# Land rental markets as an alternative to government reallocation?

## Equity and efficiency considerations in the Chinese land tenure system

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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. We find that both processes redistribute land to those with lower endowments but that land rental markets are more effective in doing so and also have a larger productivity-enhancing effect than administrative reallocation implying that more active land rental markets would allow producers to realize significant productivity gains. At the same time, the presence of a large number of producers whose participation in rental markets remains constrained suggests that efforts to reduce transaction costs in land rental markets would be warranted.

## 1. Introduction

Given the importance of land access for the efficiency of agricultural production and household investment incentives, how land is distributed and the way in which markets for land function will have important implications for food security and income growth, and thus the broader development process at both the household and the national level. China is of particular interest in this context because it is characterized by a highly egalitarian structure of land ownership whereby, after the introduction of the household responsibility system in the late 1970s and early 1980s, land was *de facto* allocated on a per capita basis (Brandt et al. 2002). As a consequence, and contrary to what is found virtually everywhere in the world, the distribution of land in China is more egalitarian than the distribution of income and land continues to perform an essential function as a social safety net. Even though the land area cultivated per household is small by international comparison,[1] the fact that every household owns enough land to at least grow their own food in times of crisis has a significant impact on the ability of households to smooth consumption. This has been credited as a key factor in allowing China to achieve much higher levels in terms of human development indicators (e.g. infant mortality, stunting, women's literacy) than other countries at comparable levels of economic development characterized by more inegalitarian structure of land ownership (Burgess, 2001).

While the benefits from an egalitarian land ownership distribution are widely recognized, whether additional interventions by government may be needed to maintain the equality of opportunity that is implied in such equal access to the main non-labor means of production is an issue that has attracted considerable debate among researchers as well as policy makers. In fact, fears that "market outcomes" may undermine basic equity objectives have led most villages in China to resort to periodic administrative redistribution of land, a practice that is viewed approvingly by a wide range of academics and researchers

[1] The average per capita land endowment is less than one mu (one fifteenth of a hectare), generally split up into about 9-10 parcels (Wen 1996).

(Kung 1994; Dong 1996; Turner et al. 1998; Benjamin and Brandt 1998). In order to assess whether such a practice may be justified or even needed, it is important to be aware of the alternatives to administrative reallocation of land and, in addition to comparing administrative to market-based land reallocation, to be able to construct a realistic counterfactual to administrative intervention in the land market, something that has proven difficult in the existing literature. In this paper, we use micro data from about 1,000 households in three of China's poorest provinces to explore three questions relating to the scope and productivity impact of different methods of land reallocation.

First, we are interested to find out whether concerns about potential negative equity implications from "unchecked" functioning of land rental markets are justified. To do so, we compare land rental markets and administrative processes with in terms of the total amount of land they were able to reallocate and the characteristics, in terms of total land owned and agricultural productivity, of recipients. We find not only that, in terms of quantity, rental markets have recently become more important than administrative reallocation, but also that markets and administrative mechanisms tend to transfer land to more productive and poorer households. This would suggest that there is little reason to be concerned about potential negative effects of the emergence of rental markets as, with more and more off-farm migration and non-farm employment, the need for reallocation of land increases. This conclusion is reinforced by the fact that, according to our regressions, land markets seem to be better than bureaucrats in transferring land to poor and more efficient producers, i.e. those with small land endowments and high levels of agricultural ability, implying that such land markets contribute to higher productivity and greater equity.

A second question is whether land markets allow households to make all the transactions they desire or whether, for example as a result of transaction costs, some households are either completely rationed out of such markets or are only able to realize much less than the desired number of land transactions. This translates into the question of determinants of supply of and demand for land rental. To explore this question, and make inferences about the presence and extent of market imperfections and transaction costs in these markets as well as policies that could help reduce them, we analyze data on hypothetical land transactions available from the survey. We find evidence for considerable rationing even at the prevailing rental price as the amount of land that villagers would want to exchange is consistently higher than what is actually observed. In fact, non-parametric regressions confirm that the difference between desired and actual participation in land rental markets increases with households' agricultural ability, suggesting that reducing rationing would lead to clear improvements in productivity. A closer look at household specific and village level factors that affect participation in rental markets helps uncover potential areas for policy intervention. It reveals that whether land rental is allowed at the village level, the dependence of the village economy on agriculture, possession of non-agricultural assets, past rental

experience, and village level activity of rental markets all increase the scope for rental markets, in terms of participation as well as area transacted. Analysis of the characteristics of households which are constrained on the supply side of the market reveals that eliminating obstacles to rental market participation, for example through clarification of rental rights at the village level will allow younger and more productive households with higher level of agricultural assets but no migration experience to access land, something that would clearly increase overall productivity.

If, as asserted above, better functioning of rental markets will enhance both productivity and equity, it would be of great interest to quantify the associated impacts. To do so, we simulate the changes in output net of variable production cost that could be realized from better functioning of land markets. We find that, even without changes in rental rates, realization of all desired transactions would double the share of producers participating in rental markets to almost 25% and participating producers would increase their level of agricultural production by almost 70%. Reduction of rental rates by one third would have an even more dramatic effect; the share of producers participating in rental markets would increase to almost 40% and the increase in social welfare would amount to five times what is currently realized. Comparing the social benefits that could be achieved by improved functioning of land rental markets to the gains realized from administrative reallocation, illustrates the potential importance of rental markets. Unconstrained rental markets would be associated with a more than nine-fold increase in social benefits with another tripling of these benefits from reduced rental prices. As the scope for exchanges of land increases with development of the off-farm economy, higher levels of education, and increased accumulation of non-farm assets, it will be more and more difficult to rely on direct redistribution as the sole means to maintain an optimal operational land distribution. In this context, measures to improve the functioning of rental markets could help to increase productivity and ensure that China's equitable land ownership distribution will be most efficiently utilized.

The paper is structured as follows: Section two reviews the literature and develops a model and an estimation strategy to analyze land rental market decisions in a framework with off-farm employment opportunities, transaction costs, and unobserved agricultural ability. Section three discusses data sources and provides evidence on descriptive statistics as well as the distribution of agricultural ability across producers. Section four 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 five concludes with policy implications.

## 2. Background and conceptual model

While the literature has long emphasized the importance of a possible investment disincentive effect derived from insecure land tenure, relatively less attention has been devoted to the allocative impact of land tenure arrangements. Focusing on the latter may be important not only because accumulating empirical evidence suggests that the magnitude of the investment disincentive effect may be small but also because adjustments through markets are likely to become more important as the rural non-farm economy develops and households increasingly migrate to urban areas. To do so, we develop a model of agricultural production and land market participation that allows us to derive comparative statics and hypotheses that can be tested with our data.

### 2.1 Investment and allocative dimensions of land tenure

We distinguish two main channels through which land redistribution could affect productive efficiency and household welfare: an investment disincentive effect; and an allocative effect.

According to the *investment disincentive* effect, which has received by far the greatest attention in the literature, the scope for continuing redistribution of land is likely to adversely affect investment incentives because households would not invest in land that might be expropriated after the investment has been made (Besley 1995). The presence and magnitude of such an effect has been studied in a large literature on virtually every continent (Soule et al. 2000; Fearnside 2001; Place and Otsuka 2001; Place and Migot-Adholla 1998; Binswanger et al. 1995; Bruce and Migot-Adholla 1994; Feder and Onchan 1987). Recently, a number of contributions have explored how land tenure security may affect land-related investment in China (Li et al., 1998; Brandt et al., 2002; Jacoby et al., 2001). The majority of these studies finds that better definition of land rights does increase producers propensity to invest but that the magnitude of such investment is quite small. There are two main reasons that might underlie such a finding. On the one hand, partly due to depressed prices for agricultural output, returns to agricultural cultivation are currently quite low implying that, even with higher levels of tenure security and the associated increased returns to investment, it may not be profitable to undertake such investment (Kung 1995). On the other hand, it may be that, with community-based mechanisms to secure property rights to land-related investments at the local level, the added security provided by formalization of such property rights may be limited. This would be reinforced by the fact that investment is undertaken mostly on upland and undeveloped "wasteland" which, by definition, is not subject to redistribution by village authorities. Such an explanation would be consistent with experience from other countries where, even though land can not be owned individually, individual property rights to land-related improvements are universally recognized, very secure, and can be enforced at relatively low cost (Platteau 2000). Although this does not imply that institutions to check village leaders' abuses of their ability to redistribute land

would not be needed (Huang 1999), it suggests that -in view of villages' apparent ability to deal with these issues in a satisfactory manner- focusing attention on the investment-impact of efforts to enhance the security of property rights alone is unlikely to bring about large increases in productivity.

