Land Distributional and Income Effects of the Chinese Land Rental Market

Ziping Wu

Department of Agricultural and Food Economics, Queen's University of Belfast

and

Agri-Food and BioScience Institute (AFBI)

Newforge Lane, Belfast, Northern Ireland, UK BT9 5PX

Email: z.wu@qub.ac.uk

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1. Introduction

Rural reforms in China started two decades ago replaced the former collectives with the household responsibility system (HRS). Under the HRS, land is tenured *equally* by certain demographic criteria to the member households and subject to periodical administrative reallocations by the former collective with respect to demographic and land usage changes. In the meantime, land market has gradually developed in a way of a rental market. In the market, land is still collective or state owned and sales of land are legally prohibited, rental activities between farm households may or may not involving rent.

The egalitarian principle has been applied in both the initial land tenure and later reallocations by the former collectives, though the process may slightly differ from case to case. As a means of redistribution, the primary function of the land tenure is to ensure the equity of land endowment among the households, and land tenured is also used as a last resort of household insurance for living.

Land rental activities appeared as early as land tenure started. Most of previous studies in this area tend to focus on reasons for the land market development (e.g. Yao, 2000; Kung, 2002; Kroskopf, 2002). Efficiency and equity effects of this new development, however, were largely ignored, except in a few studies (Zhang and Somwaru, 2001; Deininger and Jin; 2002).

Development of land market in China is closely dependent on the off-farm opportunities resulted from expansion of urban sectors and rural non-farming activities and in return the market ensures a development process in which more labour resources is transferred to non-farming sectors (Yao, 2000; Zhao, 2002). Without a coherent development of both

markets, great quantity of land may be abandoned or provision of labour resources to non-farming sector is limited. In this regard, the rental market has reduced the marginal land and labour resources and improved productive efficiency.

The question arises whether the rental market transfers land from less productive farms to more productive ones in a dynamic economic development process. It appears to be the case if farming is the only choice of the farm households, since resource reallocations in a perfect market suffice a Pareto improvement or efficiency improvement. However, as land rental market and associated factor markets such as labour and credit markets in China are imperfect and there exist off-farm employment opportunities, it is possible that households rent out land are also ones with higher agricultural productivity. In other words, whether the rental market improves efficiency of households involved is an empirical issue. In addition, as the equity of land distribution is a fundamental objective of the land tenure system, we are interested in land distributional effect of the rental market. If the rental market can improve equity of land distribution as some studies suggested (e.g. Deininger and Jin, 2002), it may partly replace the main function of the administrative reallocation.

The remainder of the paper is organised as follows. Development of the land rental market in China and possible impacts of this development are reviewed in Section 2. In Section 3, we used panel data of 450 households in seven years (1995-2001) of Zhejiang province, China to examine the land distributional and crop income effects of the rental market. The paper concludes with discussion and conclusion.

2. Land rental market and its effects

There is no official figure for the magnitude of land rental market in China. Figures used in various studies differ as most of studies only cover part of China and in different years.

A national survey of over 20, 000 farm households organised by the Research Centre of Rural Economy of the Ministry of Agriculture over the period starting from 1986 suggests that the proportion of land rent-in and rent-out in total operational land area increased from 3.4% in 1986 to 8.7% in 2003 (RCRE, various years). The rental incidents also differ from region to region. In 2003, these figures for the East, Central and Western China are 7.1%, 11.4% and 4.2%, respectively.

These figures appear to be smaller than many other studies in this area. In a study based on surveys in six provinces in China in 1998, Lohmar, Zhang and Somwaru (2001) indicate that on average of 825 households surveyed, 24% of households had land rent-in and 5% of households had land rent-out. Measured in total operational land area, rent-in land accounts for 13% and rent-out land only accounts for 2% of the land.

Another survey conducted in three Western and central Chinese provinces Hunan, Guizhou and Yunnan based on samples of rural household surveys of National Statistical Bureau (NSB) by Deininger and Jin (2002) suggests that land rental markets have emerged rapidly over the period of 1995-2001, from virtually non-existent in 1995 to be utilized by 9.4% of households in 2001, ranged from 6.1% in Guizhou, 13.2% in Yunnan and 14.3% in Hunan, and with an additional 3% of households receiving land for free.

