



CENTRE D'ETUDES  
ET DE RECHERCHES  
SUR LE DEVELOPPEMENT  
INTERNATIONAL

Document de travail de la série  
*Etudes et Documents*  
Ec 2001.17

## Impacts of Income Gap on Migration Decision in China

Nong ZHU\*

November 2001, 22 p.

---

\* E-mail address: [n.zhu@u-clermont1.fr](mailto:n.zhu@u-clermont1.fr) (N.Zhu).

Acknowledgments: The author gratefully acknowledges the help from Elisabeth Sadoulet and Xubei Luo. Naturally, the responsibility of any remaining errors lies with the author.

**Abstract**

Using survey data from China, this article examines the determinants of rural to urban migrants' income. Specifically, it studies the effects of income gap on migration decision and its sources. The empirical study demonstrates that income gap significantly influences migration decision. Moreover, our results show that income level depends greatly on education level. By estimating urban to rural income gap, we find that the income differential between migrants and non-migrants is larger for women than for men, which suggests that women receive larger monetary returns as a result of migration. In terms of its decomposition, for men, the contribution of difference in attributes is more important than that of difference in the returns to attributes; for women, their income gap is mainly determined by the differences in returns to attributes.

*Keywords:* Internal migration in China; Income gap; Sample selection

**Résumé**

En utilisant les données d'une enquête, nous analysons les déterminants du revenu des migrants, l'effet de l'écart de revenu sur la décision de migrer ainsi que les sources de cet écart. Les résultats économétriques montrent que l'écart de revenu influence significativement la décision de migrer. Le niveau d'éducation exerce un effet positif important sur le revenu. L'écart entre le revenu des migrants et celui des non-migrants est plus grand chez les femmes que chez les hommes. Dans la décomposition de l'écart, pour les hommes, la différence d'attributs joue un rôle plus important que la différence de rendement des attributs; pour les femmes, c'est la discrimination entre le revenu urbain et le revenu rurale qui prédomine.

*Mots-clés:* Migration interne en Chine, Ecart de revenu, Sélection de l'échantillon,

## **Introduction**

In China, the economic reform, which began in the late 1970s, introduced the market mechanism into the internal migration process. On the one hand, agricultural reform returned some freedom to farmers, so that they could freely enjoy their time and leave the land. On the other hand, the reforms and the opening-up increased regional disparity and reinforced demographic agglomeration. All this leads to vast labor movements, in particular, those from rural to urban areas. Migration progressively becomes an essential element of the development in China.

However, the research on China internal migration has lagged behind the research in other fields. This lag results mainly from the lack of data (Ma et al., 1997: 707). Under the hypothesis that internal migration was well controlled by government and thus it did not need to be studied, Chinese government did not include any question on migration in the census before 1990. Furthermore, no survey of migration was carried out before the mid-1980s. Migration research based on various surveys has flourished since the late 1980s. In 1990, the variable "migration" was first introduced in census. The data availability from various sources greatly stimulated the researches in this field. Nevertheless, by western standards, and compared with the migration literature on developing economies in the last three decades, migration research in China is still at an early stage (Wu & Zhou, 1997: 54). This backwardness appears at least as follows: firstly, most researches remain qualitative. Secondly, the objective of the migration survey is often subordinate to some governmental policies instead of theoretical research. Consequently, many migration surveys aim only at descriptive or static analysis or they are just inserted into other surveys, such as "China 1988 2/1000 Fertility and Birth Control Survey". Thirdly, the analyses which focus on the relation between income and migration are essentially concentrated on the comparison of the income differences between diverse groups, such as the migrants and the non-migrants (Li, 1997). The dynamic interaction between income and labor mobility is rarely examined.

In this paper, we will try to fill in some gaps in the field of microeconomic analysis on internal migration of China. The objective of this paper is to analyze the determinants of rural to urban migration and those of migrants' income. Specifically we try to study impacts of income gap on migration decision and its sources. In the following section, we provide some background description on migration in China. Then, we introduce the analysis methods and data. In the fifth section, we present our econometric results. Finally, we conclude.

## Background

Three decades ago, Todaro (1969) and Harris and Todaro (1970) formalized the hypothesis that the incidence of rural to urban migration in developing countries proceeded in response to urban to rural differences in expected earnings. Since then, a flurry of empirical studies provide evidence in support of this model (Levy et al., 1974; Todaro, 1976; Taylor, 1987; Lucas, 1988; Agesa & Agesa, 1999). China is a large agricultural country with a dual economy and with an important regional disparity. The specialties of Chinese society make the situation of labor mobility in China different from that of developed countries and developing countries.

Prior to the recent tide of migration, China had for decades tightly restricted rural to urban migration. This strict urban-rural segregation was mainly instituted following the devastating famine that occurred between 1959 and 1961. The purpose of that policy was to restrict the urban population size. The reason was that, among other things, the government was responsible for feeding this population. Two fundamental methods were used to achieve the segregation. One was to impose a high opportunity cost for leaving rural areas by tying incomes to participation in daily collective farm work (*gongfenzhi*). The other was to make it difficult for outsiders to live in urban areas through the denial of urban residence registration (*hukou*), on which employment, allocation of housing, food and other necessities were contingent. The prolonged restriction on migration created large income gaps between urban and rural areas. The income gap widened until 1978, declined between 1978 and 1984, and widened again afterwards. The ratio of urban to rural per capita income was 2.57 in 1978, dropping to 1.86 in 1985, and then rising to 2.50 in 1994. From then on, it fluctuated around 2.50 (Department of Comprehensive Statistics of National Bureau of Statistics of China, 1999: 22).

The reforms began from the late 1970s. The people's commune came to an end and the Household Responsibility System (HRS) was generalized throughout the rural areas. The HRS had two far-reaching and unintended effects on the control of migration. First, buying food in urban areas without urban registration status became possible. The HRS increased the food supply dramatically, which led to the availability of food on the free market in cities and eventually led to the abandonment of food rationing. Second, the HRS returned personal freedom to rural people. which provided greater freedom of profession choice to farmers. Rural labors could from then on freely allocate their time, choose their profession and their mode of production. The large urban to rural income gap encouraged farmers to leave

agricultural activities for non-agricultural ones or to migrate to cities. Gradually, these spontaneous movements of the rural population broke the migration constraints.

