China & World Economy

China & World Economy / 107–126, Vol. 21, No. 1, 2013

Different Roles of Land in Rural–Urban Migration: Evidence from China's Household Survey

*Xuelong Wang**

Abstract

This paper explores the influence of land holding on rural–urban migration using China's 2008 household survey data. It shows that the contradictory findings of existing published literature can be explained by introducing a migration distance variable. The empirical studies show that land holding plays a different role in short-distance and long-distance migration. Land holding has a U-shaped curve association with the probability of short-distance migration and has an inverted-U-shaped association with the probability of long-distance migration. Therefore, the government needs to provide more job information and migration subsidies to farmers who have little land to overcome difficulties in the process of migration so as to reduce rural–urban inequality.

Key words: capital constraint, inequality, land system, migration, opportunity cost

JEL codes: J64, O18, R52

I. Introduction

Many economists argue that the serious rural–urban disparity in China is restricting the sustainable development of China's economy. According to the National Bureau of Statistics of China (NBS, 2011), the disposable income of urban residents was more than three times higher than the net income of rural residents in 2010.[1] However, contrary to the observation of many economists, Cai and Wang (2008, 2009) provide persuasive evidence that China's rural–urban inequality is not as high as illustrated by the official data. They indicate a very important variable in the calculation of rural–urban inequality: temporary migration of rural labor. They take the income of temporary migrants into consideration

* Xuelong Wang, PhD candidate, Department of Economics, Hokkaido University, Sapporo, Japan. Email: wangxuelong@ec.hokudai.ac.jp. The author thanks Dr Masato Hiwatari for his kind help and beneficial suggestions.

[1] We use net income of farmers to study rural–urban inequality because farmers have to invest part of their income in agricultural production.

when decomposing the national inequality into intra-city (intra-country) inequality and rural–urban inequality. They find that rural–urban inequality contributes approximately 20 percent of the national inequality. Because temporary migration is very important for the analysis of rural–urban disparity, it is necessary to study what factors influence the temporary migration behavior of farmers.

Land is an important factor influencing rural–urban migration, because land influences agricultural revenue and the opportunity cost of migration. In Dixon (1950), migration is regarded as a function of land. Brueckner (1990) and Brueckner and Zenou (1999) also prove the important influence of land on rural–urban migration. However, there are many contradictory findings in the existing empirical literature. Some scholars provide evidence showing that there is a negative relationship between land holding and the probability of migration (e.g. Taylor *et al*., 1999; Kuhn, 2002; Barbieri, 2005; Potts and Mutambirwa, 2006). Other economists argue that land can help farmers to obtain the capital that is necessary for migration. Hence, there should be a positive relationship between land holding and migration probability (Rozelle *et al*., 1999; Gray, 2009). If we take those effects into account simultaneously, a nonlinear relationship may appear. Bilsborrow *et al*. (1987) and Bhandari (2004) study the labor migration of Ecuador and Nepal, respectively, and provide evidence for an inverted-U relationship between migration probability and land holding. However, in studying migration in Thailand and Bengal, VanWey (2003, 2005) and Mendola (2008), respectively, find that the nonlinear relationship between migration probability and land holding should follow a U shape instead of an inverted-U shape.

What is the reason for these contradictory findings? The reason may be the absence of a clear definition of migration. Land may play various roles in different kinds of migration. The present paper divides migration into temporary migration and permanent migration, and introduces the factor of migration distance into the study of temporary migration to explain the conflicts in the existing literature.

There are two main impacts of land on temporary migration. The first is the "opportunity cost effect," which refers to the loss of agricultural production caused by labor being invested in nonfarm activities. This has a negative influence on migration. The second is the "capital constraint effect," which means that land may provide necessary capital for migration. This has a positive influence on migration. For short-distance migration, the opportunity cost effect is more important than the capital constraint effect. However, for long-distance migration, both effects are important. As a result, the relationship between migration probability and land holding should take a U shape for short-distance migration and presents an inverted-U-shaped curve for long-distance migration. These arguments are supported by the data of the Chinese Family Panel Studies (CFPS). The empirical results

provide strong evidence for our theoretical analysis.

The remainder of the paper is organized as follows. Section II presents a brief introduction of China's land system, Section III contains a theoretical analysis explaining the relationship between land holding, migration distance and migration probability. Section IV provides the data, variables and methodology used for our analysis. Section V conducts a comprehensive analysis of the empirical results. Section VI concludes the paper and provides some policy implications.

II. Brief Introduction to China's Present Land System

1. Land Ownership

There are two forms of land ownership in China: state-owned and collectively-owned land.[2] All of the city land is state-owned and is under the effective control of the government. Most of the land in suburban and rural areas is collectively-owned. Decisions regarding the distribution and use of collective land are made by the village committees (*cunmin weiyuanhui*). Farmers only have the right to rent collective land for, at most, 30 years. This land is referred to as "contracted land."

2. Land Use Rights

Land can be used for construction or agriculture. All land in the city is used for construction. Villages can only use part of the agricultural land for construction, including for farmers' houses, roads and factories.

The regulations on agricultural land are very strict. Farmers are not allowed to build houses and factories on farmland. If the agricultural land needs to be used for construction, approval it required from at least two-thirds of village committee members. The village committee has tremendous power and influence in regards to the use of collective land. However, generally, a committee only consists of 3 to 7 people.

