

Impacts of migration on rural poverty and inequality: a case study in China

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Abstract: Large numbers of agricultural labor moved from the countryside to cities after the economic reforms in China. Migration and remittances play an important role in transforming the structure of rural household income. This paper examines the impact of rural-to-urban migration on rural poverty and inequality in the case of *Hubei* province using the data of a 2002 household survey. Since remittances are a potential substitute of farm income, we present counterfactual scenarios of what rural income, poverty, and inequality would have been in the absence of migration. Our results show that, by providing alternatives to households with lower marginal labor productivity in agriculture, migration leads to an increase in rural income. In contrast to many studies that suggest the increasing share of non-farm income in total income widens inequality, this paper offers support for the hypothesis that migration tends to have egalitarian effects on rural income for three reasons: (i) migration is rational self-selection – farmers with higher agricultural productivities choose to remain in local agricultural production while those with higher expected return in urban non-farm sectors migrate; (ii) poorer households facing binding constraints of land shortage are more likely to migrate; (iii) the poorest poor benefit disproportionately from remittances.

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The findings, interpretations and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the view of the institutions they represent.

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1 Introduction

Rural-to-urban migration and non-farm income play an increasingly important role in sustainable development and poverty reduction in rural areas (FAO, 1998; OECD, 2005; The World Bank, 2007). It can be considered as an important way to increase overall rural economic activity and employment. In many developing countries, non-farm activity often accounts for as much as 50% of rural employment and a similar percentage share of household income (Lanjouw, 1999a). Average non-farm income share of the total is about 42% in Africa, 40% in Latin America and 32% in Asia (The World Bank, 2000). In China, the rural-to-urban migration and the development of the rural non-farm sector strongly modified rural household income structure. Non-farm activities gradually became an important source for rural household incomes. In 2004, the share of non-farm income reached 46% of the total rural income (National Statistics Bureau of China 2005).

Shortage of arable land is a binding constraint of agricultural productivity in China. Per capita farm income has always been low due to the limited marginal labor productivity. Conflicts between shortage of land and surplus of labor are more serious in poor areas. Peasants have a strong incentive to leave land for better job opportunities. The economic reforms, in particular the implementation of the Household Responsibility System (HRS), in the late 1970s not only stimulated the incentive of the farmers and contributed to the sharp increase of the agricultural productivities, but also legitimized the rural redundant labor to leave land (*litu*) and countryside (*lixiang*). Since then, rural non-farm sectors and urban sectors have played an increasingly important role in absorbing surplus agricultural labor, enhancing rural income and reducing rural poverty. In only 21 years (1980 - 2001), the incidence of rural poverty fell from 76% to 13%, and rural income Gini increased from 0.25 to 0.37.¹ Whether the decline in poverty was principally due to farm income growth or due to non-farm income growth, and whether the rising share of non-farm income in total rural household income was the leading cause of the sharp increase in rural inequality, have been key issues of debate.

Some studies suggest that the rise in rural inequality in China since the beginning of the economic reforms has been largely due to the increasing share of non-farm income in total income for the following reasons: (i) distribution of non-farm income is more unequal than that of farm income; (ii) richer households have higher chances to participate in migration and

¹ See Ravallion and Chen (2004); Ravallion (2003).

local non-farm activities; and (iii) households with higher income are characterized by a higher participation rate in non-farm activities and a higher share of non-farm income in total income.²

Using data from a survey of rural households in *Hubei* province, we examine impacts of rural-to-urban migration on rural poverty and inequality. Taking into account of household non-observable characteristics, we consider remittances as a “potential substitute” for household earnings, and simulate the counterfactual of how rural household incomes, rural poverty and rural inequality would have been in the absence of migration for rural households. Our results show that: (i) migration is selective across households, the best farmers remained in local agricultural production; (ii) remittance largely increases rural household income and reduces poverty; (iii) remittance also reduces rural inequality as it disproportionately benefits the poorest households.

This paper is structured as follows. Section 2 studies economic reforms and rural labor mobility in China from a historical perspective. Section 3 reviews the literature on migration and income distribution. Section 4 presents the empirical analysis. Section 5 describes the data. Section 6 specifies the participation and income equations. Section 7 presents the results, and section 8 concludes.

2 Economic reforms and rural labor mobility

Economic autarky and traditional agriculture have been characterizing the Chinese countryside for a long time. Following the model of the former USSR, China gave priority to the development of heavy industry at an early stage of industrialization. Farmers were heavily taxed; a large amount of agricultural surplus was transferred to industrial investments. The real income of farmers was hence artificially lowered due to the socialist price system, which over-priced manufactured products to raise profitability in industry while squeezed agriculture through the “price scissors” (Naughton, 1999).³ Before the reforms, in order to stabilize agricultural production, farmers were tied to the land in two ways: (i) through rural collectivization and (ii) through the civil status system called “*hukou*”.⁴ Rural collectivization tightened the links between farmers’ income and their daily work-participation in collective

² See, for example, Bhalla (1990), Hussain et al. (1994), Knight and Song (1993), Liu (2006), Wan (2004), Wan and Zhou (2005), Yao (1999) and Zhu (1991).

³ See also Carr and Davies (1971).

⁴ See Davin (1999).

agriculture: a farmer earned “working-points” proportionately to the time spent on the collective land.⁵ The civil status system consisted in codifying the supply of consumption goods and the access to jobs. Without acquiring the urban civil status, rural-to-urban migrants could not settle on a permanent basis outside their place of origin. Before the reforms, these two rules divided Chinese society into two sharply contrasted segments: urban areas with a lower incidence of poverty and rural areas with high poverty.