A second set of concerns revolves around the *allocative* impact of land redistribution. The underlying idea is that, in a dynamic economic environment that is characterized by increasing levels of off-farm employment and rural-urban migration, transfer rights are likely to become more important in the future (Carter and Yao 1999a). Therefore, and irrespectively of the ownership distribution of land, efficient mechanisms to transfer land from less to more efficient producers would become increasingly important to ensure an efficiency-maximizing *operational* land distribution.[2] Administrative processes of reallocation are normally slow, associated with high transaction costs, infrequent, and possibly subject to bureaucratic inefficiencies and rent-seeking behavior (Johnson 1995). Moreover, even in a closely knit and purely agrarian economy, it is unlikely that village leaders will be able to observe individual cultivators' agricultural ability and allocate land accordingly in a productivity-maximizing way. As a consequence, administrative means may be ill-suited to respond to the demand for productivity-enhancing re-allocations of land that is needed with broader economic development. Even though market-based transactions may not be costless either, it would be of great importance to compare the potential of markets to that of administrative reallocation.

In fact, knowledge about the functioning of these markets and their equity and productivity impacts is quite limited. Studies indicate that many villagers express a desire for administrative redistribution in order to re-establish "appropriate" land-labor ratios (Kung and Liu 1997; Kung 2000), suggesting that there are still many mis-perceptions about the scope for land rental market operation. Partly as a result of such misperceptions and continuing interventions, rental markets do not function well (Yao 2000). In fact, it is often noted that renting out of land would be seen by the village leaders as a signal that expropriation of the land for subsequent reallocation to other villagers would be feasible (Yao, 1996).

### 2.2 A model of agricultural production and land market participation

Suppose household $i$ is endowed with a vector of household characteristics $\boldsymbol{X}$ (excluding agricultural ability), endowments of labor $\overline{L}_i$ and cultivated land $\overline{A}_i$ and agricultural production ability $a_i$. Assume that there is no farm labor market but that households have the opportunity to allocate their labor

[2] 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.

endowment between farming on their own plot and non-farming activities at a given wage $w(\boldsymbol{X})$, 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 is characterized as $a_i f(l_i^a, A_i)$ where $l_i^a$ represents labor used in agricultural production, and $A_i$, land used in agricultural production. To simplify the exposition, we drop the subscript $i$ in the subsequent discussion. Let f satisfy the standard assumptions: $f_{l^a} > 0$, $f_A > 0$, $f_{l^a l^a} < 0$, $f_{AA} < 0$, $f_{l^a A} > 0$ and $f_{l^a l^a} f_{AA} - f_{l^a A} > 0$.

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

$$\underset{l^a, A}{Max}\; pa_i f(l_i^a, A_i) + wl_i^o - (\overline{A}_i - A_i)r \qquad \text{( a)}$$

where $p$ is the price of agricultural goods, $l^o$ is the amount of time allocated to off-farm labor (= $\overline{L}_i - l_i^a$), and all other variables are as defined above. Note also that, for any household, $\overline{A}_i - A_i > 0$ implies net renting out and $\overline{A}_i - A_i < 0$ 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.

$$pa_i f_{l_i^a}(l_i^a, A_i) = w \qquad (1)$$

$$pa_i f_{A_i}(l_i^a, A_i) = r \qquad (2)$$

The interpretation of these FOC is intuitive: Households will 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. It is, however, more realistic that rental markets are not perfect, i.e. that renting in and renting out land is associated with a transaction cost, i.e. 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 the transaction cost to be independent of the area rented and amount to a fixed amount $T$ that has to be incurred equally by those renting in and renting out. With such transaction costs, households who would have participated in rental markets earlier will now remain in autarky. The equilibrium conditions for those people who will only cultivate their endowment and not participate in rental markets are:

$$pa_i f_{l_i^a}(l_i^a, \overline{A}_i) = w \qquad (3)$$

$$r - T < pa_i f_A(l_i^a, \overline{A}_i) < r + T \qquad (4)$$

These conditions define the existence of two cut-off points in terms of households' agricultural ability, $a_l$ and $a_u$,[3] such that households with $a_i \in [a_l ; a_u]$ will not participate in land markets. Households with $a_i < a_l$ will continue to rent out land with the amount of land rented satisfying the new FOC:

$$pa_i f_{l_i^a}(l_i^a, A_i) = w \qquad (5)$$

$$pa_i f_A(l_i^a, A_i) = r - T \qquad (6)$$

Similarly, households with $a_i > a_u$ will continue to rent in land from others and their decision rules follow their respective modified FOC:

$$pa_i f_{l_i^a}(l_i^a, A_i) = w \qquad (7)$$

$$pa_i f_A(l_i^a, A_i) = r + T \qquad (8)$$

Based on condition (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, $a$, and strictly decreasing in their land endowment $\overline{A}$. 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 $a$ (or base their reallocation decisions on criteria other than productive efficiency), we would expect that land rental markets would do so more effectively 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 $a_l$ and increasing $a_u$, 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. Compared to the perfect market case this would imply lower social welfare, with the extent of losses increasing in the dispersion of $\alpha$ across producers.

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[3] $a_l = \dfrac{r - T}{pf_A(\bar{l}_i^a, \overline{A}_i)}$ , $a_u = \dfrac{r + T}{pf_A(\bar{l}_i^a, \overline{A}_i)}$ where $\bar{l}_i^a$ can be solved from equation (3).

**Proposition 3.** Increases in 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 Estimation strategy and methodology

*Administrative vs. market-based land reallocation:* It has become commonplace in the literature to view markets and administrative modes of land reallocation as two means to achieve the same goal (e.g. Lohmar et al. 2001; Carter and Yao 1999b; Liu et al. 1999; Benjamin and Brandt 1999). There has, however, been comparatively little empirical research on this subject. Our data allow us to perform a direct comparison of the functioning of these two mechanisms, especially the extent to which each of them enhances efficiency or equity and whether there are any possible trade-offs between these two objectives. Such trade-offs might arise if strong economies of scale would lead the unfettered operation of markets to consolidate land whereas administrative reallocation might accomplish the opposite. While the presence of increasing returns to scale and the resulting tendency towards consolidation has been mentioned repeatedly in the literature on Chinese agriculture (Fleisher et al. 1992; Zhou 2000), existing evidence is ambiguous and rarely based on micro data. Benjamin and Brandt (1998) suggest that reallocation of land could provide large efficiency gains and that some of these gains are realized through administrative reallocation but they were unable to compare administrative reallocation to market based reallocation.

To explore this issue, we specify a reduced form regression for receipt of land through reallocation as well as for participation in land rental markets (either renting in or renting out). Key right hand side variables included relate to a household's agricultural productivity, its endowments of land, labor, and other factors of production, the off-farm opportunities available, and the transaction costs associated with land rental. Formally, we estimate

$$R_i = b_0 + b_1 a_i + hX_i + d\,O_i + gT_i + e_i \qquad (9)$$

where $R_i$ is a dummy for renting in/out or the actual amount of area rented in/out, $a_i$ is household agricultural ability, $X_i$ is the vector of other household characteristics including its land endowment and its level of agricultural and non-agricultural assets, $O_i$ denotes the off-farm opportunities available to household $i$, and $T_i$ is a vector of characteristics affecting the transaction cost of land rental (including rental experience in earlier years and the level of activity of the rental market at the village level). 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 other outcome variables of interest as explained in more detail below.

A parameter of key interest is the coefficient $b$ on $a_i$, household $i$'s level of agricultural ability. To the extent that such ability can not be transferred in markets, we would expect that, holding other factors constant, $b > 0$, i.e. markets transfer land to producers with higher ability. The vector $\boldsymbol{X}$ includes household characteristics such as per capita land endowment, the number of members by age group, the level of agricultural assets, and the age and education of the household head. Note that these will also affect the wage rate that can be obtained in the market. Even though the history of land reallocation in China implies that there is less dispersion in per capita land endowments than in other countries, we would expect the coefficient on the land endowment to be negative, implying that land rental markets transfer land to those with lower levels of endowments. Also, while the amount of agricultural asset ownership would be irrelevant if markets for such assets were perfect, the existence of imperfections in these markets, especially with respect to draft animals, is well established (Rosenzweig and Wolpin 1987), leading us to expect that households with higher levels of asset ownership will be more likely to rent in land. Finally, in line with the literature (e.g. Reardon et al. 2001), we expect that off-farm opportunities improve with the household's level of educational attainment, the stock of non-agricultural fixed assets owned, and with past migration or off-farm job experience. As, in terms of our model, better off-farm opportunities are equivalent to a higher wage rate, we expect the coefficients on variables that improve such opportunities to be negative and positive in the renting in and renting out equations, respectively.

