (1.60)
Agric. production ability	−0.047*** (2.71)	−0.045*** (2.79)	−4.509** (2.33)	−4.398** (2.30)
Head's age (log)	−1.370*** (3.14)	−1.358*** (3.28)	−114.416*** (2.86)	−117.714*** (2.92)
Head's age squared (log)	0.185*** (3.17)	0.183*** (3.31)	15.488*** (2.87)	15.906*** (2.93)
Household head's education	−0.000 (0.15)	−0.000 (0.32)	−0.070 (0.50)	−0.095 (0.68)
HH population 14–60 years	−0.001 (0.24)	−0.000 (0.07)	−0.038 (0.10)	0.025 (0.07)
HH population >60 years	−0.010 (1.48)	−0.009 (1.37)	−0.846 (1.04)	−0.797 (0.98)
HH population <14 years	0.003 (0.44)	0.002 (0.38)	0.266 (0.53)	0.220 (0.44)
Value of draft animals and agric. assets (log)	−0.003 (1.51)	−0.002 (1.39)	−0.185 (1.38)	−0.163 (1.22)
Value of non-farm assets (log)	0.005*** (3.82)	0.004*** (3.47)	0.425*** (3.21)	0.394*** (3.00)
Share of household members with migration experience	0.063*** (3.10)	0.064*** (3.20)	5.634*** (2.90)	5.778*** (2.95)
Renting allowed by village leader	0.017 (1.07)	0.015 (0.93)	2.642 (1.24)	2.384 (1.13)
Share of hhs in village renting	0.014 (0.45)	−0.005 (0.18)	0.111 (0.05)	−1.394 (0.59)
Past rental experience		0.030*** (2.73)		2.326** (2.24)
Guizhou dummy	0.010 (0.87)	0.013 (1.16)	0.824 (0.85)	1.074 (1.09)
Yunnan dummy	−0.029* (1.86)	−0.027* (1.69)	−3.269* (1.69)	−3.091 (1.60)
Observations	902	902	902	902
Pseudo- R^2	0.19	0.21	0.12	0.13
Log likelihood	−147.75	−143.83	−236.04	−233.44

Robust z statistics with the correction of cluster heterogeneity in parentheses.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

land. This is of possible policy relevance as it suggests that, with increasing asset accumulation outside of the agricultural sector, the supply of land to the rental market is likely to increase. Third, the share of household members who have migration experience is consistently and highly significant. Together with the rather surprising lack of significance of the own land endowment, this suggests that, with China's fairly egalitarian distribution of land endowments, households' decision to rent land out depends mostly on the non-agricultural opportunities open to them rather than, as in many other countries, the amount of land they own. The indication that diversification of the economic base and access to non-agricultural opportunities is conducive to the development of land rental markets could have important policy implications.

4.2. Comparing actual and desired market participation

The results reported above suggest not only that rental markets perform an important function in transferring land to poor and more productive producers as the rural economy diversifies, but also that, at some point, they may actually be superior to administrative reallocation in transferring land to more productive producers. This makes it of great interest to explore in more detail the extent to which barriers on either the demand or the supply side might prevent rental markets from achieving their full potential and to check whether the results from more unconstrained operation of markets would be different from what has been observed thus far.

To do so, we use information on households' desired land rental market participation at actual and lower prices, as discussed earlier and as illustrated in [Figs. 2 and 3](#). Results from repeating the regressions reported earlier with households' desired rather than their actual level of land rental participation as the dependent variable are reported in [Table 4](#). We note that elimination of constraints to market participation or lower prices would strengthen the redistributive element inherent in markets by transferring land to those with lower endowments and promote greater efficiency. Compared to the actual situation, the difference in predicted rental market participation between the most and the least efficient producer in the sample would widen by 8 percentage points in the unconstrained case at market prices, making the most efficient producer 48% more likely to participate in rental markets than the least efficient one, everything else constant. If the rental rate were reduced by one-third, this would increase by a further 40 percentage points, implying that the most efficient producer would have a 88% higher chance of land rental market participation than the least efficient one.