The economic reforms that began in the late 1970s brought huge changes to rural areas. First, the collapse of the system of “People’s Communes”, as well as implementation and generalization of the Household Responsibility System (HRS),⁶ gave greater freedom to farmers: they could freely allocate their time and choose their income strategies and productive activities. By simply de-collectivizing production and allowing farmers to sell their surplus produce on the market, rural per capita income about tripled in 1978-1984 (Zhang and Wan, 2006). Second, the agricultural reforms strongly increased agricultural production and the supply of grains in markets, which enabled people living in urban areas without the urban civil status to purchase food in free markets. It finally led to abandoning the rationing system. Since 1984, the market for food became gradually more open and housing in cities became marketable. These two factors enabled farmers to enter cities and stay there permanently, without changing their civil status. Third, with the development of various non-state enterprises, the urban labor market was gradually established, making it possible for rural-to-urban migrants to seek jobs and to earn their living in cities. In addition, the development of urban infrastructure required extra labor for construction and the diversification of consumption resulting from the improvement of living standards created niches for a multiplicity of thriving small businesses. All these factors contributed to an increase in the demand for labor in urban areas, which resulted in a vast movement of agricultural labor from rural areas to cities (Aubert, 1995; Banister and Taylor, 1990).

Although the fragmentation of rural-urban labor market has been much improved after the economic reforms, the misallocation of labour resources still leads to a significant economic welfare loss. A recent study of The World Bank estimates the large potential gains from a greater labor market integration – using 2001 as a baseline, with a mere 1% labor relocation from rural areas to urban areas, the overall economy will gain by 0.5%. If the share of labor outflow reaches to 5% and 10%, the GDP will grow by 2.5% and 5%, respectively (The

⁵ See McMillan et al. (1989).

⁶ See de Beer and Rocca (1997); Zhu and Jiang (1993).

World Bank, 2005).

Rural-to-urban migration deeply transformed the structure of household incomes in rural China. Remittances gradually became an importance source of income for rural households and served as an engine of growth for rural areas (de Braud and Giles, 2008). Rural-to-urban migration influences the rural economy through various channels. First, migration reduces the pressure on the demand for land in poor rural areas and contributes to breaking up the vicious cycle of “poverty – extensive cultivation – ecological deterioration – poverty”. Second, remittances from migrants significantly increase total household incomes and hence enhance the investment capacity in local production. It can also mitigate income fluctuations and enable the adoption of some more profitable but “risky” agricultural technologies, which favor the transformation of traditional agriculture to modern agriculture (Bright et al. 2000; Islam 1997). Third, remittances and other non-farm income are often a source of savings, which is of importance in food security. Households that diversify their income source by sending their members to outside labor market are less vulnerable to negative shocks.

3 Migration and income distribution in sending communities

Rural-to-urban migration undoubtedly increases rural income level in sending areas (Straubhaar and Vadean, 2005). However, as to its impacts on income distribution, results are mixed: some studies show that remittance tends to equalize rural income (Ahlburg, 1996; Taylor, 1992; 1999; Taylor and Wyatt, 1996; de Brauw and Giles, 2008); some studies show that remittance increases income inequality (Adams, 1991; 1998; Rodriguez, 1998); while some studies shows that the dynamics of migration and income distribution might be non-linear (Jones, 1998; McKenzie, 2005; McKenzie and Rapoport, 2007; Stark et al., 1986; 1988). Impacts of non-farm income on rural income distribution are also unclear. Some studies show that the distribution of non-farm income is more unequal than that of farm income.⁷ As participation in non-farm activities is highly selective, non-farm income tends to increase income disparities, particularly in poorer areas. Some other studies, however, show that non-farm income can reduce inequality as it accrues disproportionately to poorer households, and its equalizing impact becomes more important as the proportion of non-farm

⁷ See the results obtained by Barham and Boucher (1998), Elbers and Lanjouw (2001), Escobal (2001), Khan and Riskin (2001), Leones and Feldman (1998), Reardon and Taylor (1996), and Shand (1987).

income in total income increases.⁸ Several factors, such as entry barriers for migration (or migration costs), initial household assets, changes of migration networks, difference in initial inequality, types of non-farm activities and empirical methods applied, may contribute to the different results (Docquier and Rapoport, 2003).

There is a rich literature on rural poverty and inequality in China based on different datasets. Most studies have shown that, since the beginning of the economic reforms, aggregate household income has significantly increased and inequality noticeably widened.⁹ According to the research by the Ministry of Agriculture of China, income gap has widened, with the Gini index 0.3-0.4 in 1980s and over 0.4 since 1996 (Rural Economic Research Center, Ministry of Agriculture of China, 2003). Some studies suggest that the process of diversification into non-agricultural activities in rural areas tends to increase disparities, unlike the agriculture-based growth in the early 1980s, which equalized allocation of land kept income gaps at bay (Wan, 2004; Zhang and Wan, 2006). Based on a county-level survey, Knight and Song (1993) find that the distribution of non-farm income is more unequal than that of farm income in the 1980s. Hussain et al. (1994), comparing the distribution of farm and non-farm incomes, concluded that the more unequal distribution of non-farm income is a key factor explaining the rise in inequality in household income at the early stage of the reforms. Their conclusion implies that, with the continuing transfer of rural workers to non-farm sectors, income inequality in rural areas will continue to worsen. These results are consistent with some other studies (Bhalla, 1990; Zhu, 1991; Yao, 1999). Some studies suggest that the sharp increase in inequality in rural household incomes should be mainly attributed to differences in skills, knowledge and capital endowments, which lead to disparities in chances to participate in and earn from non-farm activities.¹⁰ As marketization deepens, the resulting differences in capital accumulation and in know-how are expected to further increase inequality. In addition, regional differences in the growth of rural non-farm sectors are also among important reasons.

In our opinion, some existing research on income distribution in rural China has a certain limits. First, most of these studies correspond to meso-economic analyses using provincial or county level data. Income is usually measured as an average at the meso level,

⁸ See the results obtained by Adams (1994; 1999), Adams and He (1995), Chinn (1979), Lachaud (1999), and Stark et al. (1986).