To proxy for availability of off-farm opportunities beyond the household level, we include two village level variables, namely the share of households whose main source of income is agriculture, and the mean per capita level of income in the village. Both will, according to our model, increase the amount of land transacted through rental markets and decrease the equilibrium rental rate. Thus we would expect the coefficients on these variables to be positive. Also, we include the share of households participating in rental markets (excluding the household under concern) at the village level as a measure of the transaction costs faced by potential participants in such markets. The rationale is that in villages where rental is already practiced, the institutions and norms to facilitate a functioning rental market are already available and it is likely to be easier for households to obtain information on rental prices and other characteristics of relevance for such markets. Even though partly endogenous, past participation in rental markets will allow households to build a reputation and become acquainted with the processes involved. Therefore we would expect the coefficient to be positive in both renting in and renting out equations.

To facilitate comparison between administrative and market-based reallocation of land, we repeat the same equations (excluding parameters relating to past involvement in land rental markets) for households' receipt of land through administrative mechanisms. Unfortunately the data set does not contain sufficient observations of households who lost land through reallocation, implying that we restrict attention to those who received land through administrative means.

*Assessing the potential for market operation and potential obstacles:* Changing $R_i$ from real to hypothetical renting decisions (both participation and the desired amount of land transacted) will allow one to identify characteristics that increase households demand for renting in as well as renting out and at the same time to identify characteristics common to households whose participation in such markets is constrained. Doing so would help to assess the extent to which markets are currently realizing their potential, point out measures that could help them to do so more fully, and identify those who are likely to gain from such better market functioning.

In our model, there are two main factors that drive market participation; one is the exogenous wage rate and the second one is ability. Better functioning of markets (or a reduction in transaction costs) would be predicted to increase the amount rented out by those with low agricultural ability while increasing the amount rented in by high ability individuals. Also, to the extent that higher levels of education, a history of off-farm employment, and possession of non-agricultural enterprise assets would increase the wage rate an individual could obtain outside the agricultural sector, we would expect these variables to increase supply of land to the market and reduce the propensity to rent in land. A second issue with policy relevance is that the data on desired land rental participation allows one to identify potential factors that lead to households being constrained. To the extent that these are amenable to policy at the local or central level, this would have immediate policy implications.

*Benefits from increased land market activity:* While our model predicts that better functioning of land markets would enhance overall productivity, empirical evidence on the magnitude of the impact of better functioning of markets on overall production is needed to assess whether this is an issue of potential policy relevance. To derive a conservative estimate of the magnitude of such a gain in production, we predict households' participation in rental markets under different scenarios (i.e. the actual situation; a hypothetical unconstrained situation, and a situation with reduced rental rates), assume they rent in the mean area observed in the sample, and predict production with no other changes in other factors but with profits re-calculated to adjust for the proportionally higher amount of other inputs used.[4] Comparing the amount and value produced under this scenario to the original situation allows one to assess the increase

[4] Note that this will yield a conservative estimate as use of the tobit model would imply that, for example, more productive farmers would rent in a larger area. The same would be true if households were to make some changes in other factors (e.g. by purchasing new equipment).

in overall production that can be realized through such an exchange. By subtracting the mean rental rate for paddy land and the cost of other material inputs, i.e., fertilizer, seed, pesticide, hired labor, etc., we can also assess how this net gain is distributed between the different factors of production and thus make inferences on the welfare impact of such a policy change.[5]

## 3. Data and descriptive statistics

Our data combine a specific survey on agricultural production, the history of land endowments and off-farm participation, and credit access with panel information from the regular SSB household survey for the same households. They illustrate the rapid evolution of land rental markets and the existence of considerable rationing on both the supply and the demand side of this market. Derivation of a measure of agricultural ability, in the form of an efficiency parameter, for producers included in the sample points towards considerable variation in such ability and thus a scope for land markets to improve productivity.

### 3.1 Data sources

The data used in the study are from two main sources. One is a household survey conducted by the Rural Survey Team of China's State Statistical Bureau (SSB) jointly with the China Center for Economic Research, the World Bank, and the University of Wisconsin, in May and June of 2001. This survey covered 1001 households from 110 villages in three of China's poorest provinces, namely Guizhou, western Hunan and Yunnan. These provinces are not only 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, 2001). Over and above the variables included in standard multi-purpose household surveys (household characteristics, expenditures, assets, income sources, and agricultural production), the survey included detailed information on the initial land endowment and changes therein through administrative reallocation, land rental markets, and other non-market processes (e.g. inheritance). This allows us to compare the current importance of these different channels but also to make inferences on the evolution of these markets in the past. We also obtained information on hypothetical participation in land rental and sales markets, at the village rental rate, as well as lower or higher prices, in order to identify not only constraints to land rental market participation but also to assess the possible impact of improved functioning of land rental markets on agricultural production. The second source of data is a three-year panel of the SSB's standard household expenditure survey which, during the 1997 to 1999 period, was conducted on the same set of households for which the more detailed production data are available. While the main focus of this survey is on a detailed recording of households' expenditure, it also provides

[5] Again, since a large share of the land rented is actually upland rather than paddy land, use of the rental rate for paddy land is likely to

information on a wide range of other variables, especially households' endowment of key assets. An additional use of these data for our purposes is the derivation of a measure of households' productive efficiency, by estimating a fixed effect production function and recovering household fixed effects as explained in more detail below.

### 3.2 Descriptive statistics on households' land market participation

Descriptive statistics on land distribution before and after land reallocation, and before and after real and desired renting activity, is reported in Table 2. The data indicate that land rental markets have emerged rapidly over the last years; historical information on land rental market participation indicates that such markets had been virtually non-existent 5 years ago but are now utilized by almost 10% of households. With an additional 3% of households receiving land for free, this implies that decentralized exchange of land has become an important element in China's rural economy.

Levels of actual and desired participation in rental markets vary across provinces; from about 6% in Guizhou, compared to about 14% in the other two province, a difference that narrows only slightly (to 17% vs 31%) if hypothetical rental is considered. Still, even in provinces where land redistribution has traditionally been the main form of adjusting to population growth, rental is now quantitatively more important than administrative reallocation as a way to adjust land area to population size. Even in Hunan, the province where administrative reallocation is the most prevalent in the sample, the area transacted through rental in 2000 is almost 50% higher than what had been reallocated administratively over the 6-year period from 1995 to 2001.[6]

While this points to a high level of rental market activity, households' answers to hypothetical questions on rental market behavior suggest that important barriers to rental market participation persist. Asked whether they would be willing to rent in land at the going village rental rate (which was obtained independently from village leaders), more than double of the households who currently rent in land (23%) indicated that they would be willing to do. With a reduction of rental rates by one third, another 12% would be willing to do so, bringing the overall share of renting households to 35%. A non-parametric illustration of the amount of land which producers would be willing to demand from the market, as a function of owned land, is illustrated in figure 1.

This suggests that land reallocation through administrative means and operation of rental markets may not necessarily be incompatible with each other. Both in terms of quantity of land transacted and the number

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overestimate the transfer from the renter to the landlord, thus causing us to underestimate the welfare gain for the former.

[6] Only 0.23 mu of arable land was actually rented in on average for the entire sample, compared to 0.69 mu and 1.5 mu that would be willing to be rented in at current or 1/2 of current rental rate. Hunan has most active real rental market, 22% households in Hunan rented in land in 2000 and 0.57 mu of land on average were rented in. By contrast, only 8% of households in Guizhou rented in land in 2000 and the amount rented in is 0.17 mu.

of participants, land rental markets have emerged as the main form of land reallocation even in areas where administrative reallocation is widespread. 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 suggests that, instead, both may be driven by the same set of underlying factors, in particular a more active off-farm market. It could also imply that administrative means are increasingly unable to handle the increased volume of reallocation needed to ensure optimal use of a village's land resource. Finally, the fact that rental activity is lowest in Guizhou, the first province to introduce longer-term property rights to land, suggests that, at least *prima facie*, land rental does not depend on improved or better enforceable property rights. All of these hypotheses will be explored in more detail below.

High levels of demand for renting in land can indicate a generalized scarcity of land at the local level, rather than the scope for productivity-improving redistribution. To explore this issue, we complement figures on willingness to rent in with ones on the scope for renting out. Not surprisingly in view of the fact that some of those renting out may have temporarily migrated out of the village and the sampling procedures employed,[7] we find that the share of "landlords" is only about half of that of renters. At the same time, the data suggest that 14% of households would be willing to rent out land at current rental prices while another 12% would want to do so with an increase of land rentals by 33%. The fact that the mean amount of area households would be willing to rent out increases even more (in percentage terms) than the area they would like to rent in indicates that the low level of transactions observed is not primarily due to low supply.[8] In addition to reinforcing the importance of transaction costs, this would also lead one to expect considerable increases in land rental activity in the future, especially as the non-agricultural economy develops.