Columns (3) and (4) of [Table 4](#) indicate that a reduction in the land rental rate would be associated with a number of other interesting features. It would contribute to generational change by allowing a higher share of young households with higher levels of agricultural assets to access land. Also, households with past migration experience would be significantly less (more) likely to rent in (out) land under an unconstrained scenario, suggesting that a mechanism of self-selection is at work whereby households with higher level of non-agricultural ability who have the chance of doing so will pursue activities in the non-agricultural sector, thereby giving way to the development of rental markets.

The regression for hypothetical supply of land to the rental market at current prices supports these conclusions. Comparing with the results obtained earlier ([Table 3](#)), and in

Table 4
Determinants of hypothetical land rental decisions

	Renting in				Renting out	
	Current village rental		Rental reduced by 33%		Current village rental	
	Participation	Area rented	Participation	Area rented	Participation	Area rented
P.c. arable land endowment	−0.105*** (3.79)	−1.552*** (3.91)	−0.119*** (3.91)	−1.716*** (3.36)	0.022 (1.44)	0.578* (1.94)
Agric. production ability	0.118** (2.04)	1.891*** (2.70)	0.221*** (2.78)	3.802*** (3.97)	−0.082 (1.46)	−1.679** (2.15)
Head's age (log)	3.367 (1.58)	63.540** (2.10)	3.794 (1.58)	84.334** (2.11)	−4.450*** (3.39)	−81.439*** (3.30)
Head's age squared (log)	−0.468* (1.65)	−8.686** (2.15)	−0.535* (1.67)	−11.726** (2.19)	0.596*** (3.38)	10.916*** (3.30)
Household head's education	−0.006 (1.14)	−0.097 (1.22)	−0.008 (1.34)	−0.128 (1.21)	0.012*** (2.90)	0.187** (2.38)
HH population 14–60 years	−0.016 (1.03)	−0.205 (0.90)	0.001 (0.07)	0.106 (0.35)	0.002 (0.21)	0.130 (0.61)
HH population >60 years	−0.017 (0.59)	−0.349 (0.80)	−0.022 (0.66)	−0.384 (0.66)	−0.009 (0.37)	−0.118 (0.28)
HH population <14 years	0.002 (0.08)	0.150 (0.54)	0.024 (1.12)	0.403 (1.05)	−0.007 (0.43)	−0.092 (0.32)
Value of agric. Assets (log)	0.016*** (3.17)	0.275*** (3.76)	0.012* (1.79)	0.280*** (2.90)	−0.003 (0.68)	−0.029 (0.40)
Value of non-farm assets (log)	−0.005 (0.93)	−0.038 (0.47)	−0.012* (1.73)	−0.109 (1.00)	0.011*** (2.96)	0.212*** (2.82)
Share of household members with migration experience	−0.398*** (3.58)	−6.160*** (3.52)	−0.386*** (3.56)	−6.324*** (2.99)	0.171*** (2.66)	3.160*** (2.61)
Renting allowed in village	0.052 (1.02)	0.824 (1.22)	0.044 (0.56)	0.649 (0.74)	0.024 (0.68)	0.417 (0.57)
Guizhou dummy	−0.138*** (2.77)	−2.198*** (4.11)	−0.124** (2.43)	−2.087*** (2.86)	0.030 (1.05)	0.623 (1.15)
Yunnan dummy	−0.043 (0.74)	−0.389 (0.59)	−0.017 (0.26)	0.910 (1.00)	−0.030 (0.80)	−0.443 (0.58)
No. of observations	902	902	902	902	902	902
Pseudo- R^2	0.09	0.05	0.09	0.04	0.08	0.04
Log likelihood	−443.05	−872.79	−535.65	−1360.73	−346.95	−592.59

Robust z statistics with the correction of cluster heterogeneity in parentheses.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

line with what had been observed in the descriptive statistics, we observe not only a large extent of unrealized “desired” rentals but also a significant difference in the characteristics between those who actually supply land to the market and those who would like to do so in an unconstrained environment. In addition to confirming the potentially efficiency-enhancing impacts of better functioning land rental markets as discussed earlier, we note that households with higher levels of education, past migration experience, and higher levels of non-farm enterprise assets, are all more likely to supply land to the rental market.

These results are of immediate relevance for policy in a number of respects. Most importantly, by comparing the coefficients between actual and the hypothetical regressions for renting out, it is possible to identify the characteristics of potential suppliers who are likely to be constrained in existing markets. Doing so suggests that more educated households with off-farm jobs and significant levels of non-farm assets are most likely to be constrained on the supply side. Second, the regressions show that greater migration will increase the amount of land transacted in rental markets, thereby allowing efficient producers with limited endowments to gain access to greater amounts of land that could, in turn, also facilitate a gradual consolidation of China’s farm size structure.