⁹ See for example Chen and Wang (2001), Chotikapanich et al. (2007), Kanbur and Zhang (1999), Khan and Riskin (2001), Liu (2006) and Wade (2003).

¹⁰ See Burgess (1998), Ravallion and Chen (1999), Wagstaff (2005) and Zhou (1994).

such as regional GDP per capita or average income. However, farmers' income distribution should be examined at the micro-level, as difference in income distribution may be dominated difference in regional characteristics when using meso data. Second, quite a few surveys show that households with higher income are usually the ones who work in the non-farm sector or run a business. However, we cannot conclude that households with higher income are more likely to participate in non-farm activity and that development of non-farm sector will widen income gaps. Motivation and capability of participating in non-farm activities differ across households (Anderson and Leiserson, 1980). Poor and rich households may both be inclined to participate in non-farm activities because the former have a stronger motivation whereas the latter have greater capability. The relatively poor households usually choose to engage in non-farm activities characterized by a higher labor-capital ratio and a lower financial entry barrier. Therefore, compared with households with better farm production conditions, households with lower income caused may choose to participate in migration and operate non-farm activities, which tends to narrow the income gap and lead to a more equal income distribution. In addition, some empirical literature does not provide structural tests of the theoretical models, but only provides partial findings that can support or invalidate intuitions and in that sense support or invalidate the policy implications of the models (Lall et al. 2006).

In the literature, two methods are used to study the impacts of remittance on inequality. One considers remittances as an "*exogenous transfer*" (Adams, 1994; Pyatt et al., 1980; Stark, 1991), and the other considers remittances as a "*potential substitute*" for home earnings (Adams, 1989; Barham and Boucher, 1998). The first method provides a direct and simple measure of how remittances contribute to total income by decomposing total household income and studying the distribution of each income source and its contribution to total income inequality. As remittances are taken as an exogenous transfer, which adds to the pre-existing home earnings, they are treated independently from home earnings. In other words, for a given household, with a given level of home earnings, an increase in remittances raises total income by the same amount. This could be true if the migration participation was to compensate a short term shock, such as a bad harvest or drought/flood. But, more often than not, participation in migration is a long-term alternative choice of participation in farm activity for households – migrants would contribute to their families in other ways if they had not migrated. Hence, this method does not address the interdependence of migration and home production. The results are hence biased if there is substitutability between the participation in migration and home productive activities (Escobal, 2001; Kimhi, 1994).

The second method compares the observed income distribution with a counterfactual

scenario in the absence of migration and remittances by including an imputation for home earnings of erstwhile migrants. Taking into account the substitutability of migration and home productive activities, Adams (1989) estimates a function of household income determination for non-migrant households, and applies the coefficients and the endowment bundles of migrant households (in the absence of migration and remittances) to impute their earnings under a non-migration scenario to study the impacts of remittance on inequality. Barham and Boucher (1998) correct the selection bias and improve the income simulation model. Using a bi-variate probit model of double selection, Lachaud (1999) moves a step forward to simulate household income obtained in the absence of remittance and migration, and examines the impacts of private transfers on poverty.

In the following sections, we take into account interactions between the participation in various productive activities and analyze the impacts of migration on poverty and inequality using data from a rural household survey in *Hubei* province in China. We relax the assumption of the independence of migration and home production, and compare the observed household income distribution with a counterfactual income distribution in the absence of migration and remittances to identify the impacts of migration on inequality and poverty. Barham and Boucher (1998) imputed migrants' home earnings using an income equation estimated from the non-migrants'. Their results showed that the distribution of simulated income is more equal than that of observed income. However, their simulation was based on the conditional expected values, i.e. $\hat{y}_i = \hat{\beta}X_i$, and the effects of the error term, ε_i , on income distribution were not appropriately taken into account. This might lead to an artificially low estimate of income inequality among predicted incomes, because the variance of the conditional expected values is in general much lower than that of observed values, i.e. $y_i = \hat{y}_i + \varepsilon_i$. In this paper, we advance their method by taking into account the effect of unobserved terms, i.e. residual, in the simulation to examine the impacts of migration on poverty and inequality in sending regions.¹¹

4 Methodologies

The present work follows a three-step approach: first, we estimate household income equations from observed values; second, we use the income equations to simulate what household incomes would have been if the household didn't participate in migration; and third,

¹¹ See also de Janvry et al. (2005), Zhu (2002a; 2002b) and Zhu and Luo (2006).

we compare the income distribution of the simulated income – the household income without remittances but including the simulated/potential migrants’ home earnings – with that of the observed income – the total income with remittances.

To allow for the most flexible form of interaction between migration and home production, we separately consider two income regimes: households without migrants, regime 0; and households with migrants, regime 1. The observed income distribution is that non-migrant households are in regime 0 and migrant households in regime 1. We are interested in predicting the total income for each household i in regime 0, y_{0i} . For non-migrant households, this is the observed income, y_i ; for migrant households, this is the predicted income they would have earned if they were not participating in migration. To predict their income y_{0i} , we need to (i) estimate a model of household earnings under regime 0, and (ii) generate a counterfactual predicted income \hat{y}_{0i} for household i using the estimated conditional mean and variance of income.

As the migrant households may be systematically different from non-migrant households, and hence migrant households are not uniformly and randomly distributed among the population, estimation of the household earnings in regime 0 is done with a standard selection model:

$$P_i^* = \alpha Z_i + \varepsilon_i \quad P_i = 1 \Leftrightarrow P_i^* > 0; P_i = 0 \Leftrightarrow P_i^* \leq 0 \quad (1)$$

$$\log y_{0i} = \beta_0 X_i + \mu_{0i} \quad \text{observed for } P_i = 0$$

where P_i^* is a non-observed continuous latent variable; P_i is an observed binary variable, which is equal to 1 for migrant households and 0 for non-migrant households; Z_i and X_i are vectors of independent variables of participation and income equations; and $(\varepsilon_i, \mu_{0i})$ are unobserved terms following a bivariate normal distribution. This distributional assumption on the unobserved terms conditional on group participation, implies that,:

$$E(\log y_{0i} | P_i) = \beta_0 X_i + \gamma_0 \lambda_i,$$

$$\text{with } \lambda_i = E(\varepsilon_i | P_i) = \begin{cases} -\phi(\alpha Z_i) / (1 - \Phi(\alpha Z_i)) & P_i = 0 \\ \phi(\alpha Z_i) / \Phi(\alpha Z_i) & P_i = 1 \end{cases} \quad (2)$$

The Inverse Mills Ratio (IMR), λ_i , measures the expected value of the contribution of unobserved characteristics to the decision to participate in migration, conditional on the observed participation (Heckman, 1979).