### 3.3 Determining agricultural ability

A key variable in our model and in terms of the impact of land markets on efficiency of production is households' level of 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

$$Q_{jit} = \exp(a_j + a_i) A_{jit}^{q_1} L_{jit}^{q_2} K_{jit}^{q_3} \qquad (10)$$

[7] To reduce the probability that a household will drop out of the sample, the SSB sample excludes households who are likely to live outside of the village for a long time. This leads to a reduced probability of observing households who rent out land.

[8] The mean amount of area households actually rented out or would be willing to rent out would be much bigger if we were able to include those who rented out all their land and lived outside.

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 $Q$, and $exp(a_i+a_j)$, is the efficiency parameter which has a household- and a village-specific element.[9] $q_1$, $q_2$, and $q_3$ are technology coefficients common to all producers. Taking logs of both sides of equation (10), adding a time trend and an iid. error term, and letting $q$ be the log of output, $a$, $l$, and $k$ be the log of the inputs, and $a_{ji} = a_j + a_i$, we obtain an estimable equation for production by producer $i$ in village $j$ at time $t$ as follows.

$$q_{jit} = a_{ji} + q_1 a_{jit} + q_2\, l_{jit} + q_3\, k_{jit} + f\, t + e_{jit} \qquad \text{(10a)}$$

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

$$q_{jit} - \bar{q}_{ji} = a_{jti} - \bar{a}_{ji} + q\,(\boldsymbol{Z}_{jit} - \bar{Z}_{ji}) + f\,(t - \bar{t}) + (e_{jit} - \bar{e}_{ji}) \qquad \text{(10b)}$$

where $Z$ is a vector consisting of $a$, $l$, $k$ and $\theta$ is a coefficient vector including $q_1$, $q_2$, and $q_3$. The composite efficiency parameter $a_{ji}$ can then be recovered for each producer. Obviously, this parameter will include other unobservable characteristics many of which are village-specific. To purge these, we apply a similar procedure at the village level which allows us to obtain $a_j$ which can be used to obtain an estimate of $a_i$ for each producer in the sample.

A graphical representation of the estimates of $a_i$ for different provinces is provided in figure 3, with the normal distribution plotted for purposes of comparison. Note that our model would predict that better functioning of land rental markets, possibly together with off-farm opportunities, would reduce the observed dispersion of ability. Indeed, we find that the dispersion of ability is greatest in Guizhou where rental markets are least active and smallest in Hunan where both rental and off-farm labor markets are quite active. Correlation coefficients between $a$ and some of the household characteristics of interest suggest that agricultural ability is significantly and positively correlated with education ($r$ = 0.10), cultivated area ($r$ = 0.10), and farm and non-farm assets ($r$ = 0.18 and $r$ = 0.09, respectively). It is negatively correlated with past migration by the household head ($r$ = -0.08).

## 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 or, with respect to equity, equal to it . Higher levels of diversification and non-agricultural activity contribute to the development of such

[9] The latter is likely to be related to infrastructure and market, soil quality, climate, and other village level characteristics.

markets and removal of other obstacles to their functioning 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 for an increase in participation between four- and six-fold, respectively, with the gains for those producers who participate increasing almost three-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. 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. To account for policy, we include, in addition to standard variables, a dummy variable indicating whether, according to households' responses in the community survey, land rental is allowed at the village level (columns 2, 3, 5, and 6). In columns 3 and 6, we further include variables referring to past rental market experience, either at the village or the household level, 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 land concentration and leave the poor without access to land. On the contrary, the fact that the coefficient on per capita land endowment is much larger in column (2) than in column (1) suggests that, quite surprisingly, markets are more effective than administrative processes of reallocation in allowing 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 re-allocated in larger and lumpy chunks.

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 it is more difficult for a "central planner" or village leaders to observe producers' ability than for decentralized market processes, 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 and significant at the 5% level, are of very low magnitude in the probit equation (column 1) and insignificant in the tobit equation (column 4). By comparison, for markets,

coefficients in both the tobit and the probit equations (columns 2, 5, and 3, 6, respectively) are not only significant at the 1% level but, more importantly, significantly 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. With a difference of only 3 percentage points, the chance of the most efficient producer receiving land through reallocation is almost identical to that of the least efficient one. By comparison, the probability of the most efficient producer receiving land in rental markets is between 24% (column 3) and 33% (column 2) percentage points higher than that for the least efficient producer. Clearly, if productive use of the economy's resources is a concern, greater reliance on rental markets as compared to central planning at the village level appears to be a prudent choice.

Given that administration of land rights in China is highly decentralized, the extent to which temporary or permanent transfers are allowed is decided at the village level. To assess whether limitations on the ability to transact land may affect observed outcomes, we include a dummy for villages where households have the rights to transfer their land (table 2 columns 2, 3, 5, and 6). Furthermore, we include the share of households in the village (excluding the household under concern) who engaged in land rental 3 years ago as well as an equally defined dummy for past land rental participation by the household under concern. While the importance of rights is self-evident, more active land markets at the village level would indicate that institutional arrangements to facilitate such exchange (e.g. contract enforcement) are in place and that barriers to information (e.g. on supply of land and rental prices) that might otherwise impede participation are lower.[10] We find that all three variables are highly significant and of large magnitude. Granting transfer rights to individual households would, at the mean of all other variables, increase the probability of participating in rental market by between 5 and 9 percentage points (column 3 and 2).[11] Having one fourth of the households in the village participate in rental markets would increase the probability of rental market participation by about 4.5 percentage points while households who had rented land in the past are 20% 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.

[10] While past rental market participation is partly endogenous, it also indicates that the household has experience with the processes involved and had an opportunity to develop a reputation that is likely to increase the probability of obtaining land in the future.
[11] Note that the coefficients for the probit regression are marginal effects evaluated at the mean of all other variables.

It has often been noted that, especially in situations where economic distortions or non-economic factors such as prestige cause households to amass large areas of land which, without these factors, they would not be able to utilize productively, considering demand without reference to the potential supply of land will be of limited policy relevance (Binswanger et al. 1995). The truncation of the sample arising from the fact that some of the households renting out may have migrated out and thus not been present for the survey is likely to imply lower quality of information which might negatively affect the precision of the resulting estimates. Table 3 reports the results from estimating identical equations for the 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 just a mirror image of what is observed for renting in, suggesting that, in the case of China, the importance of such factors is at present quite limited.

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, suggesting that there seems to be little incentive for accumulation of unproductive land. Second, while most of the other household composition variables, in particular age and education of the head, are insignificant, we note that households with higher levels of agricultural assets are less likely to rent out while those with higher levels of non-agricultural assets are significantly more likely to rent out their land. This suggests not only that, but with increasing asset accumulation outside of the agricultural sector, the supply of land to the rental market is likely to increase.

Village level variables point towards within- rather than across-village rental (as these are just the households who were found in the village at the time of the survey). While we find a weakly significant coefficient on per capita income in the village that is consistent with what was observed on the demand side, we note that a more significant force driving supply of land to the rental market is the share of households in the village who derive their main source of livelihood from non-agricultural sources. This points towards the importance of diversification. The clear indication that diversification of the economic base is conducive to the development of land rental markets could have important policy implications.

Concerning the transaction cost variables introduced earlier, the high significance of the households' past rental experience could imply the existence of an agricultural ladder. At the same time we note that the transfer right variable is insignificant (though have the right positive sign). This unexpected result could be due to the data biased problem that we discussed before. Finally, we note that the activity of land rental markets at the village level has less impact on households' willingness to supply land to the market.

**4.2 Obstacles to market development and their relevance**

The results reported above suggest not only that rental markets perform an important function in transferring land to poor and more productive producers, but also that they are superior to administrative

reallocation of land 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.

To do so, we use information on households' desired land rental participation, both at prevailing market prices as well as at prices that are half of what is observed in the market that is available from the survey. The justification for the latter 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 (Huang et al. 2001; Johnson 2000) and thus reduce the equilibrium rental rate.

Figure 1 provides a non-parametric illustration of households' actual and desired demand for land rental in mu against their agricultural ability.[12] The dotted lines (at the bottom) refer to observed rentals whereas the thin line refers to the desired amount of land rental. The figures illustrate that the amount of land rented increases with households' ability, although the difference, especially for actually rented land, is not significant statistically. More importantly, for all but the households with the lowest level of ability, there is significant rationing in land rental markets in the sense that the desired amount of land rental is significantly higher than what is actually rented in. Given that the difference increases with ability, the non-parametric evidence suggests that reducing the level of credit rationing would be associated with higher levels of overall productivity, a result which we explore below.