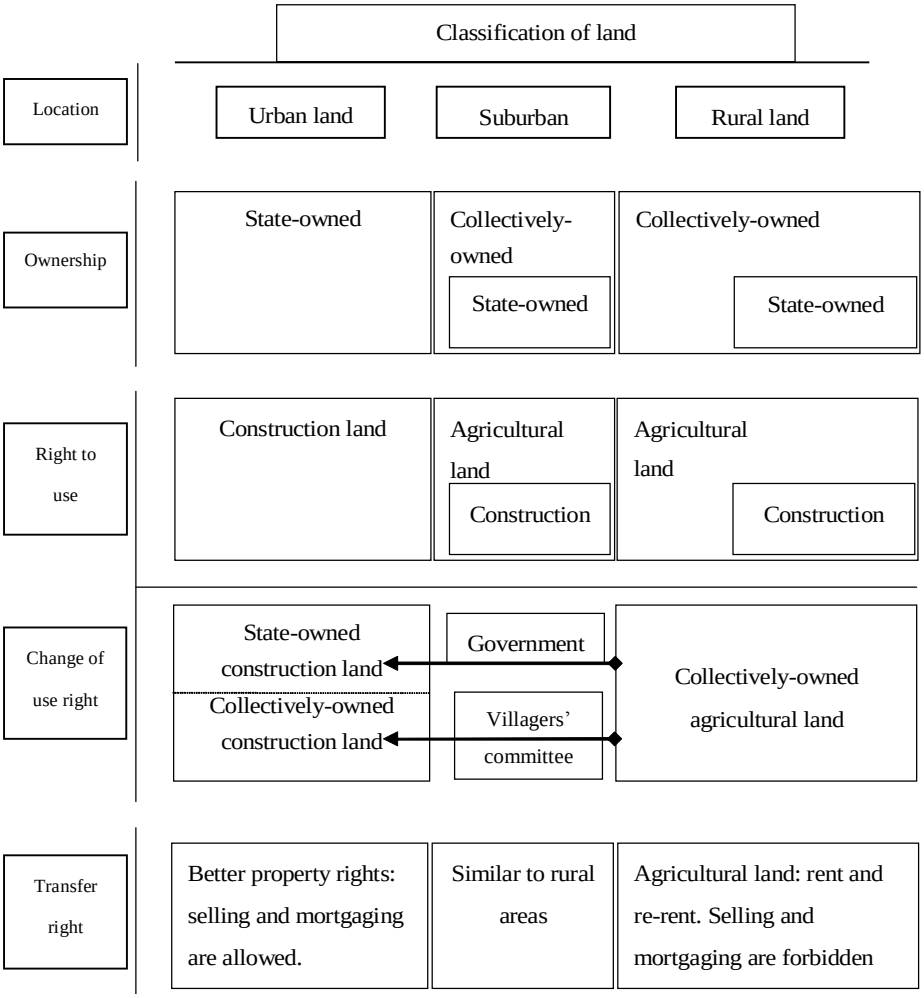
If urban residents want to buy construction land in rural areas, they can only buy state-owned construction land. Therefore, the government becomes the only provider of construction land.

3. Land Transfer Rights

In cities, urban residents are able to enjoy land-use rights for over 70 years. They can sell

[2] Property may be privately, collectively or state-owned; in the present paper, we use land holding to represent the amount of land owned by a person.

Figure 1. China's Present Land System



and mortgage their houses. However, in rural areas, farmers are not allowed to sell their land and houses, in accordance with the present *Land Management Law* of China. They can only rent their land to other users. However, transactions of farmers' houses still occur. Some provinces are trying to set up markets for land leasing and rights transfer to allow farmers to exchange their land rights; however, there are no successful cases as yet. Allowing the transfer of land-use rights might be a step toward privatization. However, there is no clear policy orientation for future property right reform in rural areas. The framework of China's present land system is described in Figure 1.

III. Theoretical Analysis

In this section, we analyze two effects of land holding on migration distance: opportunity cost effect and capital constraint effect. Then, we combine the two effects to derive the composite influence of land holding on migration distance. Finally, we divide temporary migration into long-distance migration and short-distance migration, and analyze the different influences of land holding on these two kinds of migration.

1. Opportunity Cost Effect

First, we analyze the influence of land holding on migration distance from the perspective of opportunity cost. We find that land holding has a negative influence on desired migration distance. Consider an agricultural production function, where labor and land are complementary. If land input decreases, the marginal productivity of farmers will decrease. Then, a farmer would like to invest more labor into nonfarm activities; namely, nonfarm labor will increase. What is the influence of the nonfarm labor increase on migration distance? To answer this question we need to know the relationship between wage and distance. Because the urban wage is much higher than the rural income, a farmer's nonfarm wage will be higher if he/she works at a place near a city that is far from rural areas. That is to say, the farther the worker is from rural areas, the higher their nonfarm wage will be.

To clearly understand the influence of land holding on desired migration distance, we provide a simple function of migration profits. The profit of temporary migration is decided by the migration revenue and migration cost:

$$p = w(d)l_n - T(d), \tag{1}$$

where p is the migration income and w is the wage for nonfarm work. Here, w is assumed to have a positive relationship with distance (d). In other words, if a farmer works farther away from the village it is likely that he or she will receive a higher wage.[3] We assume that $w(0) > 0$, $w'(d) > 0$ and $w''(d) < 0$. To obtain some nonfarm work, a farmer has to pay a transfer cost, which has a positive relation with distance (d). The function $T(d)$ is used to describe this relation, and it is assumed that $T(0) = 0$ and $T'(d) > 0$.

Equation (1) implies a negative relationship between land holding and the desired migration distance. It is easy to understand the conclusion from the perspective of marginal

[3] The distance in this study refers to working place relative to the village or city. If a farmer works near his or her village, the distance is short. In contrast, if he or she works near the city, the distance is great. Because wages in the city are much higher than in the rural areas, it is proper to assume a relationship between wage and distance.

cost and marginal revenue. If land holding decreases, marginal productivity of farm labor decreases, then nonfarm labor (l_n) increases. If nonfarm labor increases, then $w'(d)l_n$ increases; namely, the marginal revenue of migration increases. However, the marginal cost of migration ($T'(d)$) is constant in terms of nonfarm labor, which means that the marginal cost of migration is not influenced by nonfarm labor. To maximize his or her profit from migration, a farmer needs to make marginal revenue equal to marginal cost. Because marginal revenue is a negative function of migration distance, he or she will choose to work at a more distant workplace so as to meet the profit maximization condition. This logic implies a negative relationship between land holding and desired migration distance.