We estimated the model with a two-step Heckman procedure. From the estimated probit

equation (1), we compute an estimated value $\hat{\lambda}_i$ for λ_i , by replacing α with its estimated value $\hat{\alpha}$ in equation (2). The log-income in regime 0 is then estimated on the group $P_i = 0$:

$$\log y_{0i} = \beta_0 X_i + \gamma_0 \hat{\lambda}_i + \mu_{0i} \quad \text{for } P_i = 0 \quad (3)$$

with $E(\mu_{0i}|P_i) = 0$, $\text{var}(\mu_{0i}|P_i) = \sigma_0^2$. For this sub-sample of observations, y_{0i} is household per capita income (equal to y_i , observed income).

Using estimated parameters, we can now predict individual log-income, $\log \hat{y}_{0i}$, for all households i . Equation (3) includes two terms: a conditional expected value, $E \log y_{0i} = \beta_0 X_i + \gamma_0 \hat{\lambda}_i$, which is based on the observable characteristics of the household, and an unobserved term μ_{0i} . A prediction of the conditional expected value of farm log-income in regime 0 is given by:

$$\hat{E} \log y_{0i} = \hat{\beta} X_i + \hat{\gamma}_0 \hat{\lambda}_i$$

Note that using only the conditional expected values for predicting incomes would underestimate the variance in income, and lead to an artificially low income inequality among predicted incomes compared to observed incomes. It's therefore necessary to generate a full distribution of income by generating unobserved terms for the migrant households. To do that, we construct a random value:

$$\hat{\mu}_{0i} = \hat{\sigma}_0 \Phi^{-1}(r)$$

where $\hat{\sigma}_0$ is the estimated standard error of for non-migrant households, r stands for a random number between 0 and 1, and Φ^{-1} is the inverse of the cumulative probability function of the standard normal distribution. For non-migrant households, we use the observed residual.

Combining these two terms gives a predicted log-income in regime 0 for all households:

$$\log \hat{y}_{0i} = \begin{cases} \log y_i = \hat{\beta}_0 X_i + \hat{\gamma}_0 \hat{\lambda}_i + \mu_{0i} & P_i = 0 \\ \hat{E} \log y_{0i} + \hat{\mu}_{0i} = \hat{\beta}_0 X_i + \hat{\gamma}_0 \hat{\lambda}_i + \hat{\mu}_{0i} & P_i = 1 \end{cases} \quad (4)$$

and the corresponding predicted income $\hat{y}_{0i} = \exp(\log \hat{y}_{0i})$ in regime 0.

Having simulated the income obtained if a household didn't participate in migration, we can study the effects of migration on rural poverty and inequality. First, we calculate, respectively, the Gini of the observed incomes $G(y_i)$ and that of the simulated incomes, $G(y_{0i})$. Standard errors and confidence intervals for the Gini index are obtained by bootstrapping the procedure over 100 replications. If $G(y_i)$ is inferior to $G(y_{0i})$, migration

reduces income inequality, and vice versa. Following the same idea, we study the impacts of migration on poverty, measured by the class of P_α indices (Foster et al., 1984).

Second, we borrow the ideas of Growth Incidence Curve (GIC) developed by Ravallion and Chen (2001) to examine changes in income distribution resulted from migration across population. GIC shows income growth rate of each segment of population, i.e. at each percentile of the distribution, during the period of study. By comparing income distribution in the presence of migration (observed income distribution), y , and income distribution in the absence of migration (counterfactual scenario of no migration and remittances), \hat{y}_0 , we can identify the changes in inequality resulted from differences in income growth of segments of population. The income growth rate of the p 'th quintile is:

$$g(p) = y(p)/\hat{y}_0(p) - 1$$

Letting p vary from zero to one, $g(p)$ traces out the GIC. For example, at the 50th percentile, the figure shows the growth rate of the median income. If $g(p)$ is a decreasing (increasing) function for all p then inequality falls (rises) in the presence of migration for all inequality measures, satisfying the Pigou-Dalton transfer principle. If the GIC lies above zero ($g(p) \geq 0$ for all p), there is first-order dominance of the distribution in the presence of migration, compared with the counterfactual scenario of no migration. If the GIC is above the zero axis at all points up to some percentile p^* , poverty has fallen for all headcount indices up to p^* (for all poverty lines up to the value that yields p^* as the headcount index) and for all poverty measures within a broad class. If the GIC switches sign, whether higher-order dominance holds cannot be determined by looking at the GIC alone.

5 Data

The data used in this study come from a Survey on the Resettlement of *Shiyan-Manchuan* Highway Project in *Hubei* province, collected in January 2003. The *Shiyan-Manchuan* Highway Project is financed by a World Bank loan (The World Bank, China: *Hubei Shiman* Highway Project).¹² The survey contained 1208 households with complete information. The

¹² *Hubei* province, situated in central China, had a population of over 59.9 million in 2002. Its economy is dominated by heavy industry, light industry, and agriculture. In terms of socio-economic development, *Hubei* is in the mid to upper range among Chinese provinces. The *Shiyan-Manchuan* Highway Project is financed by a World Bank loan. In China, if resettlement is required for a project with the World Bank funding, managed

surveyed households are located in 42 villages across 9 towns in 4 counties (districts) at the north-west mountainous areas in *Hubei* province. The households lie in the zone extending 60 meters far from the highway over 106 kilometers long transept. Location of the highway is more concerned with technical problems than with the socio-economic status of the households involved. For this reason, we can consider the 1208 households as a quasi random sample of those across the above counties (districts). As highway by rule cannot pass through any towns or cities, the villages concerned in our survey are exclusively rural. Information on family members, household assets, and household income was recorded in the survey in 2002, before construction of the highway.