There were also reports of low incidents of land rental market. Turner et al (2001) reported that rented land only accounted for 3-4% of total arable land in their samples. The land market development has been largely affected by the household heterogeneity and driven by the off-farm opportunities (Yao, 2000; Zhao, 2002). Other factors such as ambiguity of the land ownership, tax or tax in kind, administrative intervention and frequent

administrative land reallocations to certain extent restricted development of the land rental market (Turner et al. 2001, Lohmar et al 2001; Kung, 2002).

Equity and efficiency effects of the land market development are the main concerns of economists and policy makers. Equity effect can be measured as changes in distribution of income, consumption or access to production means among the households. Efficiency effect can also be measured in terms of changes in income and production.

Effects of land rental market on production efficiency improvement are likely to be from following sources. First, a land rental market may make part of land abandoned due to various reasons to be used by other farmers. Land abandonment can be caused by farmers and their families leaving farm for non-farming sectors or for other reasons[1]. In an economic development process, when rural labour moving from farming to non-farming sectors, without a rental market, farm households may choose land abandonment. This has been case in many developed countries such as Japan and Korea in their dynamic economic development stage. Land rent market to certain extent may reduce land abandonment. Therefore, land rental can be regarded as a save from the abandonment.

Second, the rental market may facilitate an efficient allocation of land as more efficient households gain land from less efficient ones. More efficient households tend to have higher marginal product of land in the production and are able to attract more land at a higher rent threshold.

[1] No studies in this area are available in Chinese case. A study of Grinfeld et al (2004) suggests that four exogenous factors: personal, physical, property and historical may have caused land abandonment. There is no official figure of land abandonment available and it may also differ from region to region. According to my own discussion with local officials in Zhejiang in 2004, land abandoned accounted for approximately 5% of total land.

Third, there is possibility that the land rental may reduce land fragmentation and exploit economy of scale. As the land concentration may facilitate agricultural mechanisation and uses of new agricultural technology, a rent market may boost total production and reduce the production costs.

In the literature, two different approaches, namely a direct and an indirect one, have been used to capture effects of rental markets. In a study of Nicaraguan land market, Deininger, Zegarra and Lavadenz (2003) used an indirect approach. They have concluded their study based on two arguments. First, they proved that land market increased equity of operative land allocation among households. Second, by using a production (profit) function approach, they found that there existed an inverse relationship between profit and operational size in the households. Land market in this case brings land from large to small producers and this increases overall efficiency as well as equality.

Two existing studies in Chinese cases used a direct approach. Deininger and Jin (2002) developed a framework with off-farm employment opportunities, transaction costs and an unobserved household's level of agricultural ability to study Chinese land rental market. They found that both administrative reallocation and market based rental activities increase the amount of land available to the land poor but more efficient farmers. In another study based on surveys in six provinces in China in 1998, Lohmar, Zhang and Somwaru (2001) used data of 1422 grain plots reported in the survey and a production function approach to examine the rental market effect. A dummy variable for rent-in households was used to prove that rent-in households are more efficient.

In this study, Gini coefficients of land distribution before and after land rentals are used to measure the equity effect of the land rental market while a calculation of improved

production efficiency based on a production function approach is used to measure the efficiency improvement.

3. Data and Analysis

Data used in this study are the survey data for the same 450 households in nine villages of Zhejiang province in China during the period of 1995-2001. The surveys were part of national surveys organized annually by the Ministry of Agriculture. It covers the areas of household resource endowment, production, consumption, and incomes. Zhejiang province is one of the richest coastal provinces in China with very small average farm size and dominating private non-farming sectors. By using the same households we intend to reduce bias caused by individual household characteristics and take its econometric advantages.

3.1 Land Distributional Effect

As the administrative allocation will also change the land distribution among households, we calculated the Gini coefficients for both tenured land and operative land. Changes in land area and land rental in the sampled households of Zhejiang province during the period of 1996-2001 are reported in the Table 1.

Insert Table 1 here

Farm size measured in both tenured land or operational land is very small by any standards. Even such a small size is further declined in the period. As expected, total land tenured and operated by the households in the period has fallen considerably. Measured in

per household and per capita basis, in the six year period between 1996 and 2001, the tenured size in the sample households for both measurements fell by 23% and 22%, while the operational land size which includes the rent-in and excludes the rent-out fell by 21% and 19%, respectively.