This effect of land holding on migration is defined as the "opportunity cost effect," because the main channel of the influence is opportunity cost. When land holding is large, the marginal productivity of farm labor is high and the opportunity cost of migration is high, so nonfarm labor is reduced and migration distance becomes shorter.

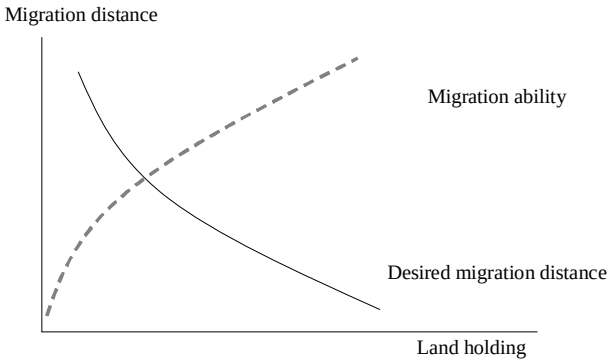
2. Capital Constraint Effect

We have proved that farmers with limited land holding tend to migrate farther away. However, sometimes even if farmers want to migrate farther away, they lack sufficient capital to migrate. Whether a potential migrant has enough capital to overcome the migration cost is important in the migration process, because developing countries lack sound financial markets and many farmers have no access to credit services. Therefore, it is necessary to analyze the influence of land holding on migration distance from the perspective of capital constraints.

The key difference of this perspective from that of opportunity cost is that the opportunity cost perspective focuses on a farmer's intention for migration while the capital constraint effect focuses on the farmer's ability to migrate. From the perspective of opportunity cost, we know that a farmer might want to migrate farther when his or her land holding is very limited. However, whether he or she can take such action will depend on his or her income.

With an imperfect capital market, only the relatively rich farmers are able to pay the migration cost. For many farmers, the migration cost can only be covered by savings (Armstrong and Lewis, 2009). Farmers can also borrow from relatives and friends to finance their migration. Regardless, there should be a positive relationship between land holding and capital ability. When a farmer has a large amount of land, his or her income is high, which enables him or her to save enough money. This means that land can provide necessary capital for a potential migrant. In this sense, owning more land may provide more opportunities to a potential migrant. This effect of land holding on migration is called the "capital constraint effect." The opportunity cost effect and capital constraint effect are described in Figure 2.

Figure 2. Opportunity Cost Effect and Capital Constraint Effect



3. Composite Effect of Land Holding on Migration

We have analyzed the influence of land holding on migration distance from two perspectives: opportunity cost and capital constraint. The opportunity cost effect and the capital constraint effect have different influences on migration distance. The opportunity cost effect has a negative impact on the farmer's desired migration distance and this effect shows a farmer's intention of migration, while the capital constraint effect has a positive influence on farmers' migration ability, which means that people with more land holdings are able to migrate to places farther away from their village. The combined result of the two contrary effects shows an inverted-U-type relationship between migration distance and land holding (see Figure 3), because the migration intention is bounded by migration ability when land holdings are very limited.

We divide migration into long-distance and short-distance migration according to a benchmark presented by the dotted line in Figure 3. We find that farmers with very little land choose short-distance migration, while the people whose land holdings are in the middle level choose long-distance migration.

Because most of the existing literature focuses on the influence of land holding on migration probability, we need to transform the distance model into a probability model to derive comparable and testable conclusions. This transformation is illustrated in Figure 4. Because the people with very limited or plenty of land holding are more likely to choose short-distance migration, the probability of short-distance migration shows a U-shaped association with land holding. Since the people whose land holding is somewhere in the middle are more likely to choose long-distance migration, the probability of long-distance migration has an inverted-U-shaped association with land holding. We can see that land holding plays different roles in different kinds of migration.

Figure 3. Relationship between Migration Distance and Land Holding

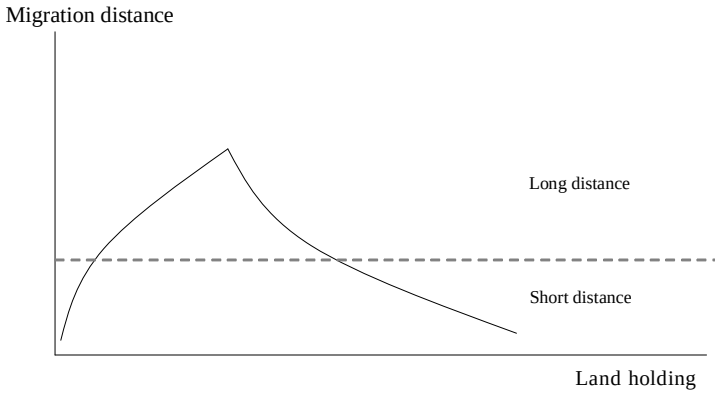
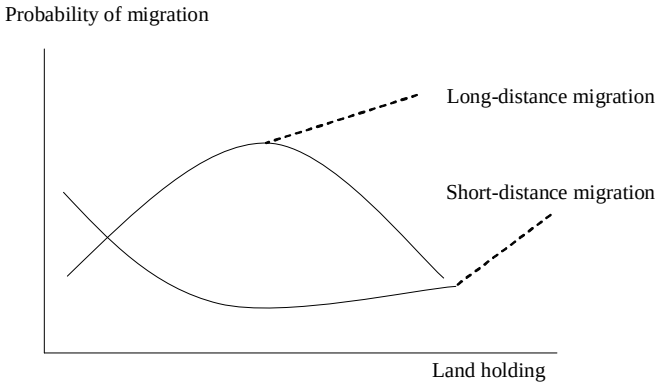


Figure 4. Predicted Impacts of Land Holding on Labor Migration



We will test these arguments in the next section.

IV. Empirical Analysis

Based on the above analysis, this section considers the influences of land holding on temporary migration, including short-distance migration and long-distance migration data from the 2008 CFPS household survey provided by the Institute of Social Science Survey of Peking University.