The survey included only permanent households, which were registered on the residence registration booklet (*hukoubu*). Of each household, information on demographics of each member, household assets, geographical location, household income and consumption, and other necessary information concerning compensation and resettlement, were recorded. Household income, including monetary income and income in kind, refers to actual income earned from different sources, such as agriculture, forestry, livestock and fishery, industry, construction, transportation, services and other incomes.

The surveyed area is poor and remote, with low income and shortage of land – rural per capita income and per capita cultivable land are inferior to the average of provincial level. The problem of agricultural surplus labor is of long duration and peasants have a strong incentive to leave land for seeking non-farm employment. As migration plays an important role in the region, information was also recorded on whether any household member had ever been to the outside of the hometown (or township) in search of work during the past year (2002), on work place and occupation of the migrants, and on contribution of remittances to household income.¹³ This allows us to calculate the sum of remittances in 2002 for each household. Most of rural-to-urban migrants are temporary and seasonal. They remain closely linked with their places of departure. Among the 1208 households surveyed, 740 have migrants (called migrant households) while 468 do not (called non-migrant households).

resettlement is required to make sure that the living standard of people affected by the project will not be diminished. Hence, once a preliminary design has been made for the project, a census is conducted on all households, profit and non-profit institutions, public facilities, and physical items within the affected area. This survey, implemented under the supervision of a World Bank team, was done by the *Hubei* Provincial Communications Department and Wuhan University.

¹³ Here, household members refer to who normally live in the household, including those who are temporarily working elsewhere.

6 Equation specification and descriptive statistics

Impacts of migration and remittances on changes in poverty and inequality are conditioned on whether a household participates in migration, and on how migration changes household income. We model this by estimate participation equation and income equation jointly.

Two major categories of factors determine a household's decision to migration (FAO, 1998): first, factors that affect the relative returns and risks of local production; second, factors that determine the capacity to participate in migration, such as education, access to credit. These two sets of factors are determined by the household's endowment in physical and human capital and by the environment where it is located. In participation equation, we introduce the following independent variables at the household level (i-vi) and the village level (vii-xi):

(i) The number of workers in the household. We define here workers as employed household members 15 years old or over.¹⁴

(ii) Average number of years of schooling of household members 15 years old or over. Education level is accordingly classified into four categories: 0-4 years, 4-8 years, 8-10 years, and 10 years or above. Many studies show that the improvement of human capital has an important positive effect on migration and productivity, and that households with higher education level engage more in migration.

(iii) Number of dependents six years old or over of the household. Some studies, for example Zhao (1999), show that dependents play the role of safeguarding the household's right to land by supplying a minimum amount of farm labor, and hence facilitating the exit of labor; while some studies, for example Zhu and Luo (2006), show that households with more dependants are less likely to send their members to migrate because of the need to take care of the dependants. We introduce here the number of dependents, including household members who are not currently employed.

(iv) Number of children 5 years old or under of the household. We suppose that this variable could have an influence on household's decision to migration.

(v) The household's land area. We use this variable to examine the effects of land shortage on migration participation.

(vi) Distance. We introduce three types of distance: first, distance to the nearest bus station;

¹⁴ Under the HRS, the limited cultivable land was divided into small plots among rural households. In general, no households need to hire extra labor.

second, distance to the county's capital city; and third, distance to the nearest rural fair. We use these three types of distance to measure convenience to access to transport network, cost of participation in migration, and accessibility to information and markets, respectively. In rural China, a county's capital city is typically the local political, economic, and cultural center, and is also the place where non-farm industries and markets are located. For this reason, distance to the capital has important impacts on participation in non-farm activities. Distance to the nearest bus station is used as a proxy for transportation, reflecting the cost of the short-distance trip or long-distance migration.

(vii) Per capital production of the village. This variable can be used as a proxy of local development level and living standard.

(viii) Percentage of non-farm production of the village. In terms of labor professional and/or spatial mobility, local rural non-farm activities RNF can to some extent complement or substitute farm activities.

(ix) Per capita cultivable land surface of the village. As mentioned earlier, the shortage of land is a crucial factor that motivates farmers to quit agricultural production. We expect that it has negative effects on participation in migration.

(x) Percentage of paddy field of the village. Considering that rice is in reality the main grain in the *Hubei* Province, we take this variable as a proxy of land quality or conditions of agricultural production.

(xi) Percentage of vegetable field of the village. The return from vegetable production is usually higher than that from grain production. In suburbs of cities or towns, many households specialize in vegetable and other non-grain production to take advantage of the geographic proximity to urban agricultural fair. We here adopt this variable to represent the level of specialized commercial farming.

In income equation, we introduce the following independent variables: number of workers, education level of the household, land area, number of dependents 6 years old or over, percentage of paddy field of the village, and percentage of vegetable field of the village.

Table 1 presents descriptive statistics for the survey samples. Average household income was 12867 *yuan* in 2002. Income of migrant households (14360 *yuan*) is higher than that of non-migrant households (10506 *yuan*). For migrant households, remittances are a major source of household income, which accounts for 55 percent of total income. Migrant households in average have better human resource endowment. The average number of workers per household is higher in migrant households (3.09) than in non-migrant households (2.45); and the average number of years of schooling of household members aged 15 years

and above of the former (7.31) is also higher than that of the latter (6.56). However, non-migrant households tend to have richer land resources. They have significantly more cultivable land surface than migrant households both in aggregate terms and in per worker terms. As to location, migrant households are in general closer to bus stations, county capital, and markets.

