Are workers close to cities paid higher non-agricultural wages in rural China?

Chloé Duvivier, Mary-Françoise Renard, Shi Li

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Chloé DUVIVIER, Shi LI, Mary-Françoise RENARD

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Les auteurs

Duvivier Chloé

Doctorant / PhD Student

Auvergne University, CNRS, UMR 6587, CERDI, F-63009 Clermont Fd.

Li Shi

Professeur / Professor

School of Economics and Business Administration, Beijing Normal University, China

Renard Mary-Françoise

Professeur / Professor

Auvergne University, CNRS, UMR 6587, CERDI, F-63009 Clermont Fd.

Corresponding author: Chloé Duvivier

Email : Chloe.DUVIVIER@u-clermont1.fr

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Résumé / abstract

This paper analyzes the effect of urban proximity on rural non-agricultural wages. Using the 2002 Chinese Household Income Project data, we study the determinants of rural non-agricultural workers' hourly wages. We find strong evidence that rural workers close to cities benefit from higher hourly wages, indicating that there is a spatial differentiation in wages across rural areas. Specifically, workers living close to cities are paid about 15% more for one hour worked. This is true even after controlling for living costs, suggesting that urban proximity leads to higher non-agricultural wages in real terms. We also find that migration enables remote workers to partially compensate for lower local wages, suggesting that restrictions on migration hurt remote workers more than other workers.

Mots clés /Key words : Remoteness, wage differentials, regional labor market, China

Codes JEL / JEL codes : J31, O53, R10, R23

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1. Introduction

Reforms in China have allowed for a fall of nearly half a billion in the number of poor people over the past thirty years (World Bank, 2009). However, many rural people remain poor and poverty is strikingly concentrated in isolated rural areas (World Bank, 1992; Jalan and Ravallion, 2002). Other studies, both on developed (Pardridge and Rickman, 2008) and developing countries (Bird and Shepherd, 2003), also highlight that poverty increases with remoteness.

A large strand of the literature argues that non-agricultural employment enables rural households to get out of poverty. Indeed, non-agricultural work can enable households both to raise their income and to reduce its instability (Ellis, 1998). This is particularly true for China, where farm size is extremely small[1] and thus, where farmers have few opportunities to generate agricultural income. Thanks to the economic reforms implemented in China over the last thirty years, nowadays, most rural households are involved in some kind of non-agricultural activity (Liu and Sicular, 2009). However, non-agricultural employment has developed unevenly across rural areas, leading to a huge increase in intra-rural inequality (Scott, 1994; Kung and Lee, 2001). More specifically, distance to urban areas plays a significant role in determining the level of non-agricultural employment. As peri-urban rural areas benefit from low transport costs and from a significant transmission of ideas, they benefit from more non-agricultural employment opportunities than areas further away from cities (Henderson *et al.*, 2001). This has been demonstrated specifically for China (Knight and Song, 2003; de Janvry *et al.*, 2005) and also for several other developing countries (Corral and Reardon, 2001; Ferreira and Lanjouw, 2001; Micevska and Rahut, 2008; Winters *et al.* 2009; Deichmann *et al.*, 2009; Jonasson and Helfand, 2010).

The present work aims at studying more deeply how remoteness affects non-agricultural employment by investigating whether remote workers are trapped in low-paid non-agricultural jobs. Therefore, unlike previous studies, the discussion here is not about the *level* but about the *kind* of non-agricultural employment that remote workers manage to get. Looking at this issue in China is particularly relevant for three reasons. First, given the in-

[1]The arable land area in China is far below the world average as it was only 0.11 hectare per capita in 2000 (Tan *et al.*, 2005).

stitutional restrictions on labor mobility (*hukou*)[2], local conditions play a very significant role in determining rural workers' earnings and well-being (Xia and Simmons, 2004). Second, if on average non-agricultural activities are much more income-generating than agricultural activities[3], there is a huge variation in the remuneration of non-agricultural wage-employment. There are even low-paid non-agricultural jobs where earnings are lower than agricultural earnings (Lanjouw, 1999), so that one cannot assume *a priori* that non-agricultural employment enables workers to raise their income. Third, it has been recognized that there are persistent spatial differences in wages, especially between workers in urban areas and workers in remote areas (Hanson, 2000).