Results from repeating the parametric regressions reported earlier with households' *desired* rather level of land rental participation as the dependent variable are reported in table 3. We note that, compared to the actual operation of rental markets, households' desired level of rental at current or lower prices would strengthen the redistributive element inherent in markets by transferring land to those with lower endowments. At the same time, removal of barriers to the functioning of rental markets, and in particular a reduction of the equilibrium rental rate, are likely to promote greater efficiency. To give a quantitative illustration, the difference in predicted rental market participation between the most and the least efficient producer in the sample would widen by 6 percentage points in the unconstrained case at market prices (making the most efficient producer 40% more likely to participate in rental markets than the least efficient one, everything else constant). It would increase by a further 32 percentage points to the most

[12] The graph is based on the results of nonparametric regression or locally weighted least square (Deaton 1999). A biweight kernel with a bandwidth of 0.5 is used throughout. Bootstrapped confidence intervals with 2 standard error are added to illustrate the significance of differences between the two measures.

efficient producer having a 72% higher chance of land rental market participation than the least efficient one, in the case of a reduction of the rental rate by one third.

As indicated in columns (3) and (4) of table 4, a reduction in the land rental rate is likely to 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 obtain access to land. Also, households with past migration experience or with an off-farm job are significantly less likely to rent in land, 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 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 endowment-equalization and efficiency-enhancing impacts of better functioning of land rental markets as discussed earlier, we note that households with higher levels of education, past off-farm job experience, and higher levels of non-farm enterprise assets, are all more likely to supply land to the rental market.

Assessment of the supply response in rental markets leads to three policy implications. First, and most importantly, by comparing the coefficients between the actual and the hypothetical regression for renting out, it is possible to identify the characteristics of potential suppliers who are constrained in existing markets. This 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. Although our regressions can not help in the identification of policies that would make it easier for these households to supply land to the rental market, further research in this area might be warranted. Second, greater diversification and development of off-farm labor markets 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 the establishment of greater farm sizes.

From a policy perspective, it is of particular interest to identify factors that prevent producers from renting out land. To do so, we identify producers who are participation or area constrained, i.e. who would like to participate in rental markets (or participate more) but do not actually do so at present. This illustrates that between 9% and 10% of all producers are supply constrained in this way, a figure that varies very little across the three provinces. Regressing a dummy for whether or not a household is constrained in rental markets on a number of variables of potential relevance suggests that households

with off-farm jobs and higher levels of education are likely to be more constrained. At the village level, a history of past reallocation increases 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.

### 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 lead to considerable productivity gains, they fail to provide any indication for the potential magnitude of such gains. To explore this, we provide, in table 5, the expected gain in individual and social benefits based on predicted participation rates from the earlier regressions, together with the coefficients from a Cobb-Douglas production function estimated on the 2000 data. A number of steps are used to compare the potential benefits from land reallocation as compared to the case of autarky for four different scenarios. These scenarios are only administrative reallocation (column 1 of table 5), only land rentals observed in reality (column 2), desired rental at the current and reduced land rental (columns 3 and 4, respectively).

The steps involved in constructing these figures are as follows: First, participation in rental markets is predicted based on a cut-off value of 0.5 in the respective probit regression (figures are shown in row 2).[13] We assume that households above this cut-off will rent in the median value observed in the sample in order to obtain a conservative estimate of the impact of transferability of land.[14] The predicted higher level of land used, together with a proportional increase in material inputs is then entered in the production function to obtain a predicted level of output (row 4).[15] This allows us to obtain the percentage increase in production (row 5) as compared to the benchmark without land transfers (row 3). To obtain the expected increase in production for the whole economy (row 6), it is necessary to multiply the gain in production per producer with the predicted increase in participation. To transform this increase in gross output into a net social gain, it is necessary to subtract the opportunity cost of the resources used. To obtain a conservative estimate of this gain (row 8), we assume the opportunity cost of land to be given by the market rental for paddy land[16] whereas the cost for other material inputs is given by their market rate. As a result, we obtain the percentage increase in net social benefit (row 9) as compared to a situation of autarky for the scenarios indicated in the columns of table 5.

[13] All rows mentioned here and below refer to table 5.
[14] According to the regressions, the amount of land rented in would be higher than the average and, furthermore, increase in a producer's level of ability. Thus the procedure applied will result in a lower bound of the impact of land transfer.
[15] While we let the purchased material inputs vary proportionately with the size of operational land, we hold labor and draft animal constant.
[16] We use the rental rate for paddy only rather than aggregate land; Based on our data, about 47% rental participating households rented in paddy land only or 65% rented both paddy and upland. On average, the rental rate for paddy is 204 yuan/mu while it is only 59 yuan/mu for upland (very few rental rates on upland were reported). Note that this is a conservative estimate since, as demonstrated in our analysis, it is the less productive individuals who will be renting out land.

From a substantive point of view, the results demonstrate that all of scenarios increase production but point towards significant differences in the magnitude of this effect, with the gains from unobstructed operation of rental markets by far outweighing those that are in reality achieved by administrative reallocation. With only 4.7% of the producers participating in exchange of land, the increase in output and gain in net social benefit achieved by reallocation are predicted to be significantly lower than what is realized by actual operation of rental markets (from 0.8% to 3.2%). Furthermore, unconstrained operation of rental markets, i.e. allowing households to obtain their desired level of renting at the current price, would lead to more than doubling of the net social gain (from 3.2% to 7.2%). Reducing the transaction costs associated with land markets together with a fall in rental price would not only be associated with a considerable increase in the rate of participation to 32% of the farming population but also lead to a gain in social welfare that is more than twenty times larger than what is achieved by reallocation. Taken together, our evidence thus suggests that direct redistribution alone will be less and less adequate as a means to maintain an optimal operational land distribution and that considerable gains can be achieved by better functioning of land rental markets. To the extent that village leaders' prohibition or approval of these markets does have a clear effect 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 the dearth of empirical investigations of land rental markets in China, despite the growing importance that such markets are likely to have in the future. The results reported allow us to draw a number of conclusions.

First, even in some of the poorest provinces of China, rental markets have emerged rapidly over the last decade and are now consistently more important as a means for land redistribution than administrative reallocation.[17] Our regressions suggest that both the redistributive and the efficiency-enhancing impact of land rental markets exceed that of administrative land reallocation and that the role of such markets is likely to increase with diversification of income sources, out-migration, increased levels of education, and accumulation of capital in non-farm enterprises. Contrary to fears that land rental markets might lead to accumulation of land in the hands of the rich and powerful, greater emphasis on markets as compared to

[17] This is consistent with the experience from transition economies where, once allowed, rental markets assumed great importance even in situations where the final ownership status of land was not yet clarified.

administrative reallocation would provide greater benefits to poor but efficient producers who have few alternative opportunities for using their labor endowment.

Although we find that administrative and rental markets work in the same direction, the scope for administrative reallocation to attain an optimum allocation of land appears to be affected by informational constraints. In addition, the large number of produces who would be willing to participate in land rental markets even at current prices but do not do so at this point suggests that there are other barriers which, at present, prevent China from fully enjoying the benefits that would be associated with unhindered rental market operation. Graphical representation as well as econometric evidence highlight the scope for enhancing the operation of such markets and that prohibition by village leaders has a clear effect. Simulations, based on the production function estimated earlier, allow us to quantify the potential benefits in terms of production. Operation of rental markets at the level desired by households would double the share of households participating and achieve almost ten times the benefits obtained from administrative reallocation. Reducing the rental price would lead to further increases in participation and social net benefits.

Given evidence of a strong impact of titling on land values and land use through improved access to credit and easier marketability of land (Feder et al. 1986, Carter and Olinto 1996, Alston et al. 1995 and 1996, Lopez 1999), a large literature has focused on land titling as a key land policy intervention and aimed to find evidence of an impact of this on credit access. The evidence presented here illustrates that, even in the absence of full marketability, increasing the transferability of land can lead to sizeable social benefits. Whether adding full marketability of land could provide additional benefits (as argued by Li, 2002), and/or how these benefits would compare to the possible social cost, can not be answered with our data but would be in important area for future research.