Table 1 - Descriptive statistics

| | All households | Non-migrant households | Migrant households | Difference | |
|--|----------------|------------------------|--------------------|------------|----------|
| Total income (<i>yuan</i>) | 12867 | 10506 | 14360 | -3854 *** | (-5.18) |
| Home income (<i>yuan</i>) | 8017 | 10506 | 6443 | 4063 *** | (6.39) |
| Remittances (<i>yuan</i>) | 4850 | | 7917 | -7917 *** | (-24.75) |
| Per capita income (<i>yuan</i>) | 3111 | 2810 | 3301 | -492 ** | (-2.32) |
| Number of workers | 2.84 | 2.45 | 3.09 | -0.64 *** | (-8.59) |
| Average number of years of education | 7.02 | 6.56 | 7.31 | -0.75 *** | (-4.92) |
| Number of dependents | 1.31 | 1.42 | 1.24 | 0.19 *** | (2.82) |
| Number of children | 0.14 | 0.10 | 0.17 | -0.07 *** | (-3.02) |
| Land area (<i>mu</i>) | 7.10 | 7.85 | 6.63 | 1.22 *** | (2.58) |
| Per capita land area (<i>mu</i>) | 2.83 | 3.50 | 2.42 | 1.09 *** | (5.28) |
| Distance from household's residence to the nearest bus station (km) | 5.37 | 7.03 | 4.33 | 2.70 *** | (5.77) |
| Distance from household's residence to the county capital (km) | 20.61 | 23.37 | 18.86 | 4.50 *** | (4.22) |
| Distance from household's residence to the nearest rural market (km) | 7.18 | 8.28 | 6.48 | 1.81 *** | (4.39) |
| Per capital gross output value of the village (<i>yuan</i>) | 3533 | 3473 | 3571 | -97 | (-0.85) |
| Percentage of non-farm production of the village (%) | 27.4 | 26.3 | 28.1 | -1.8 | (-1.44) |
| Cultivable land per capita of the village (<i>mu</i>) | 1.14 | 1.15 | 1.13 | 0.01 | (0.37) |
| Percentage of paddy field of the village (%) | 21.8 | 19.7 | 23.2 | -3.5 *** | (-3.55) |
| Percentage of vegetable field of the village (%) | 21.0 | 21.2 | 20.8 | 0.4 | (0.36) |
| Number of observations | 1208 | 468 | 740 | | |

Note: (1) t-statistics are in brackets. *** significant at 1%; ** significant at 5%; * significant at 10%. (2) One *yuan* = 0.12 US\$; one *mu* is equal to 1/15 hectares.

7 Results and discussion

Our empirical results are presented in two parts. First, we estimate the participation and income equations to identify the factors that determine participation in migration and per

capita income, and to simulate income obtained in a counterfactual scenario without migration and remittances. Second, we compare Gini coefficients and poverty indices to examine the effects of migration on income distribution.

7.1. Estimation of the participation and income equations

Table 2 reports the estimates of the participation equation based on Probit model. Most variables carry the expected signs. The coefficient of household's land area is significantly negative. The shortage of land, the major physical capital of a household, is an important motivation of migration. Households with more workers are more likely to participate in migration. Other things being equal, a larger household will have a lower opportunity cost of having some members working outside.

Households with better educated labor are more likely to participate in migration for two reasons: in terms of capacity, the better-educated are in general more likely to find a job in urban sectors (see also Lanjouw, 1999b); in terms of incentive, returns to education are higher in non-farm activities than in traditional farm activities (Schultz, 1964). Note that, however, the coefficient does not strictly increase with education level: the marginal effects of medium education level (8-10 years of schooling) is larger than that of basic education (4-8 years) and high education (10 years or above). We can borrow financial-constraint model proposed by Schiff (1996) to explain this result. When living standards improve due to an exogenous shock, such as economic reforms, labor with median level of skills are more likely to migrate because of the relaxation of financial constraints, while the high-skilled labor may be less willing to migrate because of the high opportunity cost.¹⁵

Households reside close to bus station, county capital, and rural fair are more likely to send member working outside, as they have better access to urban centers and to employment opportunities. The county capital is usually the place where most of the TVEs are located. The coefficients of other variables at village level are not significant. Some of them, such as per capita cultivable land, may be correlated to some degree with per worker land surface of the household.

¹⁵ See also López and Schiff (1995).

Table 2 - Estimation of the participation equation (Probit)

Endogenous variable = 1 if household participates in migration

| | Regression 1 For all households | |
|---|------------------------------------|---------|
| Number of workers in the household | 0.256 *** | (7.59) |
| Average number of years of education (ref.: 0-4 years) | | |
| 4-8 years | 0.393 *** | (3.00) |
| 8-10 years | 0.570 *** | (4.11) |
| 10 years or above | 0.372 ** | (2.26) |
| Number of dependents | -0.048 | (-1.37) |
| Number of children | 0.125 | (1.15) |
| Land area of the household | -0.013 *** | (-2.59) |
| Distance from household's residence to the bus station | -0.020 *** | (-3.48) |
| Distance from household's residence to the county capital | -0.007 ** | (-2.22) |
| Distance from household's residence to the rural fair | -0.002 | (-0.24) |
| Logarithm of per capita gross output value of the village | -0.033 | (-0.39) |
| Proportion of non-farm production of the village (/100) | 0.058 | (0.29) |
| Cultivable land per capita of the village | -0.017 | (-0.24) |
| Proportion of paddy field of the village (/100) | 0.417 | (1.22) |
| Proportion of vegetable field of the village (/100) | -0.097 | (-0.31) |
| Constant | -0.525 * | (-1.86) |
| Maximum likelihood in log | -730.653 | |
| Pseudo- R^2 | 0.094 | |
| Percentage of correction predictions (%) | 66.9 | |
| Number of observations | 1208 | |

Note: t-statistics are in brackets. *** significant at 1%; ** significant at 5%; * significant at 10%.