However, although the food shortage is no more a threat in nowadays, the government continues to restrict migration by some direct or indirect regulations for three reasons. Firstly, urban residents are unwilling to share their higher living standards with rural people. Secondly, the government does not want to increase its investment in urban infrastructures to accommodate the rural migrants. In fact, in rural areas, it is the local population that bears the burden of infrastructure investment. Thirdly, due to the State-Owned Enterprises reform, unemployment becomes a serious problem in urban areas. The contradictions between official policies and farmers' aspirations, entail two major consequences: first, the urban informal sector develops and the urban labor market segmentation aggravates (Leila, 1999; Wang & Zuo, 1999). Second, the rural non-agricultural sector prospers, which provides another solution to the rural surplus labor (Rizwanul & Jin, 1994; Aubert, 1995; Zhao, 1999). These two rapidly growing sectors absorb a large amount of agricultural surplus labor.

According to Todaro model, there is an "informal sector" in which urban residents not otherwise employed can eke out a subsistence living using their labor power alone. This sector is merely a holding ground for people awaiting entry into the formal sector (Todaro, 1997: 271).<sup>1</sup> Many researches have confirmed the existence of informal sector in China by emphasizing its specialties. Firstly, in China, there exists serious urban labor market segmentation: rural migrants and local urban residents participate in two different labor markets. Most of the non-qualified migrants arrive in cities to take up marginal jobs that are characterized by long working hours, poor working conditions, low and unstable pay, and no benefits – jobs which are unattractive to urban residents. Moreover, the income gap between formal and informal sectors is reflected not only by salary, but also by the advantages that the formal sector workers received, such as housing subsidies, food provided, children education, medical insurance and other social insurance (Wang & Zuo, 1999: 277). Secondly, the possibility for the unskilled migrants to enter the formal sector is slim. To these migrants, the modern sector income is with sight but beyond reach. Moreover, it is their title of migrants (for example, the registration type) instead of the sectors where they work that determines their socio-economic position. Quite many rural to urban migrants work in modern sectors, but they are engaged in low-level and temporary job with a low salary, such as sanitation

---

<sup>1</sup> According to some researches, in some countries, such as South Korea, formal sectors and informal sector are tightly related in urban labor market: there is mobility between the odd-jobbers of the non-modern sector and the blue-collar workers of the modern sector (Hashiya, 1996: 461).

worker, porter, etc. We thus call it "informal labor market" instead of "informal sector" (Zhu, 1998). Thirdly, generally speaking, the situation of the migrants in "informal market" is better in China than in some other developing countries (Zhu, 1998).

Although most of the rural to urban migrants can only find low-level job in urban informal labor market, the farmers' propensity to leave the agricultural activities is always strong because of the combination of the heavy rural demographic pressure and the low agricultural labor productivity. Todaro rejects the hypothesis of Lewis, which supposes that labor supply is unlimited (Lewis, 1954) and there exists some agricultural labor whose productivity is so low that it tends to zero. However, this hypothesis is true in some cases. In the case of China, during a long time, farmers were artificially blocked in the countryside. With the rapid growth of rural population, the problem of agricultural labor surplus became more and more serious. In 1999, per capita area of cultivated land in rural area was only 0.138 hectares (National Statistics Bureau of China, 2000 : 382). With the difficulty in cultivated land enlargement, it is not easy to provide a solution to the problem of rural surplus labor problem, at least in the short run. The agricultural sector in China is still characterized by technical stagnation and low productivity. In other words, it stays in the traditional phase, which is defined by Schultz (1964). The agricultural income thus stays at a very low level, namely, the subsistent level, except that it is influenced by some exogenous factors, such as agricultural product price adjustment, land-allocation policies, etc. After HRS was carried out, the basic budget unit became the family and land was allocated in function of the family size. Even if the farmers participate in the rural non-agricultural activities, land always belongs to them. As there exists a large quantity of surplus labor in rural areas, the opportunity cost of non-agricultural activities participation of some family members is low. All income obtained beside agricultural activities could be considered to be supplementary (Byrd & Lin, 1994). Since the income gap between agricultural and non-agricultural activities is large, the motivation of leaving agricultural activities is strong.

In the following development, we try to test econometrically the effect of income gap on migration motivation. Furthermore, the overall urban to rural wage differential may be attributed to three factors (Agesa & Agesa, 1999: 41-42): 1) rural to urban differences in observed characteristics, such as the difference of education level and the different age composition of the migrants, 2) wage differences in returns to observed characteristics in the rural and urban areas, in other words, wage discrimination between urban and rural labor market, and 3) wage differences that stem from non-observable characteristics of urban and rural workers. Based on the estimation of wage equations, we will analyze the sources of

income gap and provide some explanations for gender differences in the incidence of rural to urban migration in China.

## Methodology

Our empirical estimation takes two steps. Firstly, we estimate simultaneously the earning equations for the rural to urban migrants and non-migrants in rural areas, as well as the impacts of the income gap between these two groups on migration decision. Secondly, we study the contribution of the various sources of income gap.

### *Effects of income gap on the migration decision*

To analyze the impacts of income gap on migration, it is necessary to introduce the difference in urban to rural income into the equation of migration decision. However, in our sample, urban income is observed only if an individual has already migrated, which leads to the problem of sample selection bias. We should take it into consideration and try to correct it by migration decision. So, we should simultaneously estimate the equations of income and migration, which are both endogenous. By using the two-step procedure proposed by Heckman (1979), we can solve this problem (Nakosteen & Zimmer, 1980; Perloff 1991). This method includes three steps:

Firstly, we estimate a reduced form of the probit equation:

$$P_i^* = \mathbf{a}' Z_i + \mathbf{b}' X_i + \mathbf{e}_i' \quad (1)$$

where  $P_i^*$  represents the migration decision;  $Z_i$  and  $X_i$  represent the independent variables of the selection equation and those of the income equation, respectively.