1. Data

In the present paper, we use the 2008 CFPS data. The survey is a major social scientific

investigation project on Chinese households.[4] The survey covers three important areas of China, including two municipalities under the central government (Beijing and Shanghai) and one province (Guangdong). The questionnaires consist of three levels: individual, household and community. The 2008 CFPS data were collected through a series of questionnaire-based interviews conducted in rural and urban areas at the end of 2007. The dataset consists of 2400 households, among which 680 are rural households. We conduct our empirical study at the household level, which is better suited for our theoretical analysis.

It should be noted that this study is mainly about temporary migration, not permanent migration. Unless specified otherwise, migration in the present paper refers to temporary migration. A rural household is defined as a migrant household if there is at least one temporary migrant. Short-distance migration refers to that where a migrant works outside his or her village but within the local township.[5] We regard working in the township as short-distance migration because most townships in China have quite close relations to villages and those townships are not cities, and a farmer can go back to his or her family every day. It is those with enough knowledge and who have been accustomed to city life that are more likely to move into cities, and may contribute to the reduction in rural–urban inequality. Long-distance migration refers to the situation where a migrant leaves his or her rural family and works outside a township within or outside the local province. Sometimes there is more than one migrant in a household. In this case, we define migration type according to the most distant workplace of the family members.[6] In the 2008 CFPS household survey, the percentages for non-migrant, short-distance migration and long-distance migration are 72.38, 5.07 and 22.54 percent, respectively (see Figure 5). Approximately 30 percent of the rural households have members temporarily migrating to other places to find a job, with the majority of them choosing long-distance migration.

2. Explanation of Variables

The key variable (*land*) in our analysis is the amount of land owned by a rural family. We use two indicators to measure this variable. The first indicator, *land1*, is contracted land, including dry land, paddy land, grassland and forest. It does not include land rented for users. The second indicator, *land2*, excludes low-value contracted land, such as grassland and forest, and only includes dry land and paddy land.[7] We use this indicator because more valuable land may have

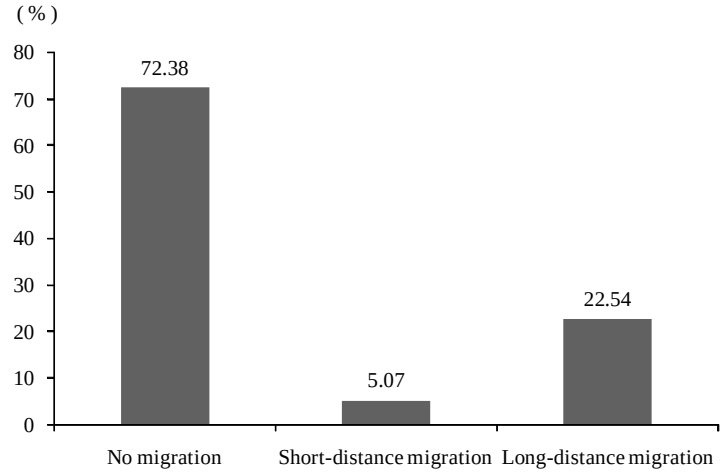
[4] Although 2009 data is available, there is a lack of information about the workplace.

[5] China's administrative division has five levels, including village, township, county, city and province.

[6] For example, there are two migrants in a rural family with one working within the local township and the other working outside the local province. We define this type of migration as long-distance migration.

[7] Generally, the dry land and paddy land are of higher value than grassland and forest, and may have greater influence on farmers' migration decisions.

Figure 5. Distribution of Different Migration Types



Source: China Family Panel Studies (2008). Available from://www.isss.edu.cn/index.php?catid=96&action=index.

a stronger influence on farmers' migration behavior. The squared term for land holding is added as an explanatory variable to catch the nonlinear influence of land.

Control variables are used to attain more accurate and robust estimation. We use them to capture the characteristics of individuals, households and the community. Control variables include *age*, *school*, *gender*, *marriage*, *electricity*, *relative*, *village population*, *temple* and *market*. Here, *age*, *gender*, *school* and *marriage* represent information of the household head, where *age* is the age of the household head, *school* reflects the education level of the household head and *gender* is a dummy variable, which equals 1 if the household head is male. *marriage* describes the respondent's marital status, which equals 1 if he or she is married. To grasp the dynamics of the influence of *age*, we introduce the squared term of *age*. *electricity* and *relative* are control variables reflecting some characteristics of the rural household, electricity is a discrete variable reflecting the quality of electricity that a household uses, with 0 representing no use of electricity and 4 representing very good electricity access. *relative* is used to measure the number of relatives of a rural household, which captures some information about the household's social network. In addition, there are some other control variables reflecting village level information, such as *village population*, *temple* and *market*. *temple* is a dummy and equals 1 if there is one temple in the village. *market* reflects whether there is a market in the village. Table 1 shows descriptive statistics of the data.

3. Methodology

(1) Migration Distance and Land Holding: A Preliminary Test

The simplest way to test whether migration distance has an inverted U-shaped relationship

Table 1. Descriptive Statistics of the Data

Characteristics	Non-migration	Short-distance migration	Long-distance migration	Total sample
Land1 (*mu*)	3.35	2.85	3.67	3.40
Land2 (*mu*)	3.46	3.62	4.45	3.73
Average age	55.82	57.02	58.17	56.30
Male percentage	0.13	0.17	0.11	0.13
Average school	1.27	1.31	1.22	1.26
Married percentage	0.86	0.80	0.89	0.86
Average electricity quality	3.20	3.17	2.99	3.16
Average number of relatives	5.47	4.96	4.95	5.35
Average village population	2652.12	1700.32	2573.25	2538.56
Temple percentage	0.10	0.04	0.06	0.08
Market percentage	0.16	0.06	0.20	0.15

Source: Calculated by the author according to the data of China Family Panel Studies (2008). Available from://www.isss.edu.cn/index.php?catid=96&action=index.