The relatively higher levels of the operational size against the tenured size in all three categories for all years suggest that the sample households may have rented in land from households in the outside of samples. Land market appears to have changed land distribution among households. Although the percentage of households involved in land rental market fluctuated, land rental as a percentage of total land area increased steadily in the period.

The average of farm size however does not indicate anything in land distribution. The land distribution is measured by the Gini coefficient. The Gini coefficient is often calculated with the more practical Brown Formula shown below:

$$G = \left| 1 - \sum_{k=0}^{k=n-1} (X_{k+1} - X_k)(Y_{k+1} + Y_k) \right| \qquad [1]$$

Where G is Gini coefficient, X is the cumulated proportion of the population variable and Y is the cumulated proportion of the land variable (i.e. land per capita or per labour). In the calculation, data are first sorted by land variable in ascending order and each household is assumed to one group, therefore k here is the total number of households. Gini coefficients calculated by operational land size and by tenured land size are reported in Table 2.

Insert Table 2 here

It is clear that:

1. The Gini coefficients measured by tenured land size are small, indicating that initial differences among households by the administrative way in both per capita and per labour bases are small.
2. Gini coefficients measuring land distribution of the tenured land by two categories (by population per capital and by labour per capita) are slightly lower than those by operative land size which includes land rental, indicating that land is more concentrated with the rental market. This result is different from observations from many other countries in which land reform program was not carried out (Deininger et al 2003). In those countries, rental market led to reduction of Gini coefficients. It is also different from findings of Deininger and Jin in their Chinese study (2002) which claims that land market enhanced equal land distribution in China[2].
3. The coefficients of tenured land fell considerably in 1998 and 1999, which are consistent with the uses of administrative land reallocation in these two yeas in the sampled sites after the announcement of Land Contract Law, confirming that the administrative land reallocation mainly serves an equity role.

3.2 Production Efficiency Effect

As discussed earlier, production efficiency improvement can be from a reduction of land abandonment and improved production efficiency. In this study, a production function approach is used to examine improved production efficiency. The specification of the

[2] It would be difficult to give a clear diagnosis for the problems in Deininger and Jin (2002), as no detailed description on the calculation of Gini coefficients is available. However, it is possible that household heterogeneity may have attributed to the problem as their samples covers more different regions and their calculated Gini coefficients are much larger than that in this study.

production function used in this study is slightly different from Lohmar et al (2001). A production function used in estimation is expressed as

$$\ln Y_{jt} = \alpha + \delta T + \sum_{i=1}^{3} \beta_i X_{ijt} + \varphi G_{jt} + \sum_{i=0}^{4} \gamma_i D_i X_{ijt} + \sum_{j=1}^{n} \delta H_j + \sum_{i=1}^{8} \theta_i V_i + \varepsilon_{jt} \qquad [2]$$

Where Y_{jt} is the crop output of the jth farm household at year t; T is time trend to capture technical progress over the period; X_{ijt}, is a vector of input quantities used by the household which include material input costs (including seeds, fertiliser, pesticides, machinery costs, etc.), labour inputs (working days) and sown area; G is the proportion of grain sown area in total sown area to capture differences in crop structure; D is the dummy variable used to distinguish the rental behaviour of the households. All households are divided into three categories: rent-in, autarky and rent-out households. In order to examine if the rent behaviour have a neutral or input embedded effect for the production, both single dummy variable and the products of rent-in dummy and three basic inputs (labour, sown area and material costs) are included in the estimation. V is village dummies to capture village differences. H is the dummy variable for households. Apart from individual household effect, four household level characteristics (head education, head age, head social status and party membership) are also included in estimation. Results of various estimations are reported in Table 3

Insert Table 3 here

Models have relatively good fit for the data. Its adjusted R squares are 0.87 for all four models, indicating that variables included can explain 87% of crop output variation. Coefficients for all basic input variables and time trend are positive and significant at the 99% significant level; proportion of grain sown area is also positive but only significant at

95% significant level. Coefficients for all household level characteristics are not significant at the 95% level but all village dummies are significant at 99% level, suggesting strong village differences.

Household is operating under the diminishing return to the scale. F tests for the sum of elsaticities for basic inputs (capital, labor and land) indicate that in all four models the hypothesis of the sum equal to unity is rejected[3].

The coefficients for rental dummies and dummy product terms are our main interests. Without product terms (Model 4), rent-in dummy is positive and significant at 99% level but rent-out dummy is positive but insignificant, indicating that with the same levels of inputs crop output in the land rent-in households appear to be higher.