Secondly, we estimate the urban income equation and the rural income equation. In order to correct the sample selection bias, we introduce the inverse Mills ratio issued from the reduced form of the probit equation.

$$\log W_{ui} = \mathbf{b}_u X_{ui} + \mathbf{g}_u I_{ui} + \mathbf{m}_{ui} \quad (2)$$

$$\log W_{ri} = \mathbf{b}_r X_{ri} + \mathbf{g}_r I_{ri} + \mathbf{m}_{ri} \quad (3)$$

where  $W_{ui}$  and  $W_{ri}$  represent the migrant's income and the non-migrant's income, respectively.  $X_{ui}$  and  $X_{ri}$  are the vectors of individual characteristics.  $I_{ui}$  and  $I_{ri}$  are the inverse Mills ratios.

Finally, from equations (2) and (3), we predict for each individual the value of  $\hat{W}_{ui}$ , if he or she migrates to the cities; and that of  $\hat{W}_{ri}$ , if he or she stays in the countryside. Then we introduce the income gap into the structural probit equation:

$$P_i^* = \mathbf{a}Z_i + \mathbf{h}(\log \hat{W}_{ui} - \log \hat{W}_{ri}) + \mathbf{e}_i \quad (4)$$

From this equation, we can study the impacts of different factors, the income factors and the non-income factors, on migration decision.

The marginal effect of the regressors on the income ( $\log W_i$ ) in the observed sample consists of two components. There is the direct effect on the mean of the income, which is  $\mathbf{b}_k$ . In addition, for a particular independent variable, if it appears in the probability that  $P_i^*$  is positive, it will influence the income through its presence in the inverse Mills ratio  $I_i$  (Greene, 1997: 977-978). The full effect of changes in a regressor that appears in both  $X_i$  and  $Z_i$  on the income is:

$$\frac{\partial E(\log W_i / P_i^* > 0)}{\partial x_{ki}} = \mathbf{b}_k - \mathbf{a}'_k \mathbf{g} \mathbf{d}_i \quad \text{where} \quad \mathbf{d}_i = I_i^2 + (-\mathbf{a}' Z_i) I_i \quad (5)$$

Contrary to  $\mathbf{b}_k$ , which is a constant, the total effect, noted as  $\mathbf{b}'_{ki}$ , varies with the individuals because of the term  $\mathbf{d}_i$ . However, we can obtain some average values of the total effect by calculating the arithmetic average of  $\mathbf{b}'_{ki}$ :

$$\bar{\mathbf{b}}'_k = \frac{\sum_i \mathbf{b}'_{ki}}{n} \quad (6)$$

where  $n$  is the number of observations.

### *Income gap decomposition*

Various reasons, such as individual characteristics, discrimination between urban and rural labor market and other unobservable factors, can lead to the income gap between migrants and non-migrants. Oaxaca (1973) proposed a decomposition technique in analyzing wage discrimination in labor market. Later, Reimers (1983) developed this method to study the labor market discrimination, taking the adjusted wage into account to correct the sample selection bias. Agesa and Agesa (1999) adopted this method to analyze the income difference between migrants and non-migrants in Kenya.

Based on equation (2) and (3), we estimate the urban income and rural income for each individual:

$$\log \hat{W}_{ui} = \hat{\mathbf{b}}_u X_{ui} + \hat{\mathbf{g}}_u \mathbf{I}_{ui} \quad (7)$$

$$\log \hat{W}_{ri} = \hat{\mathbf{b}}_r X_{ri} + \hat{\mathbf{g}}_r \mathbf{I}_{ri} \quad (8)$$

So we can obtain:

$$\overline{\log \hat{W}_u} - \overline{\log \hat{W}_r} = \log \tilde{W}_u - \log \tilde{W}_r = \hat{\mathbf{b}}_u \bar{X}_u - \hat{\mathbf{b}}_r \bar{X}_r + \hat{\mathbf{g}}_u \bar{\mathbf{I}}_u - \hat{\mathbf{g}}_r \bar{\mathbf{I}}_r \quad (9)$$

where  $\tilde{W}_u$  and  $\tilde{W}_r$  represent the geometric average values of the two groups.

The income gap between the two groups can be decomposed as the following (Reimers, 1983: 572):

$$\begin{aligned} \log \tilde{W}_u - \log \tilde{W}_r &= (\bar{X}_u - \bar{X}_r)[D\hat{\mathbf{b}}_u + (I - D)\hat{\mathbf{b}}_r] + \\ &\quad [(I - D)\bar{X}_u + D\bar{X}_r](\hat{\mathbf{b}}_u - \hat{\mathbf{b}}_r) + \\ &\quad \hat{\mathbf{g}}_u \bar{\mathbf{I}}_u - \hat{\mathbf{g}}_r \bar{\mathbf{I}}_r \end{aligned} \quad (10)$$

where  $I$  is the identity matrix;  $D$  is a diagonal matrix of weights. (10) decomposes the percentage difference between the geometric means of observed wage rates for the two groups into three parts: 1) that due to differences in average characteristics of the groups, including differences in local price levels where the group members live ; 2) that due to differences in the parameters of the wage function, caused by labor market discrimination and other omitted factors ; 3) that due to differences in selectivity bias.

The measure of various sources of the gap depends on the choice of weights in matrix  $D$ . If we assume that discrimination penalizes the non-migrants by preventing them from earning according to the migrants' wage-offer function, then  $D$  equals  $I$ . If the discrimination gives the rural to urban migrants an undeserved advantage, and they are paid more than they would get in a non-discriminatory world, then  $D$  equals 0 (Reimers, 1983: 573; Oaxaca & Ransom, 1994: 8).