Notes: The table is based on calculations using the 2008 Chinese Family Panel Studies dataset provided by the Institute of Social Science Survey of Peking University. *land1* refers to contracted land (including dry land, paddy land, grassland and forest). *land2* only includes dry and paddy land. The variable *school* ranges from 0 to 7, with 0 representing an illiterate person and 7 representing the highest education level (doctor). Electricity quality is a subjective judgment of the electricity quality, the value of which ranges from very low (0) to very high (7). 1 *mu* equals approximately 0.16 acres.

with land holding is to regress migration distance on land holding and its square term. Although accurate information on migration distance is not available in the 2008 rural household survey of the CFPS, the survey still provides some basic workplace information, through which we can define migration distance in the economic sense. Therefore, migration distance is 0 if a rural household does not have any member working outside the village, migration distance is 1 if the household's migration type is short-distance migration, 2 if the workplace of the migrant is outside the local township and within the local province,[8] and 3 if the workplace is outside the local province. We may regress migration distance on land holding and its square term. The econometric model is expressed as:

$$d_i = a + b_1 land_i + b_2 land_i^2 + gX_i + e_i, \quad (2)$$

where d_i is the migration distance of an individual, $land_i$ represents the amount of land owned by a farmer, and X is a vector of control variables that are described above, which reflects the farmer's individual, household and community characteristics. g is the vector of coefficients of X. The squared term for land holding is designed to capture the change in

[8] For the definition of migration distance we only consider the farthest workplace if there are two or more migrants in a household, which is similar to the definition of migration type.

the marginal effect of land holding that is implied by the hypotheses in Section III.3. Because the dependent variable *d* is truncated, we use the Tobit model to deal with this issue.

However, there is an important issue concerning the endogeneity of the key explanatory variable, *land*. The endogeneity problem may result from the reverse causality from migration probability to land holding. Since for someone who wants to migrate into the urban sector it is impossible to obtain new land, those who do not want to migrate have much stronger preference to obtain land, because land is the most important means of agricultural production.[9] Another possible cause of endogeneity is the existence of a third variable influencing land holding and migration intention simultaneously. For example, if a family member permanently migrates out of the village, the contracted land of this household may decrease because the permanent migrant will lose his or her land according to the land distribution system of collective ownership. At the same time, this permanent migrant (the third variable) may provide useful information regarding job hunting to other household members, which can stimulate the migration intention of other members. This means that permanent migrants will influence both migration intention and land holding as a third variable.

Therefore, it is necessary to deal with the endogeneity problem in the empirical analysis. In this study we employ an instrument variable (*crowdedness*) that reflects the crowdedness of buildings in a village to solve the problem of endogeneity. This indicator is highly correlated with the land holding because if a village is very crowded, land quantity is small relative to the village population. Crowdedness is not affected by the dependent variable in the regression. Another condition for an instrument variable is that the instrument should not directly influence the dependent variable. Therefore, we use two-stage least squares (2SLS) estimation with the degree of crowdedness as an instrument of contracted land to deal with the endogenous problem.

It should be noted that the regression using the rough distance indicator is only a preliminary test because the migration distance is roughly defined according to the workplace information. Therefore, we will conduct a further study on the relationship between migration probability and land holding to test our theoretical analysis and make the present study comparable with the existing literature.

(2) Migration Probability and Land Holding: Discrete Choice Model

In this subsection we test and analyze the influence of land holding on migration probability. This is a discrete choice problem. The simplest method to study this issue is to

[9] This reverse causality might be unimportant under China's present land system because the land market in China is not active. However, in some counties, the abovementioned situation must exist and is important, so the endogeneity problem is a result of land transactions.

consider it as a binary choice problem, by which we take short-distance migration and long-distance migration as independent choices and study each type, respectively. The most basic methods to deal with this problem are the probit model and the logit model. Both of these methods are employed in the present study.

Another way to deal with the discrete choice problem is to study all the types of migration simultaneously. There are two possible methods: the ordered logit model and the multinomial logit model. The ordered logit model is not appropriate for the present study. However, the multinomial Logit model enables us to analyze the impacts of land holding properly. The ordered logit model evaluates different choices with only one coefficient system.[10] Therefore, at least two strict assumptions are necessary to analyze the problem of this study: (i) the wages are at the same level in different places; and (ii) there is an intention for a farmer to live far away from his or her village. However, the wages and migration costs obviously vary between different types of cities, so a farmer has to calculate the migration revenue of each city and chose the working place that maximizes his or her benefits. Therefore, the ordered logit model is not appropriate for the current research. The multinomial logit model is used when there are more than two categories and it relies on the assumption of independence of irrelevant alternatives; therefore, we use it in our analysis. Similarly, we use the multinomial probit model to conduct a comparison with a binary discrete choice model to test the robustness of our conclusions. We also use 2SLS estimation with the degree of crowdedness as an instrument variable to deal with the endogeneity problem.

V. Result Analysis

1. Empirical Results of the Preliminary Test

The empirical results of the preliminary test are shown in Table 2. For long-distance migration, the coefficients of *land* and its square term are positive and negative, respectively, as predicted by our theoretical model. OLS and Tobit regressions do not show significantly negative coefficients for the *land square*, which implies that the relationship between migration distance and land holding might be negative. However, after controlling the endogeneity problem, 2SLS estimations show strong evidence for the negative coefficient of *land square* and a positive coefficient of *land*, indicating an inverted-U-shaped curve relationship between migration distance and land holding. Because all of the squared term

[10] For an ordered logit model, a farmer evaluates different choices with only one function. In other words, there is only one coefficient vector in the econometric model. If we employ the ordered probit in this study, we have to assume that the coefficients of explanatory variables are the same for small cities and big cities, for close cities and distant cities. Therefore, we cannot test our theoretical implications.