From a policy perspective, it is of interest to identify factors that prevent producers from renting out land. To do so, we identify producers who are participation or area constrained in the sense that, at prevailing market prices, they would either want to change their status of participation in rental markets or to rent in or out more than they actually do. Results from this analysis, reported in Appendix Table 1, support the conclusion that households with higher levels of education and past migration are likely to be constrained in renting out whereas households with high endowments of agricultural assets are more likely to be constrained on the demand side of the market. At the village level, restrictions on the operation of rental markets that are imposed by village leaders increase the probability of households being constrained. This suggests that, in addition to raising awareness about the scope of rental markets especially among those households engaged in the off-farm labor market, it may be useful for policy-makers at the local level to provide assurance that renting out will not be taken as a signal for land redistribution. In fact, doing so is one of the main purposes of the new land contracting law that was passed by the National People’s Congress in March of 2003 (Li, 2002).

4.3. Quantifying potential gains from improved functioning of land rental markets

Although results thus far suggest that better development of rental markets is likely to improve productivity, they do not indicate the potential magnitude of such gains. To give at least an initial estimate of the potential gains of doing so, Table 5 presents actual and predicted rates of rental market participation as well as the predicted efficiency gains from different scenarios, compared with a situation of complete autarky. We consider four scenarios, namely (i) exclusive reliance on administrative reallocation (column 1), (ii) actual land rental market operation (column 2); (iii) unconstrained operation of rental markets at actual prices (column 3); and (iv) desired level of land rental markets at lower prices (column 4). The “predicted participation rate” (row 2) is computed from the probit regression for the respective scenario whereas the “net gain in production” (row 3) is obtained by evaluating predicted production, as compared to the baseline scenario, using

Table 5

Social and individual gains from better functioning land rental markets

	Reallocation (%)	Real renting (%)	Desired renting at current prices (%)	Desired rental at 2/3 of current prices (%)
Actual participation rate	5.6	10	23	35
Predicted participation rate	4.6	12.0	20.1	32.5
Net gain in production (%)	0.9	3.7	7.2	21.2

Source: Own calculation based on the regressions as explained in the text.

the Cobb–Douglas production function estimated earlier.⁷ Results from doing so confirm not only that, for the sample considered here, the benefits from operation of markets surpass those that would be predicted to be realized through administrative reallocation, but also that further improvement in the functioning of land rental markets can help to obtain significant additional productivity benefits.

Compared to the base case of autarky, administrative land reallocation would provide 4.6% of producers with access to greater amounts of land. Given that productivity is not one of the main objectives of such reallocation, however, the associated net increase in production is, with 0.9%, quite modest. Allowing, in addition, rental markets to operate, would more than double the number of participants (from 4.6% to 12%) as well as the predicted productivity gain (from 0.9% to 3.7%). Allowing households to obtain their desired level of renting at the current price, e.g., by reducing transaction costs, would lead to a significant further increase in participation to 20% as well as a doubling of the net gain in production from 3.7% to 7.2%, or 3.5 percentage points higher than what has been obtained under the current framework. A further reduction of rental prices would not only be associated with a considerable increase in the rate of participation to 33% of the population of producers but also lead to a gain in social welfare that is more than twenty times larger than what has been achieved by reallocation.

The most relevant figure for the policy discussion is likely to be the 3.5% gain in production that can be achieved by eliminating constraints to rental at current prices. To the extent that village leaders' prohibition or approval of these markets does have an impact on observed outcomes, as suggested by earlier regressions, decentralized measures to highlight the scope for land transfers could improve rental market functioning, thereby increasing productivity and ensuring that China's equitable land ownership distribution will be most efficiently utilized.

5. Conclusion and policy implications

We started this paper by noting that the increased interest in the direct impact of off-farm employment on those directly affected has not been matched by efforts to assess

⁷ Specifically, we assume that each household with a predicted probability of renting above 0.5 rents in the mean area in the sample, use the production function obtained earlier to estimate gross output, and subtract inputs used as well as land rental.

the effects of labor movements of labor out of agriculture on those remaining in the areas of origin. Such study would be important because there is growing recognition that large-scaling factor markets will be critical to ensure that greater migration and off-farm development will provide benefits also to those who do not directly participate, thereby also helping to prevent widening inequality in the broader rural economy. Our empirical results allow to draw three main conclusions.