**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% | 30.0% | 15.7% |
| **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 real operation land | 0.3713 | 0.3180 | 0.3871 | 0.3724 |
| Gini of desired operation land | 0.3940 | 0.3414 | 0.4078 | 0.3995 |
| Gini of desired operation land at low rental price | 0.3864 | 0.3224 | 0.3714 | 0.4586 |

Source: own computation from 2001 Household survey

**Table 2: Determinants of receipt of land through administrative vs. marked-based reallocation**

| | Participation dummy (probit) | | | Area received (tobit) | | |
|---|---|---|---|---|---|---|
| | Admin. | Market | | Admin. | Market | |
| Per capital arable land endowment | -0.006*** | -0.085*** | -0.050*** | -2.403*** | -1.876*** | -1.232*** |
| | (5.29) | (4.33) | (3.90) | (4.23) | (4.21) | (3.19) |
| Agric. Production ability | 0.003** | 0.122*** | 0.079*** | 0.948 | 2.698*** | 2.009*** |
| | (2.22) | (3.70) | (3.30) | (1.34) | (3.91) | (3.39) |
| Head's age | -0.000*** | -0.002* | -0.002** | -0.061** | -0.042 | -0.045* |
| | (2.67) | (1.78) | (2.37) | (2.23) | (1.58) | (1.83) |
| Head's education | 0.000 | -0.001 | -0.003 | 0.115 | -0.035 | -0.076 |
| | (1.33) | (0.33) | (1.04) | (1.35) | (0.44) | (1.04) |
| HH population 14 – 60 years | -0.001** | -0.009 | -0.001 | -0.321 | -0.127 | 0.074 |
| | (2.21) | (0.87) | (0.19) | (1.35) | (0.61) | (0.40) |
| HH population > 60 years | -0.000 | -0.029 | -0.005 | 0.032 | -0.611 | -0.090 |
| | (0.50) | (1.46) | (0.33) | (0.08) | (1.48) | (0.25) |
| HH population < 14 years | -0.001 | -0.007 | -0.011 | -0.271 | -0.109 | -0.209 |
| | (1.48) | (0.57) | (1.15) | (0.94) | (0.39) | (0.81) |
| Value of draft ani & ag assets (log) | 0.000 | 0.007** | 0.005* | 0.030 | 0.167** | 0.136** |
| | (0.54) | (1.98) | (1.91) | (0.40) | (2.35) | (2.15) |
| Non-farm assets (log) | 0.000 | -0.002 | -0.006* | 0.058 | -0.051 | -0.128* |
| | (0.48) | (0.62) | (1.89) | (0.79) | (0.63) | (1.73) |
| Head' has migration experience | -0.001 | -0.017 | -0.002 | -0.504 | -0.595 | -0.335 |
| | (0.55) | (0.55) | (0.07) | (0.79) | (0.90) | (0.58) |
| Head has off-farm job experience | 0.006* | -0.034 | -0.018 | 1.042 | -0.676 | -0.255 |
| | (1.85) | (0.88) | (0.64) | (1.40) | (0.78) | (0.33) |
| Village per capita income (log)[a] | 0.004*** | -0.045* | -0.037 | 1.597*** | -0.943 | -0.814 |
| | (3.46) | (1.70) | (1.51) | (2.91) | (1.47) | (1.36) |
| Hh depend on agric. in village (%)[b] | 0.000 | 0.001 | 0.000 | 0.002 | 0.009 | 0.002 |
| | (0.52) | (0.86) | (0.49) | (0.14) | (0.57) | (0.13) |
| Guizhou dummy | -0.074*** | -0.116*** | -0.024 | -5.583*** | -2.415*** | -0.651 |
| | (8.02) | (4.20) | (1.10) | (6.19) | (4.28) | (1.29) |
| Yunnan dummy | -0.005*** | -0.060** | -0.015 | -2.974*** | -1.751** | -0.497 |
| | (4.59) | (2.04) | (0.59) | (3.99) | (2.40) | (0.77) |
| Renting allowed by village leaders | | 0.090*** | 0.048** | | 2.415*** | 1.363* |
| | | (3.36) | (2.10) | | (2.81) | (1.74) |
| Share of hhs in village renting | | | 0.161*** | | | 3.245*** |
| | | | (4.28) | | | (3.53) |
| Household's past renting experience | | | 0.197*** | | | 4.401*** |
| | | | (10.99) | | | (9.14) |
| No. of observations | 942 | 902 | 902 | 942 | 902 | 902 |
| Pseudo-R2 | 0.41 | 0.10 | 0.38 | 0.28 | 0.07 | 0.23 |

Robust z statistics in parentheses
significant at 10%; ** significant at 5%; *** significant at 1%

**Table 3: Determinants of renting land out**

| | Specification | | | |
|---|---|---|---|---|
| | Participation (probit) | | Area rented out (tobit) | |
| Per capital land endowment | 0.016** | 0.016** | 1.155** | 1.139** |
| | (2.22) | (2.26) | (2.31) | (2.29) |
| Agric. Production ability | -0.068*** | -0.066*** | -4.962** | -4.801** |
| | (2.92) | (2.91) | (2.48) | (2.43) |
| Head's age | 0.001 | 0.001 | 0.042 | 0.045 |
| | (0.81) | (0.82) | (0.96) | (1.01) |
| Head's education | -0.000 | -0.000 | -0.060 | -0.073 |
| | (0.14) | (0.29) | (0.43) | (0.52) |
| HH population 14 – 60 years | -0.003 | -0.002 | -0.097 | -0.092 |
| | (0.50) | (0.45) | (0.25) | (0.24) |
| HH population > 60 years | 0.001 | 0.001 | 0.041 | 0.045 |
| | (0.09) | (0.15) | (0.05) | (0.06) |
| HH population < 14 years | 0.003 | 0.002 | 0.186 | 0.151 |
| | (0.34) | (0.26) | (0.36) | (0.29) |
| Value of draft ani & ag assets (log) | -0.002 | -0.002 | -0.129 | -0.113 |
| | (1.45) | (1.34) | (0.99) | (0.87) |
| Non-farm assets (log) | 0.005*** | 0.005*** | 0.389*** | 0.370*** |
| | (3.34) | (3.20) | (2.97) | (2.85) |
| Head' has migration experience | 0.027* | 0.028* | 1.629 | 1.650 |
| | (1.68) | (1.75) | (1.42) | (1.45) |
| Head has off-farm job experience | 0.015 | 0.013 | 0.818 | 0.692 |
| | (0.89) | (0.78) | (0.64) | (0.54) |
| Village per capita income (log) | 0.006 | 0.005 | 0.396 | 0.254 |
| | (0.47) | (0.42) | (0.35) | (0.22) |
| Share of hhs depending on agric. in village (%) | -0.001** | -0.001** | -0.042* | -0.041* |
| | (2.48) | (2.50) | (1.80) | (1.77) |
| Renting allowed by village leaders | 0.025 | 0.023 | 2.882 | 2.777 |
| | (1.24) | (1.12) | (1.39) | (1.37) |
| Share of hhs in village renting | | -0.032 | | -3.048 |
| | | (0.98) | | (1.25) |
| Household's past renting experience | | 0.031*** | | 1.834* |
| | | (2.60) | | (1.81) |
| No. of observations | 902 | 902 | 902 | 902 |
| Pseudo-R2 | 0.14 | 0.15 | 0.09 | 0.10 |

Robust z statistics in parentheses
significant at 10%; ** significant at 5%; *** significant at 1%

**Table 4: Determinants of hypothetical 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 |
| Per capita land endowment | -0.115*** | -1.694*** | -0.132*** | -1.910*** | 0.035** | 0.833*** |
| | (4.19) | (4.11) | (4.58) | (3.68) | (2.22) | (2.74) |
| Agric. efficiency | 0.134*** | 2.069*** | 0.239*** | 4.027*** | -0.095* | -1.886** |
| | (2.85) | (2.84) | (4.03) | (4.09) | (1.91) | (2.34) |
| Head's age | -0.003* | -0.037 | -0.005** | -0.086** | 0.001 | 0.008 |
| | (1.88) | (1.36) | (2.56) | (2.33) | (0.38) | (0.31) |
| Head's education | -0.004 | -0.066 | -0.005 | -0.059 | 0.009** | 0.135* |
| | (0.85) | (0.81) | (0.85) | (0.55) | (2.20) | (1.68) |
| HH population 14 – 60 years | -0.014 | -0.133 | 0.003 | 0.199 | -0.003 | 0.034 |
| | (1.00) | (0.62) | (0.20) | (0.69) | (0.26) | (0.16) |
| HH population > 60 years | -0.040 | -0.746* | -0.044 | -0.827 | 0.017 | 0.343 |
| | (1.42) | (1.75) | (1.34) | (1.48) | (0.78) | (0.83) |
| HH population < 14 years | 0.003 | 0.185 | 0.027 | 0.467 | -0.010 | -0.175 |
| | (0.15) | (0.65) | (1.24) | (1.21) | (0.64) | (0.59) |
| Value of ag assets (log) | 0.016*** | 0.276*** | 0.011** | 0.273*** | -0.002 | -0.015 |
| | (3.33) | (3.74) | (2.06) | (2.84) | (0.53) | (0.21) |
| Non-farm assets (log) | -0.004 | -0.019 | -0.010 | -0.068 | 0.008* | 0.151** |
| | (0.72) | (0.23) | (1.59) | (0.61) | (1.92) | (1.96) |
| Head migr. Experience | -0.048 | -0.686 | -0.134*** | -2.223** | 0.039 | 0.681 |
| | (1.10) | (0.98) | (2.62) | (2.29) | (1.05) | (1.03) |
| Head w. off-farm exp. | -0.071 | -1.440 | -0.083 | -2.182* | 0.136*** | 1.923*** |
| | (1.33) | (1.56) | (1.24) | (1.79) | (2.97) | (2.62) |
| Share of hhs depending on agric. | -0.026 | -0.205 | -0.064 | -1.091 | 0.002 | -0.101 |
| in village (%) | (0.64) | (0.34) | (1.33) | (1.37) | (0.06) | (0.16) |
| Village per capita income (log) | 0.001 | 0.012 | 0.001 | 0.005 | -0.002** | -0.038** |
| | (0.99) | (0.75) | (0.52) | (0.22) | (2.55) | (2.51) |
| Guizhou dummy | -0.137*** | -2.163*** | -0.120*** | -1.941** | 0.057* | 1.201** |
| | (3.57) | (3.69) | (2.62) | (2.47) | (1.87) | (2.03) |
| Yunnan dummy | -0.062 | -0.618 | -0.043 | 0.573 | 0.016 | 0.424 |
| | (1.34) | (0.80) | (0.72) | (0.55) | (0.37) | (0.49) |
| Renting allowed by village leaders | 0.055 | 0.898 | 0.042 | 0.578 | 0.011 | 0.165 |
| | (1.30) | (1.25) | (0.80) | (0.63) | (0.29) | (0.22) |
| No. of observations | 902 | 902 | 902 | 902 | 902 | 902 |
| Log-likelihod | -449.37 | -879.98 | -534.35 | -1359.65 | -343.56 | -590.56 |