Table 2. Results of Preliminary Test

	Dependent variable: *migration distance*					
	(1)	(2)	(3)	(4)	(5)	(6)
Land	0.0490**	0.177**	0.106**	0.0447**	0.137	0.106**
	(0.0214)	(0.0872)	(0.0504)	(0.0217)	(0.0840)	(0.0513)
Land square	–0.00217	–0.00675	–0.0186***	–0.00196	–0.00490	–0.0201***
	(0.00137)	(0.00529)	(0.00556)	(0.00138)	(0.00507)	(0.00608)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Method	OLS	Tobit	2SLS	OLS	Tobit	2SLS
Number of observations	628	628	628	631	631	631

Notes: ***, ** and * denote statistical significance at the 1, 5 and 10-percent level, respectively. Heteroskedasticity robust standard errors are in parentheses. 2SLS, two-stage least squares estimation. Because the dependent variable, *migration distance*, is at least 0 to at most 3, we use the Tobit model to deal with the truncation problem. Specifications (1), (2) and (3) use *land1* (contracted land) as the key variable; and specifications (4), (5) and (6) use *land2* (only dry and paddy land) as the key variable. "Yes" means control variables are used in the estimation. Control variables include *age*, *school*, *gender*, *marriage*, *electricity*, *relative*, *village population*, *church* and *market*.

coefficients are consistently negative, we can conclude that there is an inverted-U-shaped curve relation between migration distance and land holding. However, this is only a preliminary result; we will further analyze the results for the discrete choice model.

2. Empirical Results of Ordinary Discrete Choice Model

The regression results for the binary discrete choice model are summarized in Table 3, where panel 1 shows the empirical analysis of long-distance migration and panel 2 shows the analysis of short-distance migration. We cannot see obvious evidence for the hypothesis about the influence of land holding on short-distance migration because the coefficients of land are not significantly negative, and sometimes they are positive. However, the results indicate that land holding could influence long-distance migration seriously and the influence shows an inverted-U-shape, which supports our theoretical implication.

In the estimations of multinomial discrete choice models we treated non-migration as the reference group. The results for the multinomial regression are presented in Table 4.[11] The results of the multinomial logit regression are consistent with those of the binary logit

[11] The standard interpretation of the coefficient is that for a unit change in the independent variable, the logit of a certain outcome relative to the reference group is expected to change by its respective coefficient given the other variables in the model are held constant. For example, the coefficient of land (0.149) means that if a farmer were to increase his or her land by 1 *mu*, the multinomial log-odds for short-distance migration relative to non-migration would be expected to decrease by 0.149 units, while holding all other variables constant in the model.

Table 3. Estimation Results of Binary Choice Model

Panel 1: Long-distance migration						
	(1)	(2)	(3)	(4)	(5)	(6)
Land	0.0987**	0.172**	0.244***	0.113***	0.199***	0.275***
	(0.0403)	(0.0726)	(0.0759)	(0.0399)	(0.0724)	(0.0774)
Land square	–0.00578**	–0.0102*	–0.0120**	–0.00650**	–0.0116**	–0.0136**
	(0.00282)	(0.00535)	(0.00531)	(0.00282)	(0.00539)	(0.00539)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Method	Probit	Logit	Logit	Probit	Logit	Logit
Number of observations	644	644	644	647	647	647
Panel 2: Short-distance migration						
	(7)	(8)	(9)	(10)	(11)	(12)
Land	–0.0136	0.00604	0.0702	–0.0924*	–0.156	–0.128
	(0.0535)	(0.113)	(0.127)	(0.0518)	(0.115)	(0.126)
Land square	0.00369	0.00542	0.00360	0.00730***	0.0126**	0.0118**
	(0.00274)	(0.00537)	(0.00570)	(0.00268)	(0.00552)	(0.00575)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Method	Probit	Logit	Logit	Probit	Logit	Logit
Number of observations	564	564	564	566	566	566

Notes: ***, ** and * denote statistical significance at the 1, 5 and 10-percent level, respectively. Heteroskedasticity robust standard errors are in parentheses. Logit, logit estimation; probit, probit estimation. Specifications (1), (2), (3), (7), (8) and (9) use contracted land as the key variable; the specifications (4), (5), (6), (10), (11) and (12) use *land2* (only dry and paddy land) as the key variable. Control variables include *age*, *school*, *gender*, *marriage*, *electricity*, *relative*, *village population*, *temple* and *market*.

regression, with ambiguous influence of land holding on short-distance migration. Both multinomial logit estimations and multinomial probit estimations show that the influence of land holding on long-distance migration is statistically significant and the relationship takes an inverted-U-shape. This implies that collective land ownership, which evenly distributes land holding, stimulates long-distance migration. However, these estimations do not take the endogeneity problem into consideration; therefore, the results are likely to be biased to some extent. We need to conduct instrumental estimation to obtain consistent estimators.

3. Empirical Results of Two-stage Least Square Estimation

Controlling endogeneity, the 2SLS estimation results perfectly support our theoretical implications. The results of the 2SLS estimation are shown in Tables 5 and 6. From Table 5 we can observe that the coefficients of *land* and its squared term are all statistically significance at 10 percent, indicating a statistically important relationship between migration probability and land holding. Therefore, the inverted-U-shaped influence of

Table 4. Estimation Results of Multinomial Choice Model

Panel 1: Multinomial logit				
	(1)		(2)	
	Short distance	Long distance	Short distance	Long distance
Land	0.0347	0.149***	0.0347	0.149***
	(0.114)	(0.0575)	(0.114)	(0.0575)
Land square	0.00393	–0.00720*	0.00393	–0.00720*
	(0.00539)	(0.00400)	(0.00539)	(0.00400)
Control variables	Yes	Yes	Yes	Yes
Number of observations	628	628	628	628
Panel 2: Multinomial probit				
	(3)		(4)	
	Short distance	Long distance	Short distance	Long distance
Land	0.0347	0.191**	0.0347	0.191**
	(0.114)	(0.0759)	(0.114)	(0.0759)
Land square	0.00393	–0.00977*	0.00393	–0.00977*
	(0.00539)	(0.00559)	(0.00539)	(0.00559)
Control variables	No	Yes	No	Yes
Number of observations	628	628	628	628