First, we find that even in some of China's poorest provinces, rental markets have emerged rapidly over the last decade and are now more important as a means for land redistribution than administrative reallocation. Our regressions suggest that such markets have a positive impact on land access by those with small endowments and, by redistributing land to those with higher agricultural ability, also improve productive efficiency. The fact that they have emerged rapidly even though all land remains state-owned and restrictions on rentals remain in place suggests that full private ownership is not a necessary pre-condition for the emergence of land transactions. Even though more detailed study of the direction of causality would be of interest, the fact that there appears little direct correlation between the level of tenure security and that of land market development suggests that increased levels of tenure security are not a sufficient condition for the emergence of land markets. At the same time, China's gradual move towards a legal framework that provides increased levels of tenure security through longer use rights and successively increasing restrictions on the nature of reallocations and the conditions under which these can occur suggests that greater market activity is likely to lead to demand for property rights to adjust, an issue that would deserve further study.

A second finding of interest is that, contrary to concerns that land rental markets may leave out the poor, our regressions suggest that, at least in the case at hand, market transactions transfer land to those with lower initial endowments. Moreover, according to our results, decentralized land rental transactions have a more favorable impact on productivity than administrative reallocations, consistent with the hypothesis that, with higher levels of demand for land market activity, transaction costs and informational imperfections limit the scope for administrative reallocations of land to achieve optimum outcomes. Also, contrary to fears that land rental markets might lead to accumulation of land in the hands of the rich and powerful, greater emphasis on rental as compared to administrative reallocation would provide greater benefits to poor but efficient producers who have few alternative opportunities for using their labor endowment. To what extent and under which conditions (e.g., in terms of clear rules for reallocations) higher levels of land market activity can co-exist with communities maintaining administrative land reallocation to provide a basic safety net is an area for further study.

Finally, the large number of producers who would be willing to participate in land rental markets even at current prices suggests that the role of decentralized land transfers between private parties is likely to increase as higher levels of out-migration, greater educational attainment, and increased accumulation of capital in the non-farm sector all contribute to structural change and diversification of income sources in rural areas. Simulations, based on the production function estimated earlier, allow us to quantify the potential benefits in terms of production. Unconstrained functioning of rental markets

would double the share of households who participate in rental markets and achieved almost ten times the benefits obtained from administrative reallocation. To facilitate the realization of this potential, measures to reduce the transaction cost of exchanging land will be appropriate.

Although our study has been limited to China, the issues discussed are likely to be of relevance to a wider range of developing countries (e.g., Ethiopia, India, Bangladesh) that aim to make the transition from an agricultural to a more diversified economic structure but have, for various reasons, restricted the scope for operation of land rental markets. The fact that studies from other countries with different property rights arrangements come to similar conclusions regarding the impact of land rental suggests that the positive potential of rental markets is not contingent on the specific property rights arrangement (i.e., only use but no ownership rights) prevailing in China. Also, the evidence provided here suggests that well-functioning land rental markets have an important role in spreading the benefits from off-farm development and out-migration to the broader rural population. Restrictions on the operation of such markets will not only make adjustment and structural change more difficult but could in principle also constrain the development of the non-agricultural sector more generally. More work on the impact of land markets on off-farm development and on factors that may promote or restrict transferability of land would, particularly in these countries, be a promising avenue for research with immediate implications for policy.