Using regression 1 as the selection equation, we estimate the income equation of the non-migrant households (Table 3). The results suggest that the number of workers does not have significant impacts on household income, which corroborates findings in other studies that, in rural China, marginal labor productivity is low, mainly due to shortage of land and backwardness of technology. As expected, households with larger land surface have higher income. Better schooling is associated not only with higher probability of participating in migration, but also with higher household income. The effect of education on rural farm productivity is positive. It suggests that households with well-educated members will choose to stay in rural areas only if the return on rural production is high enough (Taylor and Yunez-Naude, 1999). Household with more dependent persons tends to have lower per capita income. As we expect, households in suburban areas are richer as specialization in commercial farming, measured by the percentage of vegetable field of the village, significantly contributes to increasing farmers' income.

Table 3 - Estimation of the income equation (OLS)

Endogenous variable: logarithm of household per capita income

| | Regression 2 Only for non-migrant households | |
|--|---|---------|
| Number of household's workers | -0.037 | (-0.54) |
| Average number of years of education (ref.: 0-4 years) | | |
| 4-8 years | 0.553 *** | (3.50) |
| 8-10 years | 0.819 *** | (4.22) |
| 10 years or above | 0.846 *** | (4.15) |
| Number of dependents | -0.091 ** | (-2.15) |
| Land area of the household | 0.018 *** | (3.13) |
| Percentage of paddy field of the village (/100) | -0.053 | (-0.12) |
| Percentage of vegetable field of the village (/100) | 1.440 *** | (4.45) |
| Inverse Mills Ratio | -0.059 | (-0.18) |
| Constant term | 6.525 *** | (32.94) |
| R^2 | 0.172 | |
| Number of observations | 468 | |

Note: t-statistics in brackets. *** significant at 1%; ** significant at 5%; * significant at 10%.

7.2 Remittances, inequality and poverty

We use the results of regression 2 to simulate the counterfactual of how household incomes, poverty and inequality would have been in the absence of migration for all the households. Table 4 shows the comparison between observed income and predicted income. In the absence of migration, household per capita income would have been 17.1% lower, while Gini would have been 16.7% higher. In other words, participation in migration not only increases household income but also lowers inequality in rural areas. Poor households largely benefit from migration/remittances. Using the basic needs poverty line developed by Ravallion and Chen (2004) for rural areas, which is equal to 850 *yuan* in 2002, we find that remittances lead to a decline in the incidence of household poverty (P_0) from 27.5% to 14.3%, in the depth of poverty (P_1) from 12.0% to 5.6%, and in the severity of poverty (P_2) from 7.1% to 3.1%. The strong impacts on depth of poverty suggests that migration reduces the income gap among the poor; and those on the severity of poverty, which assigns higher weights to the poorest of the poor, suggests that migration improves the well-being of the poorest disproportionately. In other words, the gains in poverty reduction due to migration go disproportionately to the poorest households (de Braud and Giles, 2008).

Table 4 - Comparison of income distribution with and without migration

| | Income in the presence of migration (observed income) | Income in the absence of migration (simulated income) |
|---|--|--|
| Gini coefficient | 0.454 | 0.530 |
| Average per capita income (<i>yuan</i>) | 3111 | 2580 |
| FGT index (%) | | |
| P_0 - poverty incidence | 14.3 | 27.5 |
| P_1 - poverty depth | 5.6 | 12.0 |
| P_2 - poverty severity | 3.1 | 7.1 |
| Number of observations | 1208 | 1208 |

Note: Poverty line is equal to 850 *yuan*.

Figure 1 presents the growth incidence curve calculated from the difference between observed income and predicted income, which show the changes in per capita income resulted from migration and remittances for each segment of population. As the GIC is above the zero axis at all points, income growth was positive for the entire population. A strictly negative-sloped GIC, which displays changes in household per capita income of each percentile ranked from poor to rich, indicates that the poorer households experienced a higher rate of growth due to migration. In other words, the poorer the households, the larger their proportionate income gains. For the poorest group (below the 25th percentile), household per capita income increased more than 80% (with the poorest poor gaining even more from migration); while that of the richest group (above 75th percentile), increased less than 25% (with the richest rich gaining even less).