According to the 2002 and 2007 Chinese Household Income Project (CHIP) surveys, there are both high differences in wages across rural areas and high differences in wages between suburban villages and other villages in China. On the one hand, in 2002 the average daily wage[4] was 2.5 times higher in the ninth decile than in the first decile. Even if the gap narrowed slightly[5] from 2002 to 2007, the average daily wage was still two times higher in the ninth decile than in the first decile in 2007. This data shows that intra-rural wage inequality and intra-urban wage inequality are of comparable magnitude (see Combes *et al.* (2012) for data on intra-urban wage inequality). On the other hand, suburban villages benefit from higher wages, as the average daily wage in these villages was about 1.25 higher than in other villages.

In spite of these spatial variations in wages in rural China, to our knowledge, no empirical evidence exists on the effect of urban proximity on rural non-agricultural wages in China[6], although there is some empirical evidence for other developing countries. On the one hand, non-agricultural earnings tend to be higher in rural areas closer to urban

[2]For a review of the hukou system, see Chan and Buckingham (2008).

[3]Wage-employment is estimated to be paid more than twice, and self-employment three to five times as much as agricultural work in China (Kung, 2002).

[4]The average daily wage refers to the daily wage for temporary workers who perform local labor in towns and villages.

[5]Note that the 2002 and 2007 CHIP surveys were not carried out in the same villages so that the narrowing in wage differentials could be lead by differences in villages surveyed between 2002 and 2007.

[6]Most studies focus on spatial differences in wages in urban China (Hering and Poncet, 2010; Combes *et al.*, 2012).

centers and roads (Corral and Reardon, 2001; de Janvry and Sadoulet, 2001; Micevska and Rahut, 2008). However, these studies estimate the determinants of annual non-agricultural earnings which depend on both the intensity of participation in the non-agricultural sector and on the hourly wage. As urban proximity increases the intensity of participation in the non-agricultural sector (Knight and Song, 2003), one cannot infer from these studies that workers close to urban areas are paid higher wages. On the other hand, others assess whether workers closer to cities have a higher probability of being involved in high-paid[7] jobs and find mixed evidence. Deichmann *et al.* (2009) estimates that high-paid jobs are concentrated in rural areas surrounding urban centers in Bangladesh. In contrast, Jonasson and Helfand (2010) find that there is no clear relation, as both high-paid and low-paid jobs are concentrated around urban agglomerations.

In China, non-agricultural wages are likely to be lower in remote rural areas. First, the type of industry varies across rural areas, and high-return sectors are more likely to concentrate in suburban areas. Indeed, in areas located far away from cities, non-agricultural employment often consists of small scale manufactures that specialize in modest articles. On the contrary, in areas close to cities, the production is much more technologically sophisticated and is tied to urban production, through subcontracting and technical assistance to urban firms (Naughton, 2007). Second, nowadays Chinese suburban areas are highly urbanized with a high level of industrial development, densely concentrated industries and competitive industrial clusters, so that they are very similar to cities (Naughton, 2007). Suburban villages are therefore likely to benefit from some kinds of agglomeration economies, leading to higher labor productivity and so, to higher real wages[8]. However, the huge labor surplus in rural China could also impede wages from rising close to urban areas. Moreover, most of the production in rural industries is intensive in low-skilled labor so that human capital externalities may not be significant, limiting the scope of agglomeration economies. As a result, one cannot say *a priori* whether or not rural areas closer to cities benefit from higher wages - this issue requires an empirical assessment.

[7]Non-agricultural jobs are high-paid if the hourly wage falls above the earnings of wage laborers in agriculture.

[8]Duranton and Puga (2004) present the theoretical micro-foundations of agglomeration economies and Rosenthal and Strange (2004) review the empirical literature on agglomeration economies.

Using the 2002 rural survey of the Chinese Household Income Project, we estimate the determinants of hourly wages, controlling both for the potential selection bias and for a range of characteristics at the individual and village levels.

We find that remote workers suffer both from scarcer opportunities to work out of agriculture locally and from lower local wages. Specifically, workers in suburban villages are paid about 15% more for one hour worked. Moreover, the result holds even after controlling for differences in living costs between suburban and other areas, which suggests that urban proximity leads to higher wages in real terms. We also find that migration enables remote workers to partially compensate for lower local wages, suggesting that restrictions on migration hurt remote workers more than other workers.

The rest of the paper proceeds as follows. Section 2 presents the data and Section 3 the methodology used. We describe the results in Section 4 and finally, we conclude and propose some policy recommendations in Section 5.