When the product terms are introduced (Models 1 and 2), however, the coefficient for rent-in dummy term becomes significant but negative. Product term of rent-in dummy and labor is positive and that of dummy and sown area is negative and both are significant at the 95% level. While the coefficients of product terms become insignificant when both rent-in and rent-out dummies are removed.

By further looking at input structure of the three types of farm households, we found that household's tenured land size for rent-in households is slightly lower but its operational size is significantly larger than other two groups (Table 4). It is the same if we calculated in land per capital basis. On average, rent-out households tend to have higher inputs (land, labor, material inputs) per mu land and higher crop output than autarky households and rent-in ones. Its grain sown area proportion however is lower than other two. Compared

[3] F tests for the unity restriction for four models are 35.0, 34.7, 37.1 and 32.5, respectively.

to autarky households, rent-in households have lower land multi-cropping rate, similar labor input level but higher material input and output levels. Their grain share levels are quite similar.

Insert Table 4 here

Without a land rental market, land rented out by farm households may be partly or totally abandoned. In this study, as the likelihood of land abandonment without the land rental market is not clear, we consider its productive effects in the two extreme scenarios: (1) all land rent-in are abandoned and (2) all rent-in land will be maintained for production by rentees. By using Model 4 in the Table 3, we find that under the first scenario, the crop production with the rental market is 15% higher than without the market in the sample households and under the second scenario the difference made by the rental activities alone contributed 0.22% of total crop output[4].

4. Discussions and Conclusion

By using household survey data in Zhejiang, China, we analyse land distributional effect and income effect of land rental market. By comparing land distribution with and without the land rental market, we found that the rental market has contributed to less equal distribution of land resources among farm households while the administrative reallocations served an equalitarian role. Therefore the land rental market may not be able to replace the function of administrative reallocation.

[4] By the first scenario, rent-in land accounts for 43% of total operational land and it contributes 35% of total production in the households. With the second scenario, the difference between with and without the rental market has mainly to do with the total land rented in the rent-in households. According to a decomposition of the Model 4, the total extra contribution made by the rent-in dummy accounted for only 0.64% of total crop output in rent-in households. As rent-in households accounted for 35% of total production, we arrive a

Land distributional effect of the rental market is associated with the fact that land resources in China after later 1980s is very much equally tenured and it is also subject to constant administrative reallocations with respect to demographic changes and non-agricultural land uses. There is no sign of easing this type of land reallocation even after government encouragement for longer and more secured tenures.

In a dynamic economic development process as in Zhejiang, efficiency improvement appears mainly from saves from land abandonment as without a land rental market part or total of land rented may be abandoned. In our case, if all rent-in land is to be abandoned, total production will be 15% lower while compared to a case that all land is maintained in production by rent-out households, production gain with a rental market is only 0.22% higher.

Efficiency improvement in the rent-in households may have mainly to do with reorganising its input structure. As we can see from Table 4, land has moved from high inputs / high output households to low inputs / low output households. Although land per capita in rent-in households is initially slightly lower by tenured land, its land is used less intensively in terms of multi-cropping rate and its land productivity is actually slightly lower than rent-out households. This also suggests that land rental market driven by a development process may be quite different from that caused by the inequality of land distribution.

The moderate efficiency improvement in the rent-in households may be related to two factors. First, land rentals in this study occur in a dynamic economic development process

0.22% contribution.

in which the main reason of the land rental is to facilitating labour transferring from agriculture to non-agricultural sectors. In this case, there is possibility that more productive farmers, usually with better education and skills, will be among those leaving farming. This may partly offset gains from the rental market[5]. Second, under the current technology level and farm size, efficiency improvement from reducing land fragmentation and economic scale will be very limited (Wu, et al., 2005).

To conclude, both ways of land reallocation serves different roles in Chinese agriculture. Even without land market Chinese land distribution will become more unequal due to demographic and land use changes, development of land market will accelerate the concentration of land. Empirical examination suggests that with land market land is moving to households with higher efficiency in which less intensive uses of resources and different production structure is observed, however, in a economic development process the main efficiency contribution of the rental market comes from saves for land abandonment and efficiency improvement from changing users is very limited.