Figure 1 - Growth incidence curve: effect of migration on income change

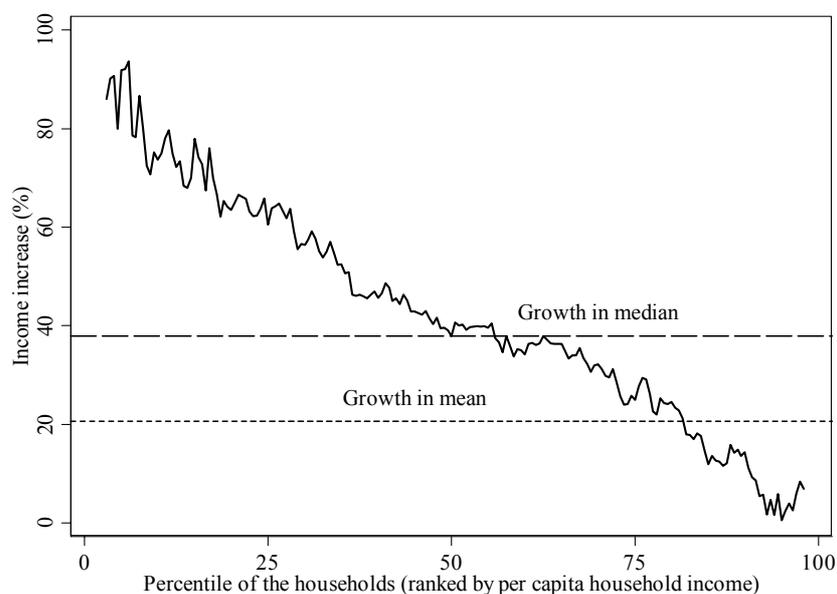


Table 5 shows income distribution of migrant households and non-migrant households under different scenarios. In the absence of migration (regime 0), per capita income of migrant households (2435 *yuan*) would have been lower than that of non-migrant households (2810 *yuan*), while levels of income inequality within migrant households and within non-migrant households are similar. Income premiums of the farmers who choose to stay in local production is 14% higher than those who choose to migrate. For the migrant households, their expected income from local production is lower; but participating in migration raises significantly their average living standard. Hence, migration is a long-term rational choice of the rural households. The households that choose to concentrate on local production are usually those with comparative advantages in rural areas and with higher expected home earnings. However, in the presence of migration (regime 1), level and distribution of income of migrant households both significantly improve. As the poorest poor benefit disproportionately from remittances, migration contributes to lower income inequality among migrant households. One reason could be that poor households are more likely to suffer from the binding constraints, such as lower level of land resource per capita. They may face cornered solutions as their abilities to weather negative shocks are weaker. If those currently employed in the urban sector were engaged in some alternative employment, such as being agricultural labor, agricultural wage rates might be lower and overall income inequality might rise. Rather than raising inequality, migration actually contributes to prevent inequality from rising even further (Barrett et al., 2001; Chapman and Tripp, 2004).

Table 5 – Income distribution of migrant households and non-migrant households in different regimes

| | Average per capita income (<i>yuan</i>) | Gini index |
|---|--|--|
| Non-migrant households ($P_i = 0$) in Regime 0 | 2810 ($y_0 _{P=0}$, observed income) | 0.551 ($G(y_0 _{P=0})$, observed income) |
| Migrant households ($P_i = 1$) in Regime 0 | 2435 ($\hat{y}_0 _{P=1}$, simulated income) | 0.513 ($G(\hat{y}_1 _{P=1})$, simulated income) |
| Migrant households ($P_i = 1$) in Regime 1 | 3301 ($y_1 _{P=1}$, observed income) | 0.386 ($G(y_1 _{P=1})$, observed income) |

8 Conclusions

Migration and remittances have played an important role in increasing income level and changing income distribution in rural China since the economic reforms. Urban employment not only offers migrant workers alternatives job opportunities, but also helps alleviate the pressure of land shortage on those remain in countryside. As credit market and insurance market are highly inefficient in China, many poor rural households are not able to optimize their investments in physical and human capitals due to binding constraints of shortage in resources (Stark, 1980). In this circumstance, migration and remittances not only provide household with inflows of resource to invest in farming activities, but also serve as an insurance system to mitigate income fluctuations. A large amount of rural labor spontaneously chooses to migrate to urban areas to seek better opportunities.

Our results first show that remittances from migrants as a whole, considered as a “potential substitute” for home income, tends to have an egalitarian effect on earnings in rural China. Migration provides the possibility for the households with low marginal labor productivity in rural activities to diversify their production in urban sector and hence increase income. Households with larger labor endowment relative to land resources, which would have been in general poorer in the absence of migration, are more likely to participate in migration as their opportunity costs are in general lower.

Second, our results indicate that participation in migration noticeably reduced rural poverty. Migration raises the income of poor households to a larger extent than that of rich households. Poverty headcount, poverty depth, and poverty severity are significantly lower in the presence of migration in the case of *Hubei*. Remittances not only narrow the income gap among rural poor households, but also disproportionately improve income of the poorest poor. In rural China, with no ownership but only usufruct of the land, a land market does not exist. Hence, farm income is relatively fixed because it is difficult to increase farm size. Therefore, migration serves as a solution for the absorption of rural surplus labor and remittances provide rural households with an additional source of income, improving their living standards and narrowing income gaps as well.

Third, we find that shortage of land, education, and proximity to economic centers are important factors that encourage households to participate in migration. Non-migrant households are more productive in local production than migrant households due to observable and non-observable characteristics, implying a positive selection.

We argue that, the two observations that many existing studies rely on – (i) the distribution

of non-farm income is more unequal than the distribution on farm-income in rural areas; and (ii) the average observed income of migrant households are higher than that of non-migrant households – do not provide adequate support to conclude that non-farm income increases inequality. First, as most rural household have farm income but not all rural households have non-farm income, it is normal that the distribution of non-farm income is more unequal. However, this does not necessarily suggest that, in relative terms, poor households have lower non-farm income. The relationship between urban-to-rural remittances and home earnings can be both substitute and complement. Our results show that this relationship makes the distribution of total income prone to be more equal than that of income in the absence of non-farm activity participation. Second, a higher observed average income of migrant households than non-migrant households does not necessarily suggest that households that choose to migrate would have had higher income in the absence to migration. Our analysis shows that, if these households did not participate in migration, their income would have been lower than that of non-migrant households. The households that choose to stay in rural area are those with a comparative advantage in farming and with higher expected farm income. Migration in fact offers opportunities for households to make rational choice in optimizing income strategies given their observable and unobservable attributes, and the returns to these attributes given where they live.

Implementation of the Household Responsibility System in the late 1970s undoubtedly raised agricultural productivities and set stage for the economic reforms. However, as household became a basic economic unit and household size became criteria for land allocation, land was divided into small plots for cultivation, which seriously impedes agricultural modernization as the economy develops. Given the natural endowments and technology conditions in China, agricultural development can not mainly rely on land area increase or on technical improvement in the short run. Consolidating plots to exploit economy of scale may be a main source of gains in agricultural productivity. Agricultural labor productivity will remain low. Migration serves as a rational self-selection – more productive farmers stay in countryside while worker with higher expected return in urban sectors migrate. Appropriate policy reforms that allow the market to play a better role in allocating land to productive farmers, and alleviate the barriers of migration to increase labor productivity would be important for improving living standards and reducing income inequality in rural China.

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