2. Data

To carry out the empirical analysis, we use the 2002 rural survey of the Chinese Household Income Project[9]. This survey was conducted by the Chinese Academy of Social Sciences and investigates households' conditions in 2002. The database is composed both of an individual, a household and a village level survey. Thus, we benefit from detailed information on individual labor allocation and from household and village characteristics. In addition, this is a nationally representative survey which investigates 37,969 individuals of 9,200 households from 961 villages belonging to 122 counties (*xiàn*) of 22 provinces[10]. As a result, we benefit from a huge variability in terms of remoteness-proximity to urban areas, contrary to most micro-economic studies.

[9] A detailed description of the data can be found in Gustafson *et al.* (2008). We do not use the 2007 CHIP survey as there is no detailed information on rural non-agricultural work to calculate hourly wages.

[10] The "province" and the "county" correspond respectively to the first and third levels of administrative division in China. The sample includes the provinces of Beijing, Hebei, Shanxi, Liaoning, Jilin, Jiangsu, Zhejiang, Anhui, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Shaanxi, Gansu and Xinjiang.

2.1. Labor Allocation of Rural Workers

We restrict the CHIP sample to workers. Every individual above 15 years old who reports having earned some income or having spent some time working is considered as a worker. We further distinguish between agricultural workers (those who work on-farm or as a farm-employee) and non-agricultural workers (those who work out of agriculture). Non-agricultural workers are composed of wage-earners and self-employed workers. Here we focus on non-agricultural wage-earners because most information on labor time and earnings for self-employment is not available at the individual level. Note that wage-employment represents the bulk of rural non-agricultural employment in China (de Brauw *et al.*, 2002; Mohapatra *et al.*, 2007). Finally, non-agricultural wage-earners are composed both of local workers and migrants. Following Zhao (1999) and de la Rupelle *et al.* (2009), in order to include commuters, local wages earners are defined as people working in their home county. Most migrants are working in a city because migration from one rural area to another is very low in China[11]. To study whether there is a spatial differentiation in wages, we focus on *local* non-agricultural wages.

Table 1 presents data on the labor allocation of workers in the sample. Our sample is composed of 25,116 workers. 8,414 of them are non-agricultural wage-earners and 5,325 are non-agricultural wage-earners working locally[12]. According to the data, a significant share of the labor-force (39%) is involved in some kind of non-agricultural work, which is very consistent with previous findings (de Brauw *et al.*, 2002; Knight and Song, 2003; Shi *et al.*, 2007). In addition, nearly one-third of workers is diversified, as they work both in and out of agriculture. Finally, given land rights reallocation and the scarcity of non-agricultural jobs in rural China, a large share of the labor force remains in agriculture (especially on-farm).

[11]According to 2007 Chinese Household Income Project data, more than 90% of migrant rural workers leave their local countryside to work in towns or cities.

[12]On the 37,969 individuals surveyed, 7,869 are children and 30,100 are adults. 26,065 adults are workers and 4,035 are inactive. However, we have missing information on place of work, labor time and/or wage for 949 workers so that our sample is composed of 25,116 workers. Finally, there are 2464 individuals for whom explanatory variables are missing. As a result, the estimates are undertaken on a sample of 22,652 workers.

[Table 1]

2.2. Dependent Variable: Non-agricultural Hourly Wages

To study whether spatial differences in wages exist between remote rural areas and other ones, we estimate the determinants of individual non-agricultural hourly wage (NAHW). This variable is calculated using information on wages and labor time for non-agricultural wage earners. To ensure robustness, we calculate the individual non-agricultural hourly wage in two ways. First, we consider both an individual's primary and secondary activities. In this case, the individual non-agricultural hourly wage is calculated as:

$$NAHW_i = \sum_{k=1}^{2} \frac{W_{ki}}{D_{ki} * H_{ki}} * \frac{1}{k}$$

where k refers to the non-agricultural wage employment of individual i ($k = 0$ if the individual is a full-time agricultural worker; $k = 1$ if the individual has one non-agricultural wage activity and $k = 2$ if the individual is engaged in non-agricultural wage-employment both as a primary and secondary activity). W_{ki} are the annual earnings[13] of individual i derived by working in activity k; D_{ki} is the number of days worked during the year in activity k and H_{ki} the number of hours worked per day in activity k.

Second, we follow Deichmann *et al.* (2009) and only consider an individual's primary occupation. In this case, the individual non-agricultural hourly wage is calculated as:

$$NAHW_i = \frac{W_i}{D_i * H_i}$$

2.3. Variable of Interest: Remoteness from Urban Centers

When measuring distance to urban centers, two elements must be considered: (1) how to measure distance? (2) Whether or not different urban centers can have varying impacts.