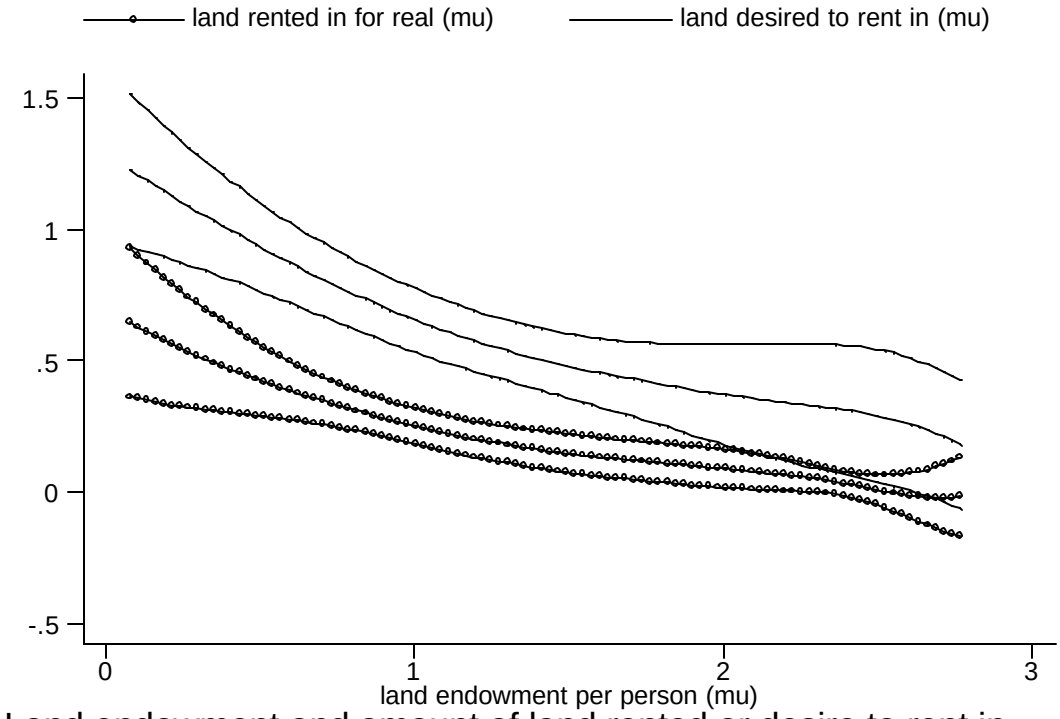
Robust z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

**Table 5. Social and individual gains from better functioning rental markets**

| | Reallocation | Real renting | Desired renting at current rental price | Desired renting at 2/3 of current rental price |
|---|---|---|---|---|
| Actual participation rate | 5.6% | 10% | 23% | 35% |
| Predicted participation rate | 4.7% | 12.4% | 20.6% | 32.1% |
| Benchmark production (yuan) | 1807 | 1663 | 1824 | 1772 |
| Production after non-market/market land transfer (yuan) | 2577 | 2588 | 3125 | 3462 |
| Individual production gain (%) | 42% | 56% | 71% | 95% |
| Social production gain (%) | 2.0% | 6.9% | 14.7% | 31.5% |
| Net social benefit after rental (yuan)* | 17 | 62 | 144 | 348 |
| Net social benefit after rental and material costs (yuan)* | 10 | 41 | 89 | 211 |
| Percentage gain in net social benefit (%)* | 0.8% | 3.2% | 7.2% | 17.1.0% |

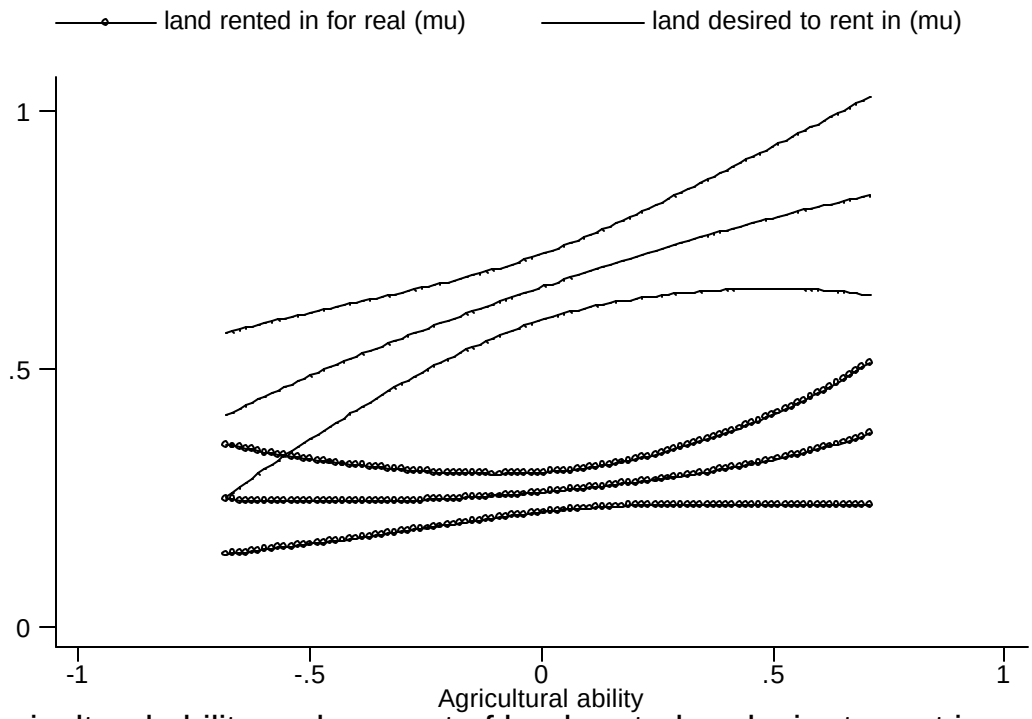
* The net benefit would be much bigger if we use the rental rate for aggregated land rather than for paddy only; Based on our data, about 47% rental participating households rented in paddy land only or 65% rented both paddy and upland.