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Table 1 Changes in land area and land rental in Zhejiang province

Year	Operational size (mu)		Tenured size (mu)		Land Rental (%)	
	By Household	By Population	By Household	By Population	By Household	By total operational land
1996	2.17	0.57	2.06	0.54	34.5	19.4
1997	2.11	0.59	1.99	0.56	30.9	17.8
1998	2.10	0.66	1.94	0.61	35.5	26.1
1999	2.10	0.53	1.85	0.47	37.9	25.6
2000	1.94	0.59	1.91	0.58	41.0	38.6
2001	1.71	0.46	1.58	0.42	29.3	31.7
2001 as % of 1996	79	81	77	78	85	163

Source: own calculation

Note: (1) As one village in the survey is a sea fishery village without any farmland, only data of 450 households in other nine villages is used in the calculation;

(2) As 1995 data includes many missing data, it is excluded from the calculation and later modelling work; (3) A mu is one fifteenth hectare.

Table 2 the Calculated Gini coefficients for land distribution

	Operational land		Tenured land	
	By population	By labour	By population	By labour
1996	0.243	0.190	0.193	0.197
1997	0.265	0.227	0.197	0.230
1998	0.214	0.226	0.207	0.238
1999	0.207	0.190	0.169	0.240
2000	0.189	0.150	0.174	0.164
2001	0.154	0.195	0.150	0.179

Note: (1) Both land area per capital and per labour are used in the calculation;

(2) Operational land includes both rent-in and rent-out.

Table 3 Fixed Effect Models of Household Income under Land Rental Market

	Model 1		Model2		Model 3		Model 4	
	Coeff	T test	Coeff	T Test	Coeff	T Test	Coeff	T Test
Material input	0.368	21.4	0.370	21.5	0.383	22.6	0.388	24.3
Labor Input	0.161	13.7	0.161	13.8	0.175	15.6	0.174	16.1
Sown area	0.398	18.8	0.397	18.8	0.371	18.6	0.374	19.8
Grain share	0.059	2.3	0.061	2.3	0.058	2.2	0.060	2.3
rent-in dummy	-0.544	-3.8	-0.548	-3.8			0.050	2.8
rent-out dummy	0.014	0.6	0.013	0.6			0.018	0.7
time trend	0.015	3.3	0.015	3.5	0.016	3.6	0.016	3.7
dummy *capital	0.037	1.4	0.037	1.4	0.019	0.7		
Dummy*labor	0.086	2.8	0.087	2.9	-0.006	-0.3		
Dummy*sown	-0.074	-2.0	-0.074	-2.0	0.009	0.3		
Village dummies	Yes		Yes		Yes		Yes	
EDU1	-0.032	-0.9						
EDU2	-0.045	-1.5						
EDU3	-0.026	-0.8						
STATE	-0.078	-1.6						
LOCAL	0.046	1.4						
PARTY	-0.004	-0.2						
AGE1	0.007	0.2						
AGE5	-0.007	-0.3						
Constant	4.152	50.1	4.107	53.8	4.004	56.5	3.983	56.8
No of Observation	1988		1988		1988		1988	
Adjusted R^2	0.87		0.87		0.87		0.87	

Note: (1) Households without involved in farming activities will need to be excluded from the sample of estimation.

(2) Crop output and material input costs were respectively deflated by price index of crop output and input price index in Zhejiang province.

(3) Except those specified, dummy here refers to rent-in dummy.

Table 4 Land, Crop Output and Input Structure in Three Types of Households

		Rent-Out	Autarky	Rent-in
Land	**Tenured land (mu/h)**	**2.55**	**2.50**	**2.15**
	Operational Land (mu/h)	**1.56**	**2.50**	**3.77**
Output	**Output (yuan/ mu)**	**1156.32**	**895.46**	**959.67**
Input Intensity	**MCI (%)**	**196.98**	**172.93**	**167.46**
	Labor (days/mu)	**37.54**	**30.29**	**31.03**
	Material costs (yuan/mu)	**286.65**	**211.63**	**274.23**
	Grain share (%)	**63**	**73**	**74**
Partial productivity for	**Land (by sown area)**	**587**	**518**	**573**
	Labor	**30.80**	**29.56**	**30.93**
	Working capital	**4.03**	**4.23**	**3.50**

Note: (1) The same data for the model is used in calculation; (2) Output and inputs are calculated in operational land basis and land productivity is calculated in sown area basis.