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Appendix A. Proofs for main propositions

Proposition 1. *The amount of land rented in is strictly increasing in households' agricultural ability, α , and strictly decreasing in their land endowment $\bar{A}$.*

Total differentiating both sides of (5) or (7) with respect to α (again, i is ignored for notation simplicity), yields:

$$pf_{l^a}(l^a, A) + p\alpha \left(f_{l^a l^a} \frac{\partial l^a}{\partial \alpha} + f_{l^a A} \frac{\partial A}{\partial \alpha} \right) = 0.$$

Total differentiation of both sides of (6) or (8) with respect to α , yields:

$$pf_A(l_i^a, A_i) + p\alpha \left(f_{AA} \frac{\partial A}{\partial \alpha} + f_{Al^a} \frac{\partial l^a}{\partial \alpha} \right) = 0.$$

From the first equation, we obtain $\partial l^a / \partial \alpha$; substituting this into the second equation gives:

$$\frac{\partial A}{\partial \alpha} = \frac{f_{Al^a} f_{l^a} - f_A f_{l^a l^a}}{\alpha (f_{AA} f_{l^a l^a} - f_{Al^a} f_{l^a A})} = \frac{f_{Al^a} f_{l^a} - f_A f_{l^a l^a}}{\alpha [f_{AA} f_{l^a l^a} - (f_{Al^a})^2]} > 0 \quad (A1)$$

This implies that for all households who participate in rental markets (on either side), the area operated will increase with ability.

For households renting in, the amount of land rented in is the difference of the amount of operational land and the land endowment, i.e.,

$$a_{in} = A - \bar{A}. \quad (A2)$$

Total differentiation of both sides of (A2) with respect to α yields $(\partial a_{in} / \partial \alpha) = \partial A / \partial \alpha > 0$, implying that for households who rent in land, the amount of land rented in is increasing in agricultural ability. Total differentiation of both sides of (A2) with respect to $\bar{A}$, yield $(\partial a_{in} / \partial \bar{A}) = -1 < 0$, implying that for the households who rent in land, the amount of land rented in is strictly decreasing in land endowment.

For those households who rent out land, the amount of land rented out is the difference between the land endowment and the land used for self-cultivation, or formally,

$$a_{out} = \bar{A} - A \quad (A3)$$

Total differentiation of both sides of (A3) with respect to α yields $(\partial a_{out} / \partial \alpha) = -(\partial A / \partial \alpha) < 0$, implies that for those households who rent out land, the amount of land rented out will be decreasing in agricultural ability. Total differentiation of both sides of (A3) with respect to $\bar{A}$, yields $(\partial a_{out} / \partial \bar{A}) = 1 > 0$ (for by assumption, individual household's operational land, A is not constrained by individual household's endowment), implying that for those households who rent out land, the amount rented out is strictly increasing in land endowment.

Proposition 2. *Presence of transaction costs drives a wedge between those renting in and those renting out with any increase in T decreasing α_l and increasing α_u , thereby expanding the range of producers who remain in autarky, reducing the number of households who participate in rental markets, as well as the amount of land transacted through rental markets.*

Totally differentiating both sides of Eqs. (7) and (8) with respect to T yields

$$p\alpha f_{l^a l^a} \frac{\partial l^a}{\partial T} + p\alpha f_{l^a A} \frac{\partial A}{\partial T} = 0 \text{ and } p\alpha f_{Al^a} \frac{\partial l^a}{\partial T} + p\alpha f_{AA} \frac{\partial A}{\partial T} = -1.$$

We obtain $\partial l^a/\partial T$ from the first equation and substitute into the second equation, which yields

$$\frac{\partial A}{\partial T} = \frac{-1}{p\alpha[f_{AA}f_{l^a l^a} - (f_{Al^a})^2]} < 0. \quad (\text{A4})$$

Eq. (A4) implies that households who rent in will operate less land as the transaction cost increases.

Total differentiation of both sides of (A2) with respect to T yields $(\partial a_{in}/\partial T) = \partial A/\partial T < 0$, implying that households who still rent in land will rent in less and as the transaction cost increases.

Totally differentiating both sides of Eq. (5) and (6) with respect to T and rearranging terms yields:

$$\frac{\partial A}{\partial T} = \frac{1}{p\alpha[f_{AA}f_{l^a l^a} - (f_{Al^a})^2]} > 0. \quad (\text{A5})$$

Eq. (A5) implies that households in the renting in pool will operate less land as the transaction cost increases. Total differentiate both sides of (A3) with respect to T , yield $(\partial a_{out}/\partial T) = -(\partial A/\partial T) < 0$, implies that households who still rent out land will rent out less as the transaction cost increases.