As Bird and Sheperd (2003) highlight, remoteness can result from physical distance (number of kilometers) and/or from frictional distance (due to bad road quality or natural conditions such as mountainous areas or floods). To take into account both of these

[13] Following Hering and Poncet (2010) and Démurger *et al.* (2012), it includes the basic wage, bonuses, in-kind earnings and subsidies and pension income.

dimensions, distance is sometimes measured by travel time (Jacoby, 2000; Fafchamps and Shilpi, 2003). However, travel time indicators may suffer from endogeneity[14] so that other studies prefer using indicators of physical distance (Deichamnn *et al.*, 2009).

In addition, the effect of urban centers on rural non-agricultural employment is expected to vary according to their size. In Nepal, for example, rural household' labor allocation is affected both by the distance to city and by the population of the city: bigger cities tend to have a higher impact (Fafchamps and Shilpi, 2003). In the same way, other studies distinguish between major urban centers and other urban municipalities (Deichmann et al., 2009) or between rural towns and cities (de Janvry and Sadoulet, 2001; Lanjouw *et al.*, 2001). Thus in China, proximity to the county seat and to the city significantly increases the number of days worked out of farm whereas proximity to smaller towns has no effect (Knight and Song, 2003).

Here we use the two different indicators of remoteness that are available in the 2002 CHIP survey: the distance to rural town and the distance to city. On the one hand, the distance to rural town is measured by the distance, in kilometers, between a worker's village and the nearest county seat. On the other hand, the distance to city is measured by a dummy variable which is equal to 1 if the village is *not* a suburb of a large or middle city (*jiaoqu*) and 0 if it is a suburban village. Thus, these two indicators of interest enable us to check whether different types of urban areas have a heterogeneous impact. Indeed, agglomeration economies are likely to be much more bigger in the vicinities of cities, which are larger, and the economy of which is much less dependant on agriculture than that of rural towns. Moreover, these indicators are measures of physical distance and not of travel time, which protects us from endogeneity problems. However, this raises concerns about the accuracy of the distance measure as it does not take into account frictional distance. To solve this problem, we introduce two variables to control for frictional distance: a measure of road access and of the topographical conditions of the village (see Appendices A and B). As a result, our indicators of interest enable us to estimate the effect of physical remoteness after controlling for frictional distance. Note that our indicators of interest account both

[14] Indeed, rural roads are likely to be built where there is a developed non-agricultural sector. As a result, the placement of roads in these areas reduce the travel time to urban centers, which would lead to estimation bias.

for lower transaction costs and for demand-side effects (size of the local market) arising from urban proximity. In other words, we only test whether urban proximity leads to higher wages, without assessing which transmission channels lead to higher wages, this being well beyond the scope of this paper[15].

[Table 2]

Table 2 gives descriptive statistics on the hourly wages in yuan according to the distance to urban areas. According to the table, hourly wages broadly decrease with distance to county seat. The relation between hourly wages and distance to city seems stronger given that workers in suburban villages are paid significantly higher hourly wages.

3. Methodology

3.1. Baseline specification

To test whether workers further away from urban centers are paid lower wages, we estimate an income function. Contrary to previous studies (Corral and Reardon, 2001; de Janvry and Sadoulet, 2001; Jonasson and Helfand, 2010), to test the effect of distance on rural non-agricultural earnings, we do not use as dependant variable total non-agricultural earnings. Indeed, total non-agricultural earnings are determined both by hourly earnings and by the intensity of participation in the activity. As remoteness significantly reduces the intensity of participation in non-agricultural activities (Knight and Song, 2003), it would over-estimate the effect of remoteness on earnings. Therefore, we use as dependant variable the individual non-agricultural hourly wage (NAHW) presented in Section 2.2.

As not every rural worker derives income from non-agricultural wage-employment, we estimate the two-step Heckman selection model (Heckman, 1979) in order to correct for the potential selection bias. The first step consists in estimating a probit model of participation in non-agricultural wage-employment (selection model). In the second step,

[15]Very few empirical studies on rural non-agricultural earnings separately assess the different effects arising from urban proximity. A notable exception is Jonasson and Helfand (2010) who use a collection of variables to separately estimate demand-side effects and transaction costs effects.