**Figure 1: Demand for rental land as a function of per capita land owned**



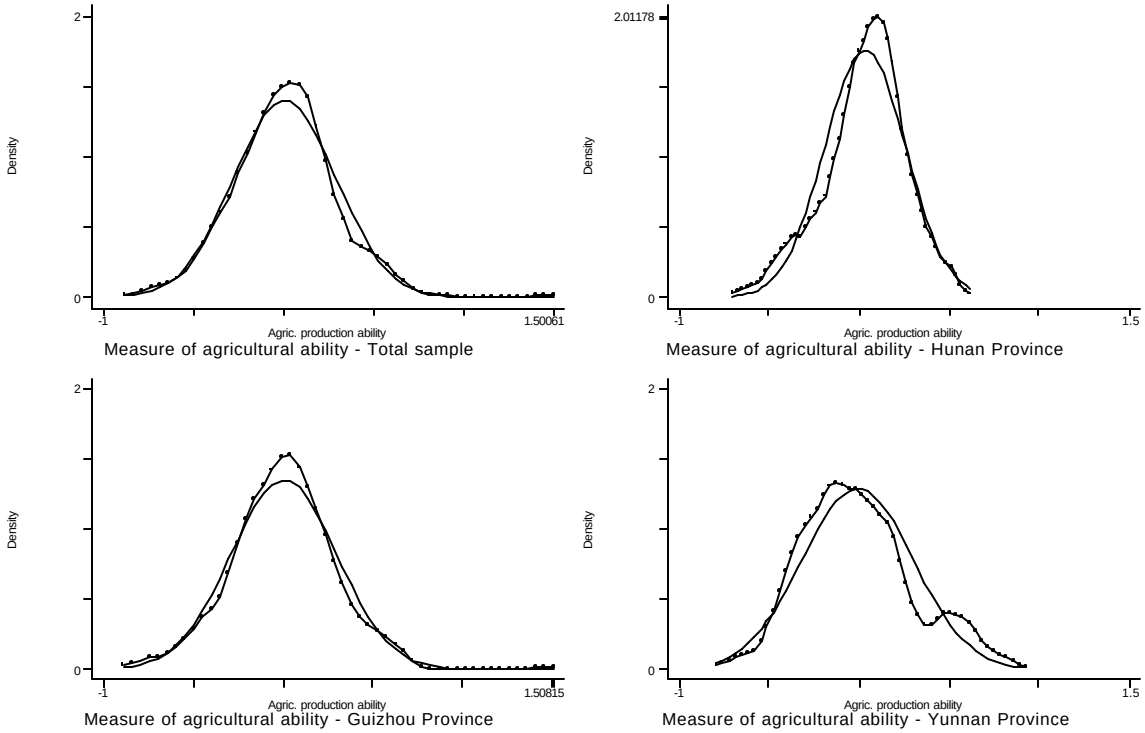

Land endowment and amount of land rented or desire to rent in

**Figure 2: Demand for rental land as a function of household's agricultural ability**




Agricultural ability and amount of land rented or desire to rent in

**Figure 3: Distribution of agricultural ability in different provinces**



**Annex 1: Proofs for main propositions**

***Proposition 1.*** Among the households who rent out land, the higher ability α, the less likely they will rent out and among households who rent in land, the higher α, the more likely they are to rent in.

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

$$pf_{l^a}(l^a, A) + pa(f_{l^a l^a}\frac{\partial l^a}{\partial a} + f_{l^a A}\frac{\partial A}{\partial a}) = 0$$

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

$$pf_A(l_i^a, A_i) + pa(f_{AA}\frac{\partial A}{\partial a} + f_{Al^a}\frac{\partial l^a}{\partial a}) = 0$$

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

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

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. $A_{in} = A - \overline{A}$ (A2).

Total differentiation of both sides of (A2) with respect to *a*, yields $\frac{\partial A_{in}}{\partial a} = \frac{\partial A}{\partial a} > 0$, 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 $\overline{A}$, yield $\frac{\partial A_{in}}{\partial \overline{A}} = -1 < 0$, 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, $A_{out} = \overline{A} - A$ (A3). Total differentiation of both sides of (A3) with respect to *a*, yields $\frac{\partial A_{out}}{\partial a} = -\frac{\partial A}{\partial a} < 0$, 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 $\overline{A}$, yields $\frac{\partial A_{out}}{\partial \overline{A}} = 1 > 0$ (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 $a_l$ and increasing $a_u$, 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 equation (7) and (8) with respect to T, yields

$$paf_{l^a l^a}\frac{\partial l^a}{\partial T} + paf_{l^a A}\frac{\partial A}{\partial T} = 0$$

and $$paf_{Al^a}\frac{\partial l^a}{\partial T} + paf_{AA}\frac{\partial A}{\partial T} = -1$$

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

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

Equation (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 $\frac{\partial A_{in}}{\partial T} = \frac{\partial A}{\partial T} < 0,$ implying that households who still rent in land will rent in less and as the transaction cost increases.

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

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

Equation (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 $\frac{\partial A_{out}}{\partial T} = -\frac{\partial A}{\partial T} < 0$, 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 equation (7) and (8) as $A_i = A_i(a, p, r, T, w)$. Setting $A_i$ to $\overline{A}_i$, yields the identity

$$\overline{A}_i = A_i(a_l, p, r, T, w) \qquad \text{(A6)}$$

Totally differentiating both sides, yields, $d\overline{A}_i = \frac{\partial A_i}{\partial a_i} da_l + \frac{\partial A_i}{\partial T} dT = 0$ (for $d\overline{A}_i = 0$)

$$\frac{da_u}{dT} = -\frac{\frac{\partial A_i}{\partial T}}{\frac{\partial A_i}{\partial a}} > 0 \qquad \text{(A7)}$$

(for $\frac{\partial A_i}{\partial a} > 0$ 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:

$$\frac{da_l}{dT} = -\frac{\frac{\partial A_i}{\partial T}}{\frac{\partial A_i}{\partial a}} < 0 \qquad \text{(A8)}$$

(for $\frac{\partial A_i}{\partial a} > 0$ 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 with the increase of the overall off-farm opportunities.

For those households who rented out land, we take the derivative of both sides of equation (5) or equation (6) with respect to w, yield

$$paf_{l^a l^a} \frac{\partial l^a}{\partial w} + paf_{l^a A} \frac{\partial A}{\partial w} = 1$$

$$paf_{Al^a} \frac{\partial l^a}{\partial w} + paf_{AA} \frac{\partial A}{\partial w} = 0$$

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

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

which implies that households who rented out land will use even less endowment for self-cultivation and $A_{out} = \overline{A} - A \Rightarrow \frac{\partial A_{out}}{\partial w} = -\frac{\partial A}{\partial w} > 0$, 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 $a_{in} = a_{in}(a_1,...a_I, p, w^{in}, r^*, T)$ be the aggregate rent-in curve, and let $a_{out} = a_{out}(a_1,...a_I, p, w^{out}, r^*, T)$ be the aggregate rent-out curve. At equilibrium, set amount of land rented in equals to the amount of land rented out, or

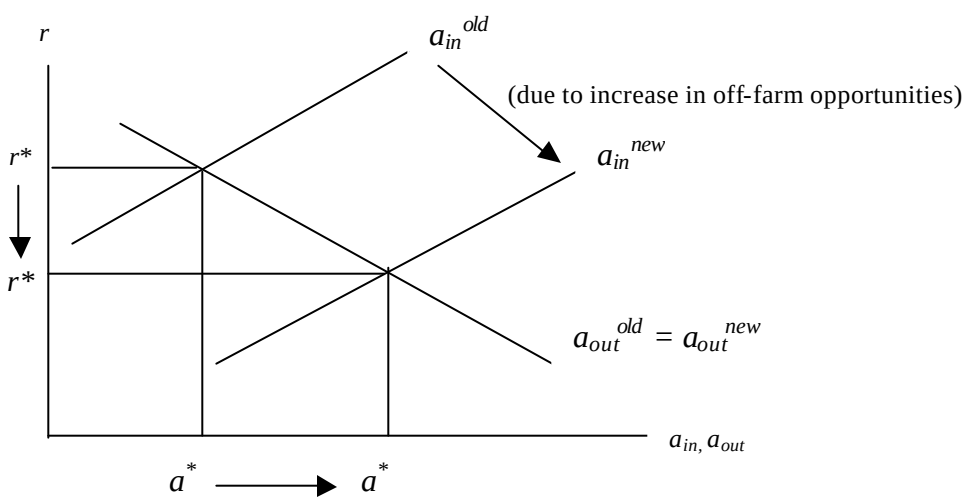
$$a_{in}(a_1,...a_I, p, w^{in}, r^*, T) = a_{out}(a_1,...a_I, p, w^{out}, r^*, T) \qquad \text{(A10)}$$

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

$\frac{\partial a_{in}}{\partial r^*} dr^* = \frac{\partial a_{out}}{\partial r^*} dr^* + \frac{\partial a_{out}}{\partial w^{out}} dw^{out}$, rearrange terms, we will have $\frac{dr^*}{dw^{out}} = \frac{\frac{\partial a_{out}}{\partial w}}{\frac{\partial a_{in}}{\partial r^*} - \frac{\partial a_{out}}{\partial r^*}}$ (A11)

It is easy to show that the sign of (A11) is negative. We know $\frac{\partial A_{out}}{\partial w} > 0 \Rightarrow \frac{\partial a_{out}}{\partial w} > 0$, $\frac{\partial a_{in}}{\partial r^*} < 0$, and $\frac{\partial a_{out}}{\partial r^*} > 0$, 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 increases, the equilibrium rental rate falls while the amount of land transacted in the market increases.

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