Notes: ***, ** and * denote statistical significance at the 1, 5 and 10-percent level, respectively. Heteroskedasticity robust standard errors are in parentheses. Logit, logit estimation; probit, probit estimation. Specifications (1) and (3) use contracted land as the key variable, specifications (3) and (4) use *land2* (only dry and paddy land) as the key variable. Control variables include *age*, *school*, *gender*, *marriage*, *electricity*, *relative*, *village population*, *temple* and *market*.

land holding on long-distance migration is supported by strong evidence. The results shown in Table 5 also imply that land holding has a U-shaped relationship with the probability of short-distance migration, which is consistent with our theoretical analysis. In addition, the relationship is economically important. For example, taking the results of specification (1), when land holding is 3.4, its influence on long-distance migration is 0.43 ($=0.300 \times 3.4 - 0.0509 \times 3.4^2$), implying that land holding increases the probability of long-distance migration by 43 percent. This indicates that land holding at the middle level will stimulate long-distance migration. Therefore, the U-shaped curve means that both large and limited land holding stimulates short-distance migration.

Table 6 presents the results for 2SLS estimation of the multinomial logit model and the multinomial probit model. The coefficients of long-distance migration are consistent with the 2SLS logit and 2SLS probit estimators, with statistically positive coefficients of *land* and negative coefficients of *land square*. With regard to the short-distance migration, although the parameter estimator of *land square* is not statistically significant under specification (3), the signs are all consistent with our theoretical expectations. To sum up, we use substitutable

Table 5. 2SLS Estimation Results of Binary Choice Model

Panel 1: Long-distance migration						
	(1)	(2)	(3)	(4)	(5)	(6)
Land	0.300**	0.593**	0.593**	0.290**	0.554**	0.554**
	(0.126)	(0.240)	(0.240)	(0.120)	(0.226)	(0.226)
Land square	–0.0509***	–0.0971***	–0.0971***	–0.0546***	–0.101***	–0.101***
	(0.0156)	(0.0298)	(0.0298)	(0.0160)	(0.0303)	(0.0303)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Method	Probit	Logit	Logit	Probit	Logit	Logit
Number of observations	647	647	647	647	647	647
Panel 2: Short-distance migration						
	(7)	(8)	(9)	(10)	(11)	(12)
Land	–0.251*	–0.527*	–0.527*	–0.264*	–0.552*	–0.552*
	(0.139)	(0.304)	(0.304)	(0.141)	(0.304)	(0.304)
Land square	0.0299*	0.0643*	0.0643*	0.0340*	0.0729*	0.0729*
	(0.0162)	(0.0357)	(0.0357)	(0.0176)	(0.0386)	(0.0386)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Method	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS
	Probit	Logit	Logit	Probit	Logit	Logit
Number of observations	566	566	566	566	566	566

Notes: ***, ** and * denote statistical significance at the 1, 5 and 10-percent level, respectively. Heteroskedasticity robust standard errors are in parentheses. 2SLS, two-stage least squares estimation. Logit, logit estimation; probit, probit estimation. Specifications (1), (2), (3), (7), (8) and (9) use contracted land as the key variable; specifications (4), (5), (6), (10), (11) and (12) use *land2* (only dry and paddy land) as the key variable. Control variables include *age*, *school*, *gender*, *marriage*, *electricity*, *relative*, *village population*, *temple* and *market*.

indicators, different estimation methods and many control variables in our empirical analysis, and most of the results provide evidence for our theoretical implications that land holding has a U-shaped influence on the probability of short-distance migration and has an inverted U-shaped influence on the probability of long-distance migration.

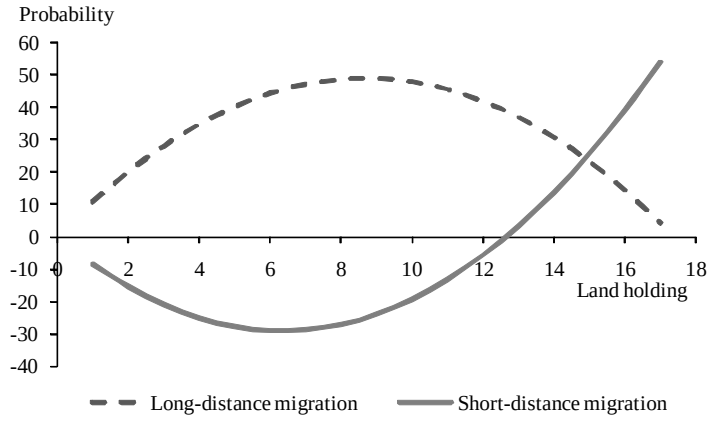
The estimation results of specification (1) in Table 6 are illustrated in Figure 6. The figure shows that if land holding is very limited the probability of migration is very low, which implies that the influence of land holding on migration is quite small. If land holding is abundant, the probability of long-distance migration would be very low while the probability of short-distance migration might be high. When land holding is in the intermediate interval, the probability of long-distance migration might increase because famers who have intermediate land holding do not face capital constraints and tend to migrate to farther for a higher wage. Although collective land ownership stimulates long-distance migration, which precedes permanent migration, the cost of permanent migration is high under collective land ownership, because a famer will lose his or her land if he or she permanently

Table 6. 2SLS Estimation Results of Multinomial Choice Model

Panel 1: Multinomial logit				
	(1)		(2)	
	Short distance	Long distance	Short distance	Long distance
Land	–0.308*	0.443**	–0.308*	0.443**
	(0.185)	(0.184)	(0.185)	(0.184)
Land square	0.0309	–0.0725***	0.0309	–0.0725***
	(0.0217)	(0.0230)	(0.0217)	(0.0230)
Control variables	Yes	Yes	Yes	Yes
Number of observations	631	631	631	631
Panel 2: Multinomial probit				
	(3)		(4)	
	Short distance	Long distance	Short distance	Long distance
Land	–0.509*	0.586**	–0.509*	0.586**
	(0.303)	(0.243)	(0.303)	(0.243)
Land square	0.0612	–0.105***	0.0612	–0.105***
	(0.0386)	(0.0331)	(0.0386)	(0.0331)
Control variables	No	Yes	No	Yes
Number of observations	631	631	631	631

Notes: ***, ** and * denote statistical significance at the 1, 5 and 10-percent level, respectively. Heteroskedasticity robust standard errors are in parentheses. Logit, logit estimation; probit, probit estimation. Specifications (1) and (3) use contracted land as the key variable; specifications (2) and (4) use *land2* (only dry and paddy land) as the key variable. Control variables include *age*, *school*, *gender*, *marriage*, *electricity*, *relative*, *village population*, *temple* and *market*. The instrument variable is the degree of crowdedness in a village.