We suppose that: 1) most of the rural to urban migrants cannot enter the formal sector but only the informal one, where labor market is clean-up; 2) a great amount of agricultural surplus labor reduces the rural income; and 3) the difference between industrial product price and agricultural product price also lowers the rural income. Then, we take  $D = I$  in the following analysis:

$$\log \tilde{W}_u - \log \tilde{W}_r = (\bar{X}_u - \bar{X}_r)\hat{\mathbf{b}}_u + \bar{X}_r(\hat{\mathbf{b}}_u - \hat{\mathbf{b}}_r) + \hat{\mathbf{g}}_u \bar{\mathbf{I}}_u - \hat{\mathbf{g}}_r \bar{\mathbf{I}}_r \quad (11)$$

We can define the ratio of urban to rural income,  $R$ , and its value  $R'$ , corrected for the sample selection bias:

$$R = \frac{\tilde{W}_u}{\tilde{W}_r} = (1 + P_x)(1 + P_b)(1 + P_l) \quad (12)$$

$$R' = \frac{\tilde{W}_u}{\tilde{W}_r(1 + P_l)} = (1 + P_x)(1 + P_b) \quad (13)$$

where  $P_x = e^{(\bar{X}_u - \bar{X}_r)\hat{b}_u} - 1$ ,  $P_b = e^{\bar{X}_r(\hat{b}_u - \hat{b}_r)} - 1$  and  $P_l = e^{\hat{g}_u \bar{I}_u - \hat{g}_r \bar{I}_r} - 1$  represent the respective contributions of the three sources of income gap between migrants and non-migrants.

### *Data description*

The data we use in this article come from the research project "Migration and regional development", which is financed by the China National Social Science Fund.

### *Sample restrictions*

We did our survey in *Hubei* province in March 1993.<sup>2</sup> The sampling is composed of three stages. Firstly, 81 cities or counties are classified by three levels: 1) *Wuhan*, the provincial capital, 2) the cities at prefectural level, and 3) the counties or the cities at county level.<sup>3</sup> We choose *Wuhan* to represent the large city, *Danjiangkou* to represent medium city and four counties, which situate respectively in East, South, Central and West. Secondly, we choose randomly 9 resident's committees (6 in streets and 3 in towns) in the two cities, and 1 resident's committee (in town) and 2 villages in each county. Thirdly, all the families in villages chosen are taken into the survey. However, in urban committees, only all the temporary resident's families (*zanzhuhu*), which are formally or informally registered in the committees in street chosen, are taken into the survey. Given the high population density in the city and the relatively low proportion of migrants (generally less than 5%), we do a systematical sampling in the permanent resident's families (*changzhuhu*) according to the demographic dimension of committees. Hence, our sample includes 2796 households, which dispatch in 21 communities, including 6 resident's committees in street, 7 resident's

<sup>2</sup> *Hubei* province situate in central China, with a population size of over 53 millions in 1993. Heavy industry, light industry and agriculture are very developed there. In terms of demographic characteristics as in terms of socio-economic conditions, it is a province richer than many other ones. To some degree, it is a miniature of internal continent of China.

<sup>3</sup> In the hierarchy of administrative authorities of China, there are six grades: 1) Central Government, 2) province and municipality directly under the Central Government (MCG), 3) prefecture and municipality at prefectural level (MPL), 4) county (*xian*), municipality at county level (MCL) and district under the jurisdiction of MCG or MPL (*qu*), 5) town (*zhen*), township (*xiang*) and street of municipality (*jiedao*), 6) rural village and urban resident's committee (*juminweiyuanhui*).

committees in town and 8 rural villages. The elimination of incomplete information leads to a sample of 2573 valid observations.

We use two types of questionnaires: household questionnaire and individual questionnaire. In each household, we randomly choose one member of at least 15 years old to answer the household questionnaire and the individual questionnaire. Here, the household is the one, which is registered on the (permanent) residence registration booklet (*hukoubu*). For the temporary residents, the survey is carried out in their destination place. So, the information of their original place is reported by the migrants themselves.

We define migration as the change of usual residency between towns, townships or streets. The survey was executed in the actual residency place. For the migrants, the survey was done in the destination place of their latest movement. Using a life history table, the survey registers the migration history from the age of 15 years. However, concerning the other information of the households, only their actual situation is registered because it is difficult to catch their evolution. To simplify our study, we consider someone as a migrant if his or her birthplace is different from his or her actual residency place.

The rural to urban migrants can be regrouped into two sub-groups: permanent migrants and temporary migrants. The criterion is the change of the household registration place. Generally speaking, we define the migrants whose usual residency place and the *hukou* place are different as "temporary migrants"; on the contrary, we define the migrants who have moved with their *hukou* as "permanent migrants". There are two types of *hukou*: agricultural registration and non-agricultural registration. A permanent rural to urban migration signifies a change from agricultural registration to non-agricultural registration, which is in general difficult for non-qualified agricultural labor. Many researches have already proved that there exist significant differences between permanent migrants and temporary migrants (Goldstein & Goldstein, 1993; Chang, 1996; Wu & Zhou, 1997; Fan, 1999; Ma, 1999; Wang & Zuo, 1999). Firstly, the authorities directly control permanent migration so the permanent migration decision depends greatly on government plan. The theory of push-pull does not work in this case. On the contrary, temporary migration is a consequence of the market economy. It is a spontaneous process, which is regulated by the rural and urban labor markets. Government policies cannot influence it directly. Secondly, permanent migrants are rather qualified, generally integrated in employment programs and government social protection programs. Normally, they can get permanent and stable posts in the urban formal sector and receive the advantages provided by the government. On the contrary, temporary migrants are

generally non-qualified workers. Most of them present themselves in the urban informal labor market and take up hard manual jobs. Generally speaking, they just occupy inferior posts, which are refused by citizens. Thirdly, permanent migration is generally a definitive movement. Permanent migrants do not have many links with their original place. On the contrary, temporary migrants are closely linked with their departure places and often keep their plots of land for the sake of security. In certain circumstances, it is possible that they return to the countryside and resume their former professions. In fact, temporary migrants include some seasonal migrants.