For households who continue to rent in, the optimal operational land holding can be obtained from Eqs. (7) and (8) as $A_i = A_i(\alpha, p, r, T, w)$. Setting A_i to $\bar{A}_i$ yields the identity

$$\bar{A}_i = A_i(a_i, p, r, T, w). \quad (\text{A6})$$

Totally differentiating both sides yields, $d\bar{A}_i = (\partial A_i/\partial \alpha_i)(d\alpha_i) + (\partial A_i/\partial T)(dT) = 0$ (for $d\bar{A}_i = 0$)

$$\frac{d\alpha_i}{dT} = -\frac{\frac{\partial A_i}{\partial T}}{\frac{\partial A_i}{\partial \alpha}} > 0 \quad (\text{A7})$$

(for $\frac{\partial A_i}{\partial \alpha} \geq 0$ from (A1) and $\frac{\partial A_i}{\partial T} < 0$ from (A4)), implying that, as the transaction costs increase, more households would change from renting in land to autarky.

Similarly, for the households who continue to rent out land, and based on (5) and (6), we can derive the following proposition:

$$\frac{d\alpha_i}{dT} = -\frac{\frac{\partial A_i}{\partial T}}{\frac{\partial A_i}{\partial \alpha}} < 0 \quad (\text{A8})$$

(for $\frac{\partial A_i}{\partial \alpha} > 0$ from (A1) and $\frac{\partial A_i}{\partial T} > 0$ from (A5)) implying that, as transaction costs increase, more households would change from renting out to autarky.

Proposition 3. *Increases of the exogenously given wage for off-farm employment will increase the amount of land transacted in rental markets by increasing the amount rented out by households with low agricultural ability (who join the off-farm labor force) and the amount rented in by those with high-ability (who specialize in agricultural production).*

This will be associated with a decrease in the equilibrium rental rate which, in a risk-free environment, will make everybody better off.

Without loss of generality, we assume that only the households who originally rented land out will take advantage of the increased off-farm opportunities. Those who rented in land originally will continue to rent in land and their off-farm opportunities are assumed to remain the same as before. In other words, households who rented out land before will face wage increase while those who rented in land before will face the same wage regardless of the increase of the overall off-farm opportunities.

For those households who rented out land, taking the derivatives of both sides of Eq. (5) and Eq. (6) with respect to w yields

$$p\alpha f_{l^a l^a} \frac{\partial l^a}{\partial w} + p\alpha f_{l^a A} \frac{\partial A}{\partial w} = 1$$

$$p\alpha f_{A l^a} \frac{\partial l^a}{\partial w} + p\alpha f_{AA} \frac{\partial A}{\partial w} = 0$$

Obtain $\partial l^a / \partial w$ from the second equation and substitute into the first equation, we will have

$$\frac{\partial A}{\partial w} = \frac{f_{A l^a}}{p\alpha [(f_{A l^a})^2 - f_{l^a l^a} f_{AA}]} < 0 \quad (\text{A9})$$

which implies that households who rented out land will use even less endowment for self-cultivation and $a_{\text{out}} = \bar{A} - A \frac{\partial a_{\text{out}}}{\partial w} = -\frac{\partial A}{\partial w} > 0$, implying that amount of land rented out by individual household is increasing in its off-farm opportunity, as consequence, aggregate supply of land increases.

If we also assume that off-farm opportunities will not affect those households who originally rented in, greater supply of land due to increases in the wage rate will lead to a decrease in rental rate. To show this informally, let $a_{\text{in}} = a_{\text{in}}(\alpha_1, \dots, \alpha_I, p, w^{\text{in}}, r^*, T)$ be the aggregate rent in curve, and let $a_{\text{out}} = a_{\text{out}}(\alpha_1, \dots, \alpha_I, p, w^{\text{out}}, r^*, T)$ be the aggregate rent out curve. At equilibrium, set amount of land rented in equals to the amount of land rented out, or