Figure 6. Influence of Land Holding on Migration Probability



Notes: The unit of land holding is *mu* which equals approximately 0.16 acre.

migrates out of the local village. This implies that collective land ownership might be associated with increasing pressure in the process of urbanization.

VI. Conclusions and Policy Implications

The present paper attempted to explore the influence of land holding on rural–urban temporary migration. We first analyze the influence of land holding on migration distance from two perspectives: opportunity cost and capital constraint. The opportunity cost effect has a negative influence on the desired migration distance. The capital constraint effect has a positive impact on the ability of migration. The composite of the two different effects reveals an inverted-U-shaped influence of land holding on migration distance.

Based on this nonlinear relationship between migration distance and land holding, we divide temporary migration into short-distance migration and long-distance migration and find that land holding plays a different role in short-distance migration and long-distance migration. We use different empirical methodologies to test the theoretical implications. It is found that land holding and the probability of short-distance migration presents a U-shaped curve relationship. For long-distance migration, the relation between migration probability and land holding presents an inverted-U-shaped curve. In addition, the influence of land holding on temporary migration is statistically and economically significant.

The study helps us to identify who are the most in need of help in rural areas: it is those who have very little land and who do not have enough capital to migrate. Cai and Wang (2008) point out that migration income is very important for increasing rural income and reducing rural–urban inequality. Therefore, effective policy is necessary to help those who are unable to migrate freely. We find that migration cost and the lack of necessary capital are the main obstacles for temporary migration. The cost consists of not only transportation costs, but also information costs, accommodation costs and psychological costs. To help the farmers with little land and capital, the Chinese Government should provide further job information, migration subsidies and the necessary employment training for those who want to migrate, and ensure the effectiveness of policy implementation.

References

Armstrong, Alexander and Frank Lewis, 2009, "Capital constraints and European migration to Canada: Evidence from the 1920s passenger lists," *Queen's Economics Department Working Paper* No. 1230, Queen's University, Ontario.

Barbieri, Alisson Flávio, 2005, "People, land and context: Multi-scale dimensions of population mobility

in the Ecuadorian Amazon," PhD Dissertation, University of North Carolina [online; 9 December 2012]. Available from: http://proquest.umi.com/pqdlink?did=997899921&Fmt=7&clientId=79356&RQT=309&VName=PQD.

Bhandari, Prem, 2004, "Relative deprivation and migration in an agricultural setting of Nepal," *Population & Environment*, Vol. 25, No. 5, pp. 475–99.

Bilsborrow, Richard E., Thomas M. McDevitt, Sherrie Kossoudji and Richard Fuller, 1987, "The impact of origin community characteristics on rural–urban out-migration in a developing country," *Demography*, Vol. 24, No. 2, pp. 191–210.

Brueckner, Jan K., 1990, "Growth controls and land values in an open city," *Land Economics*, Vol. 66, No. 3, pp. 237–48.

Brueckner, Jan K. and Yves Zenou, 1999, "Harris-Todaro models with a land market," *Regional Science and Urban Economics*, Vol. 29, No. 3, pp. 317–39.

Cai, Fang and Meiyan Wang, 2008, "A counterfactual analysis on unlimited surplus labor in rural China," *China & World Economy*, Vol. 16, No. 1, pp. 51–65.

Cai, Fang and Meiyan Wang, 2009, "Why the free flow of laborer couldn't narrow the income gap between rural and urban areas," *Economic Perspectives*, Vol. 52, No. 20, pp. 4–10.

Dixon, George I. J., 1950, "Land and human migrations," *American Journal of Economics and Sociology*, Vol. 9, No. 2, pp. 223–34.

Gray, Clark L., 2009, "Environment, land and rural out-migration in the southern Ecuadorian Andes," *World Development*, Vol. 37, No. 2, pp. 457–68.

Kuhn, Randall Steven, 2002, "The logic of letting go: Family and individual migration from rural Bangladesh," *Population Aging Center Working Paper* PAC2002–2004, University of Colorado, Boulder.

Mendola, Mariapia, 2008, "Migration and technological change in rural households: Complements or substitutes?" *Journal of Development Economics*, Vol. 85, No. 1, pp. 150–75.

NBS (National Bureau of Statistics of China), 2011, *China Statistical Yearbook*, Beijing: China Statistics Press.

Potts, Deborah and Chris Mutambirwa, 2006, "Rural mobility as a response to land shortages: The case of Malawi," *Population, Space and Place*, Vol. 12, No. 4, pp. 291–311.

Rozelle, Scott, J. Edward Taylor and Alan de Brauw, 1999, "Migration, Remittances, and agricultural productivity in China," *American Economic Review*, Vol. 89, No. 2, pp. 287–91.

Taylor, Rozelle, J. Edward Taylor and Alan de Brauw, 1999, "Agricultural price policy, employment and migration in a diversified rural economy: A village township CGE analysis from Mexico," *American Journal of Agricultural Economics*, Vol. 81, No. 3, pp. 653–62.

VanWey, Leah K., 2003, "Land ownership as a determinant of temporary migration in Nang Rong, Thailand," *European Journal of Population* (*Revue Européenne de Démographie*), Vol. 19, No. 2, pp. 121–45.

VanWey, Leah K., 2005, "Land ownership as a determinant of international and internal migration in Mexico and internal migration in Thailand," *International Migration Review*, Vol. 39, No. 1, pp. 141–72.

(Edited by Zhinan Zhang)