The objective of this paper, as said above, is to analyze the impact of income gap on migration behavior from countryside to cities. Here, we are interested in temporary migration, whose decision is made by the migrant himself or herself (or his or her own family) and depends essentially on the labor market situation. In the following analysis, we restrict our sample to a sub-sample including only the temporary rural to urban migrants and the interviewees in the countryside. Because our survey was executed in *Hubei*, we can only study the urban and rural labor markets in this province. So, the migrants who come from the other provinces are removed from the sample. In addition, among the temporary migrants, some of them have already settled down in cities for a rather long time. Though they keep their agricultural registration, their living and employment styles almost match those of the urban inhabitants. In consequence, we remove the migrants who have migrated to cities for more than five years from our sample. In other words, we only keep the migrants who migrated to the destination cities or towns after 1988. We consider all those who stay in the countryside, including the rural to rural migrants, as the reference group, and we define them as non-migrants. Thereafter, there are 1353 individuals in our sub-sample, including 384 rural to urban migrants and 969 non-migrants.

### *Variables*

Many researchers have shown that migration is strongly selective according to the sex: men and women face different labor market situations (Agesa & Agesa, 1999; Yang, 1999). So, we estimate two separated models for each sex.

We have two types of equations: income equation and selection equation. In income equation, the dependent variable is the natural logarithm of monthly income, measured by *yuan* (the Chinese currency). In the questionnaire, the corresponding question was "what is your average monthly income". As to the interviewees who depend mainly on their permanent or temporary wage, in case of the difficulties in measuring the monthly income due to the

instability of their job or their wage, their monthly income would be calculated from their income of last month or last months. As to the farmers, their monthly income was composed of two parts, one was calculated from their income of household exploitation in the last year (1992), weighted by their participation time in productive activities, and the other was their individual remuneration, such as wage from rural enterprises. In any case, the income is reported by interviewees themselves.<sup>4</sup>

We introduce the following into the income equation as independent variables: age, square age, education level and per capita GDP (in 1990) of the actual residency place (district in the cities, town or township in the counties).

When it comes to the selection equation, the dependent variable is binary: it takes the value of 1 when the individual has migrated and the value of 0 if the individual stays in countryside. The independent variables of the selection equation include: age, education level, marriage status before migration,<sup>5</sup> family size, the number of brothers and sisters (a proxy of the clan size), the eldest status, the size of cultivable land of the household and the per capita GDP (in 1991) of the actual residency place. Table 1 shows the average values of individual and household characteristics of migrants and non-migrants according to their sexes.

Table 1  
Average values of individual and household characteristics of migrants and non-migrants

	Males		Females	
	Migrants	Non-migrants	Migrants	Non-migrants
Age	29.8	37.1	28.8	34.0
Years of schooling	7.2	6.0	6.5	5.0
Education level (%) <sup>a</sup>				
Illiterate or semiliterate <sup>b</sup>	8.4	18.6	17.3	31.0
Primary school <sup>b</sup>	19.1	32.9	23.9	30.5
Junior secondary school <sup>b</sup>	48.5	32.9	45.0	25.9
Senior secondary school <sup>b</sup>	24.0	15.6	13.8	12.6
Number of brothers and sisters	4.5	4.4	4.5	4.9
Eldest status (%)	30.4	32.2	25.6	27.4
Married (%)				
Before migration <sup>b</sup>	37.3	-	40.5	-
Actual <sup>b</sup>	67.2	88.2	64.6	87.1
Monthly income ( <i>yuan</i> )	255	147	187	105
Cultivable land size of the household ( <i>mu</i> ) <sup>c</sup>	3.1	4.5	3.1	4.3

<sup>4</sup> The individual income is a question which is difficult to control in the survey. Most of the interviewees reported their income with a vigilant and reserved attitude. Even in the cases where interviewees are cooperative, the income is always difficult to precisely measure because of its instability, its diversification and its complexity. In general, we have no alternative but to take the answer of interviewee.

<sup>5</sup> In case that migration and marriage took place in the same year, we suppose that migrants were married before migration if the reason of migration is not marriage, while single if it is.

Number of observations	198	512	186	457
------------------------	-----	-----	-----	-----

Note : a –The four categories of education level above are classified according to the year of schooling: 0-3 years, 4-6 years, 7-9 years and 10 years or above.

b – Dummy variable.

c – One *mu* is equal to 1/15 hectare.

From Table 1, we find that, migrants are younger than non-migrants; migrants are better educated than non-migrants and men are better educated than women. Among the male migrants, the average number of schooling years is 7.2, which is equal to the junior secondary school level. The income of migrants is higher than that of non-migrants, with the former surpasses the latter by 70%. The men's income is higher than the women's.

## Empirical results

In this section, we will analyze the determinants of migrants' income and the effects of income gap on migration decision, and then we will study the sources of this gap.

### *Determinants of the migration decision*

We firstly estimate a reduced form probit equation, which includes the independent variables of the migration decision function and those of the income function (see Regression 5 and Regression 6 in Table 4). Then, we estimate respectively the urban income equation and the rural income equation, introducing the inverse Mills ratios which come from the reduced form probit equation to correct the sample selection bias.

Table 2 shows the estimation results. Regression 1 shows the results of the male migrants. The relation between income and age is an inverted U-shape: at the beginning, income increases with the increase of age; when age reaches its optimal level, income reaches its maximum; then as age continues to increase, income decreases. This result corresponds to the results of other researches (Agesa & Agesa, 1999; Li, 1997). On the one hand, age reflects the accumulation of human capital, which includes the setting up of personnel connections and the accumulation of experience (Li, 1997: 1012,1020). So, the increase of age favors the increase of income. On the other hand, most of the rural to urban temporary migrants are non-qualified workers, they can only find hard manual jobs. So, evidently, old workers have some disadvantages. Education plays an important role in individual income determination. The results confirm the positive effects of formal instruction: as the education level increases, the effect on income increases, represented by an increase in the value of the coefficient when

education level is higher. Finally, we find that per capita GDP of the destination place, which is a proxy of the regional development level, has positive effect on the migrants' income. For women, Regression 3 shows that the age does not significantly influence the income level of female migrants. Only the senior secondary school level has a positive and significant effect on migrants' income.