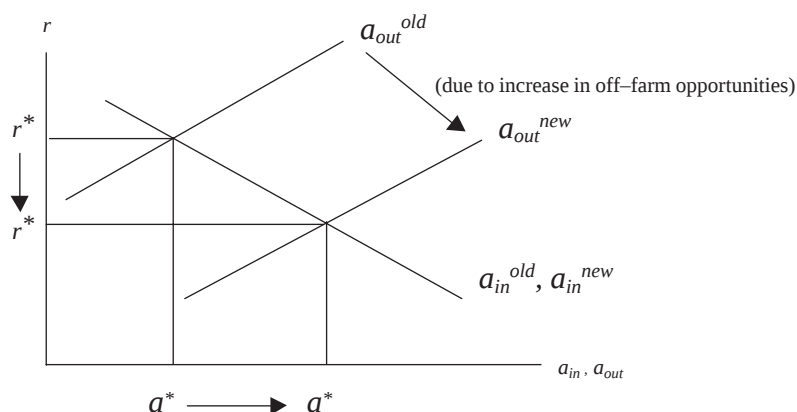
$$a_{\text{in}}(\alpha_1, \dots, \alpha_I, p, w^{\text{in}}, r^*, T) = a_{\text{out}}(\alpha_1, \dots, \alpha_I, p, w^{\text{out}}, r^*, T) \quad (\text{A10})$$

Total differentiate both sides of (A10) by allowing r^* and w^{out} to vary, yield:

$$\begin{aligned} \frac{\partial a_{\text{in}}}{\partial r^*} dr^* &= \frac{\partial a_{\text{out}}}{\partial r^*} dr^* + \frac{\partial a_{\text{out}}}{\partial w^{\text{out}}} dw^{\text{out}}, \text{ rearrange terms, we will have } \frac{dr^*}{dw^{\text{out}}} \\ &= \frac{\frac{\partial a_{\text{out}}}{\partial w}}{\frac{\partial a_{\text{in}}}{\partial r^*} - \frac{\partial a_{\text{out}}}{\partial r^*}}. \end{aligned} \quad (\text{A11})$$

It is easy to show that the sign of (A11) is negative. We know $(\partial a_{\text{out}} / \partial w) > 0$, $(\partial a_{\text{in}} / \partial r^*) < 0$, and $(\partial a_{\text{out}} / \partial r^*) > 0$, and we just showed that the equilibrium rental rate falls as the off-farm opportunities increases.

To show the aggregate rent in and rent out curve graphically, we will have:



Again, as the off-farm opportunities increase, the equilibrium rental rate falls while the amount of land transacted in the market increases.

Table A1

Determinants of households being constrained in land rental markets

	Renting in		Renting out	
	Participation constrained	Quantity constrained	Participation constrained	Quantity constrained
P.c. arable land endowment	−0.025 (1.64)	−0.051*** (2.74)	0.007 (0.56)	0.018 (1.22)
Agric. production ability	0.002 (0.07)	0.012 (0.31)	−0.034 (0.84)	−0.045 (1.04)
Head's age (log)	1.619 (1.29)	2.060 (1.28)	−1.637 (1.52)	−2.554** (2.19)
Head's age squared (log)	−0.219 (1.30)	−0.276 (1.29)	0.218 (1.52)	0.339** (2.16)
Household head's education	−0.003 (0.87)	−0.001 (0.30)	0.011*** (2.93)	0.012*** (2.91)
HH population 14–60 years	−0.007 (0.70)	−0.013 (1.14)	0.005 (0.49)	0.006 (0.52)
HH population >60 years	−0.001 (0.04)	−0.011 (0.48)	0.006 (0.33)	−0.008 (0.36)
HH population <14 years	0.006 (0.51)	0.011 (0.92)	−0.009 (0.87)	−0.019 (1.46)
Value of agric. Assets (log)	0.008** (2.24)	0.010*** (2.60)	0.001 (0.39)	0.000 (0.06)
Value of non-farm assets (log)	−0.001 (0.33)	−0.001 (0.20)	0.003 (0.79)	0.003 (0.83)
Members migrating out (%)	−0.144** (2.03)	−0.193** (2.48)	0.054 (0.94)	0.120** (2.07)
No renting restriction in village	−0.057* (1.79)	−0.009 (0.24)	0.011 (0.34)	0.022 (0.61)
Guizhou dummy	−0.003 (0.08)	0.001 (0.02)	0.014 (0.49)	0.025 (0.84)
Yunnan dummy	0.021 (0.62)	0.053 (1.19)	0.008 (0.22)	0.000 (0.01)
No. of observations	902	902	902	902
Pseudo- R^2	0.05	0.05	0.03	0.05
Log likelihood	−283.05	−341.56	−274.73	−297.76

Robust z statistics with the correction of cluster heterogeneity in parenthesis; * significant at 10%; ** significant at 5%; *** significant at 1%.

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