Table 2  
Logarithmic income equation adjusting for sample selectivity

Dependent variable: Logarithmic income

	Males		Females	
	Migrants	Non-migrants	Migrants	Non-migrants
	Regression 1	Regression 2	Regression 3	Regression 4
Age	0.039* (1.92)	0.041*** (2.73)	...	0.069*** (4.17)
Age <sup>2</sup> (/100)	-0.047* (-1.77)	-0.051*** (-2.91)	-0.015 (-0.40)	-0.081*** (-4.27)
Education level				
Primary school	0.056 (0.30)	0.325*** (2.88)	-0.415* (-1.91)	0.088 (0.87)
Junior secondary school	0.379** (2.08)	0.720*** (5.67)	0.207 (1.02)	0.349*** (3.01)
Senior secondary school	0.630*** (3.26)	1.052*** (7.54)	0.381* (1.78)	0.644*** (4.64)
Per capita GDP of actual residency (/100)	0.036*** (5.23)	0.091*** (10.80)	0.007 (0.84)	0.095*** (11.36)
Inverse Mills Ratio	0.053 (0.56)	-0.338* (-2.33)	-0.015 (-0.13)	0.030 (0.23)
Constant	3.577*** (8.65)	2.418*** (7.22)	4.931*** (8.74)	1.750*** (4.67)
$R^2$	0.263	0.344	0.156	0.300
Number of observations	198	512	186	457

Note: The t-students are presented in parentheses.

"..." indicate that the absolute value is less than 0.001.

\*\*\* indicates coefficient significant at 1% level; \*\* indicates coefficient significant at 5% level;

\* indicates coefficient significant at 10% level.

In order to quantify the marginal effects of the independent variables, we calculate the arithmetic average of the total individual effects for each variable, using formula (6). Table 3 shows the results. The introduction of the variable "square age" demonstrates that income

reaches its maximum when age is 41-42. The effect of education level on income is greater for non-migrants than for migrants, which implies that human capital return is higher in rural areas than in urban areas. One possible explication is that most of rural to urban migrants held inferior posts and work as manual workers, it reduces the effect of education level. On the contrary, for farmers, "a higher education level favors the acquiring and the usage of certain modern factors" (Schultz, 1964: 176), so it is more probable for them to participate in non-agricultural activities, which may significantly increase their income. However, this conclusion is valid only in the case of the comparison between rural to urban temporary migrants and those who stay in rural areas.

Table 3  
Total effect of the explanatory variables of income function  
(Arithmetic average of the total individual effects)

	Males		Females	
	Migrants	Non-migrants	Migrants	Non-migrants
Age	0.037 <sup>#</sup>	0.042 <sup>#</sup>	0.002	0.069 <sup>#</sup>
Age <sup>2</sup> (/100)	-0.045 <sup>#</sup>	-0.051 <sup>#</sup>	-0.018	-0.082 <sup>#</sup>
Education level				
Primary school	0.054	0.325 <sup>#</sup>	-0.419 <sup>#</sup>	0.088
Junior secondary school	0.355 <sup>#</sup>	0.722 <sup>#</sup>	0.207	0.349 <sup>#</sup>
Senior secondary school	0.599 <sup>#</sup>	1.054 <sup>#</sup>	0.385 <sup>#</sup>	0.644 <sup>#</sup>
Per capita GDP of actual residency (/100)	0.026 <sup>#</sup>	0.091 <sup>#</sup>	0.009 <sup>#</sup>	0.096 <sup>#</sup>

Note : # indicates that the direct effect of this variable is significant at least at 10% level in Table 2.

From the income equations, we can predict urban and rural incomes, so we can predict the income gap for a given individual. It enables us to study the impact of this gap on migration decision by the structural probit equation estimation. The last two columns of Table 4 (Regression 7 and Regression 8) show the estimation results.

From Table 4, we find that, for women, the relations between age and migration probability are inverted U-shapes; for men, the effect of age is not significant. Education level plays a positive role in migration decision only for men, but not for women. It seems that migration decision of male migrants is determined by their education level; but that of female migrants depends essentially on their age. The per capita GDP of the actual residency place constitutes an attraction force for the migrants. On the contrary, lack of land acts as a repulsion force from the original place. Once married, the migration probability is strongly reduced: the setting up of a family and the birth of children mark the start of a more stable

live, which increases migration cost. Finally, our results confirm the important role of income gap in migration decision for two sexes: the larger is this gap, the stronger is the migration propensity.

Table 4  
Probability of migration  
Dependent variable: Migrant=1, Non-migrant=0

	Reduced form equation		Structural equation	
	Males	Females	Males	Females
	Regression 5	Regression 6	Regression 7	Regression 8
Age	0.033 (1.00)	0.122*** (3.30)	0.025 (0.74)	0.417*** (2.57)
Age <sup>2</sup> (/100)	-0.029 (-0.75)	-0.138*** (-3.08)	-0.030 (-0.78)	-0.434*** (-2.67)
Education level				
Primary school	0.035 (0.13)	-0.227 (-1.07)	0.784 (1.64)	1.510 (1.34)
Junior secondary school	0.393 (1.36)	0.028 (0.13)	1.249** (2.33)	0.311 (0.73)
Senior secondary school	0.515* (1.70)	0.200 (0.83)	1.569** (2.48)	0.304 (0.45)
Per capita GDP of actual residency (/100)	0.151*** (9.95)	0.116*** (8.50)	0.249*** (4.49)	0.478** (2.42)
Land size of the household	-0.161*** (-7.07)	-0.116*** (-7.14)	-0.103*** (-2.82)	-0.077*** (-3.81)
Married	-1.907*** (-9.95)	-2.024*** (-10.47)	-1.198*** (-2.97)	-2.120*** (-7.66)
Household size	0.070 (1.21)	0.091* (1.72)	0.041 (0.68)	0.045 (0.62)
Number of brothers and sisters	0.070 (0.78)	-0.046 (-0.57)	0.047 (0.51)	-0.034 (-0.84)
Eldest status	0.118 (0.76)	0.069 (0.46)	0.110 (0.71)	0.188 (0.93)
Income gap ( $\log \hat{W}_{ui} - \log \hat{W}_{ri}$ )			2.849* (1.92)	3.896* (1.79)
Constant	-2.277*** (-3.34)	-2.795*** (-3.72)	-5.630*** (-2.95)	-15.967** (-2.28)
Log-likelihood	-223.567	-252.794	-221.637	-251.105
Percentage of correction predictions (%)	85.4	82.0	85.8	92.2
Number of observations	717	654	717	654

Note: The t-students are presented in parentheses.

\*\*\* indicates coefficient significant at 1% level; \*\* indicates coefficient significant at 5% level;

\* indicates coefficient significant at 10% level.

*Income gap decomposition*

Having estimated urban and rural income, we can calculate the geometric average value of the urban income and that of the rural income respectively. Then we can deduce the ratio of urban to rural income and investigate in the decomposition of income gap. Agesa and Agesa (1999) use this technique to analyze the income gap between migrants and non-migrants. They find that urban to rural wage gap is larger for men than for women, and more importantly, the gain in returns to productivity-enhancing attributes is larger for men than for women. The two above findings explain the fact that men have a higher incentive to migrate to urban areas (in greater number than women) due to their larger gains in returns to migration.

Table 5 shows our results: the geometric average of urban income and rural income are respectively 207 *yuans* and 104 *yuans* for men, 154 *yuans* and 77 *yuans* for women. So the ratio of urban to rural income is 1.99 for two sexes. It suggests that the urban to rural wage gap is the same for men and for women. However, the correction of the selectivity bias changes the story: the ratio becomes 1.78 for men and 2.02 for women. It is thus contrast to the conclusion of Agesa and Agesa (1999: 52). Our results suggest that urban to rural income gap is larger for women than for men. In other words, women, compared to men, will have greater profit to migrate. So the migration propensity will be higher for women than for men, which explains that there is no sensible difference between the ratio of male migration and that of female in our case.

When it comes to the decomposition of income gap, we find that there is a great divergence between two sexes. For men, the contribution of the difference in attributes (39.3%) is more important than that of the difference in returns to attributes (27.6%). It implies that 1) a male farmer will earn a higher income in cities than in countryside; 2) if he has some better individual attributes, he can get a higher income. For women, the principal component is the portion due to differences in returns to attributes. This can be explained, in part, by the fact that some women in rural areas participate only partially in productive activities and care rather for household work, which lower, to some extent, their income. On the contrary, in cities, job participation of women rate is as high as that of men, because the income of only one person in a family is generally not enough to support all the family. The monetary returns to attributes are higher in cities than in countryside. What's more, women have further advantages in some informal sectors (Todaro, 1997: 270, 276), so that the

possibility that they can find a job is higher than men, no matter whether they have some individual attributes or not. This divergence between men and women gives an explication to the results that we obtained above. Since the difference of attributes plays an important role in determining the income gap of men, their education level significantly favors their migration probability and thus their income in cities. In contrast, for women, it is the discrimination between urban and rural income that dominates, which relatively reduces the effect of education on their mobility.

Table 5  
Income gap decomposition

	Males	Females
Before correction for sample selection bias		
Geometric mean of urban income, $\tilde{W}_u = e^{\hat{b}_u \bar{X}_u + \hat{g}_u \bar{I}_u}$ (yuan)	207	154
Geometric mean of rural income, $\tilde{W}_r = e^{\hat{b}_r \bar{X}_r + \hat{g}_r \bar{I}_r}$ (yuan)	104	77
Relative income, $R = \frac{\tilde{W}_u}{\tilde{W}_r}$	1.99	1.99
Contribution of the various components of income gap (%)		
Difference in attributes, $P_X = e^{(\bar{X}_u - \bar{X}_r) \hat{b}_u} - 1$	39.3	22.1
Difference in returns to attributes, $P_b = e^{\bar{X}_r (\hat{b}_u - \hat{b}_r)} - 1$	27.6	65.2
Sample selection bias, $P_I = e^{\hat{g}_u \bar{I}_u - \hat{g}_r \bar{I}_r} - 1$	12.0	-1.3
After correction for sample selection bias		
Geometric mean of urban income, $\frac{\tilde{W}_u}{e^{\hat{g}_u \bar{I}_u}}$ (yuan)	201	155
Geometric mean of rural income, $\frac{\tilde{W}_r}{e^{\hat{g}_r \bar{I}_r}}$ (yuan)	113	77
Relative income, $R' = \frac{\tilde{W}_u}{\tilde{W}_r (1 + P_I)}$	1.78	2.02

## Conclusions

This paper provides some economic explanations for the actual rural to urban migration decision in China. Our results confirm the important role of the urban to rural income gap in the migration decision. During a long period, the surplus agricultural labor was artificially kept in rural areas and the disequilibrium of agricultural labor and cultivable land aggravated. In consequence, the rural income stagnated at a low level and the urban to rural income gap remained large. It is difficult to change this situation radically in the short run, provided the large rural population size and the limited urban absorption capacity. The urban to rural income gap will thus play a dominant role in the migration motivation of farmers for a long time.

As to the determinants of migrants' income, we find that there exists an inverted U-shape relation between the labor's age and his or her income level. The higher education level significantly favors income. Moreover, the results show that the influence of education level (or human capital) on income is stronger for non-migrants than for migrants. It implies that it is important to invest in human capital in rural areas to increase the productivity. Schultz (1964: 176) pointed out: human capital is a major source of economic growth in agriculture.

According to our results, the urban to rural income gap is larger for women than for men. This finding is consistent with the fact that women have an important incentive to migrate to urban areas due to their larger gains in return to migration. In the decomposition of income gap, for men, the individual characteristics play a more important role than the gain in returns to attributes. In others words, their income level seems to be a function of their individual human capital endowments rather than that of their movement between the labor markets. For women, their income gap is mainly determined by the differences in returns to attributes.

However, this paper only studied the impact of income gap on migration decision. As suggested by Stark (1991), some other factors, such as "diversification of risk" and "deprivation", may also play important roles in migration decision. We can also study the migration behavior from the household aspect. In addition, as the rural non-agricultural sector plays an important role in rural income, it may be considered as an alternative solution to the problem of agricultural labor surplus in China. The impact of the participation in non-agricultural activities on rural household income will be an interesting subject of future studies.

## References

- Agesa, J. & Agesa, R.U. (1999). Gender Differences in the Incidence of Rural to Urban Migration: Evidence from Kenya, *The Journal of Development Studies* 35(6), 36-58.
- Aubert, C., (1995). Exode rural, exode agricole en Chine, la grande mutation?, *Espace Populations Société* 1995-2, 231-245.
- Byrd, W. & Lin, Q. (1994). *China's Rural Industry: Structure, Development, and Reform*, Oxford: Oxford University Press.
- Chang, S. (1996). The Floating Population: An Informal Process of Urbanization in China, *International Journal of Population Geography* 1996-2, 197-214.
- Department of Comprehensive Statistics of National Bureau of Statistics of China (1999). *Comprehensive Statistical Data and Materials on 50 Years of New China*, Beijing: China Statistics Press.
- Fan, C.C. (1999). Migration in a Socialist Transitional Economy: Heterogeneity, Socioeconomic and Spatial Characteristics of Migrants in China and Guangdong, *International Migration Review* 33(4), 954-987.
- Goldstein, A. & Goldstein, S (1993). Determinants of permanent and temporary migration in Hubei province, PRC, *IUSSP Proceedings*.
- Greene, W.H. (1997). *Econometric Analysis*, New Jersey: Prentice-Hall International, Inc..
- Harris, J. & Todaro, M.P. (1970). Migration, Unemployment and Development: a Two-Sectors Analysis, *American Economic Review* 60(1), 126-142.
- Hashiya, H. (1996), Urbanization in the Republic of Korea and Taiwan : a NIEs pattern, *The Developing Economies XXXIV-4* (December 1996), 447-469.
- Heckman, J. (1979). Sample selection bias as a specification error, *Econometrica* 47, 153-161.
- Leila, F. (1999). Labor allocation of Chinese Rural Migrant Workers in Urban Areas: Job Election or Job Enforcement?, *Asian and Pacific Migration* 8(3), 329-340.
- Levy, M.B. & Wadycki, W.J. (1974). What is the opportunity cost of moving ? Reconsideration of the effects of distance on migration, *Economic Development and Cultural Change* 22(2), 198-214.
- Lewis, W.A. (1954). Economic Development with Unlimited Supply of Labour, *The Manchester School of Economic and Social Studies* 22(2), 139-191.
- Li, S. (1997). Population Migration, Regional Economic Growth and Income Determination: A Comparative Study of Dongguan and Meizhou, China, *Urban Studies* 34(7), 999-1026.
- Lucas, R.E.B. (1988). Migration from Botswana, *Economic Journal* 95, 358-382.
- Ma, Z. (1999). Temporary migration and regional development in China, *Environment and Planning A* 1999 31, 783-802.
- Ma, Z, Liaw, K-L & Zeng, Y (1997). Migrations in the urban-rural hierarchy of China : insights from the microdata of the 1987 National Survey, *Environment and Planning A* 1997 29, 707-730.
- Nakosteen, R.A. & Zimmer, M.A. (1980). Migration and Income: The Question of Self-Selection, *Southern Economic Journal* 46, 840-851.
- National Statistics Bureau of China (2000). *China Statistical Yearbook*, Beijing: China Statistics Press.
- Oaxaca, R. (1973). Male-female wage differentials in urban labor markets, *International Economic Review* 14(3), 693-709.
- Oaxaca, R. & Ransom M.R. (1994). On discrimination and the decomposition of wage differentials, *Journal of Econometrics* 61, 5-21.

- Perloff, J. M. (1991). The Impact of Wage Differentials on Choosing to Work in Agriculture, *American Journal of Agricultural Economics* 73(3), 671-80.
- Reimers, C. W. (1983). Labour Market Discrimination Against Hispanic and Black Men, *Review of Economics and Statistics* 65(4), 570-79.
- Rizwanul, I. & Jin, H. (1994). Rural Industrialization: An Engine of Prosperity in Postreforme Rural China, *World Development* 22(11), 1643-1662.
- Schultz, T.W. (1964). *Transforming Traditional Agriculture*, New Haven and London: Yale University Press.
- Stark, O. (1991). *The Migration of Labor*, Oxford: Basil Blackwell Inc..
- Taylor, J.E. (1987). Undocumented Mexico-U.S. Migration and the Returns to Households in Rural Mexico, *American Journal of Agricultural Economics* 69(3), 626-638.
- Todaro, M.P. (1969). A Model of Labour Migration and Urban Unemployment in Less Developed Countries, *American Economic Review* 59(1), 138-148.
- Todaro, M.P. (1976). Internal migration in development countries: A review of theory, evidence, methodology and research priority, Geneva: BIT.
- Todaro, M.P. (1997). *Economic Development*, London: Longman.
- Wang, F. & Zuo, X. (1999). Inside China's Cities: Institutional Barriers and Opportunities for Urban Migrants, *American Economic Review* 89(2), 276-280.
- Wu, H.X. & Zhou L. (1997). Rural-to-Urban Migration in China, *Asian-Pacific Economic Literature* 10(2), 54-67.
- Yang, X. (1999). Gender Differences in Determinants of Temporary Labor Migration in China: A Multilevel Analysis, *International Migration Review* 33(4), 929-953.
- Zhao, Y. (1999). Labor Migration and Earnings Differences: The Case of Rural China, *Economic Development and Cultural Change* 47(4), 767-782.
- Zhu, J. (1998). *Rural to urban labor transfer in the labor market of threes dimensions of China*, PhD thesis, Tianjin: Nankai University.