we estimate an augmented Mincerian hourly earnings function (Mincer, 1974) by the Ordinary Least Squares:

$$\ln NAHW_i = \alpha + \beta_1 Dist_v^T + \beta_2 Dist_v^C + \delta X_i + \zeta X_v + \gamma \lambda_i + \varepsilon_i \qquad (1)$$

where i refers to the worker and v to the village. $Dist^T$ and $Dist^C$ are respectively distance to the nearest rural town and distance to city, our two indicators of interest. ε is the error term, β, δ and ζ are vectors of unknown coefficients, associated with the explanatory variables, which must be estimated. We control for variables both at the individual (X_i) and village (X_v) levels. As control variables, we follow the literature and introduce a set of characteristics which are expected to affect the level of non-agricultural hourly wage (Li, 2003; Hering and Poncet, 2010; Démurger *et al.*, 2012). We control for worker's age and its square, education, experience and its square, gender and dummy variables to control whether the worker is from an ethnic minority and whether he is a member of the Communist Party. Controlling for individual characteristics, we address the issue that workers may sort spatially according to their characteristics[16] (Combes *et al.*, 2008). In this way, we are able to clearly separate the effect of location variables from the effect of workers characteristics.

We introduce two more variables, at the village level, to control for frictional distance as discussed in Section 2.3.: a dummy variable to control for the topography of the village (plain, hilly area or mountainous area) and a dummy variable indicating whether or not a road reaches the village. Province and regional (East, Center, West) dummies are introduced to control for differences in development, living costs, endowments and policies. In addition, as wages are expected to be lower in poorer areas, we introduce a dummy variable indicating whether the village is in a province level poverty township. Finally, to correct for the potential sample selection bias, the inverse Mills ratio λ, generated from the 1^{st} step probit model, is introduced among the determinants of income. If λ is significant, it indicates that common factors influence both the participation in the non-agricultural sector and the hourly wage earned from this sector, so that the errors

[16]Note that we also partially address the issue of the spatial sorting of workers, carrying out the analysis on the sample of local workers.

of the two equations are correlated. The Heckman selection model, by introducing the inverse Mills ratio among the determinants of income, enables us to take into account this correlation and thus, leads to consistent estimations. As identifying restriction[17], we use the quantity of land per capita in the worker's household. Indeed, this should decrease rural workers participation in the non-agricultural sector without affecting the wage level. Definition and descriptive statistics of the variables are given in Appendices A and B.

3.2. Controlling for higher living costs close to urban centers

In equation (1) we control for differences in living costs by introducing provincial dummies. However, living costs are also likely to vary within a given province, and especially between remote rural areas and other ones. As wages are expected to be an increasing function of living costs, and as living costs are expected to be higher close to urban areas, the coefficient associated with the variables of interest could be over-estimated (Hering and Poncet, 2010).

To control for differences in living costs between remote and other areas, we calculate an index of living costs at the village level. The index is calculated using information on the market price, in yuan per kg, of six non-staple foods[18] (meat, eggs, edible oil, sugar, vegetables, fruit and melons). As a result, we further analyze the effect of urban proximity on hourly wages by adding the index of living costs among the determinants of income:

$$\ln NAHW_i = \alpha + \beta_1 Dist_v^T + \beta_2 Dist_v^C + \eta LC_v + \delta X_i + \zeta X_v + \gamma \lambda_i + \varepsilon_i \qquad (2)$$

where LC refers to the index of living costs at the village level. As the higher the living costs are, the higher the wage should be, we expect η to be positive.

[17]The identification of the Mills ratio implies that all the explanatory variables in the income function must be included in the selection model. In addition, at least one explanatory variable must be introduced in the selection model but not in the income model.

[18]We do not use information on the market prices of fish and shellfish because of too many missing values. Moreover, market prices of non-staple foods are reported at the household level. As market prices are likely to vary across villages and to avoid measurement errors, we construct an index at the village level. First, for each of the six non-staple foods, we calculate the average of its market price at the village level. Second, we create the living cost index by averaging the market price of the six non-staple foods.

4. Results

4.1. Are there spatial differences in wages in rural China?

Table 3 presents the estimation results of equation (1) (estimations (1) and (3)) and equation (2) (estimations (2) and (4)) for local non-agricultural wage-earner. As explained in Section 2.2, we calculate the worker's non-agricultural hourly wage in two different ways: first, we consider both a worker's primary and secondary occupation (estimations (1) and (2)) and second, we only consider the worker's primary occupation (estimations (3) and (4)).

The inverse Mills ratio is significant in all estimations, suggesting that the Heckman selection model is appropriate. A simple OLS estimation of the income function, without correction for the sample selection, would have led to biased estimates. Regarding the determinants of participation in non-agricultural wage-employment (selection model), the results are consistent with previous findings (Zhao, 1999; Xia and Simmons, 2004; Guang and Zheng, 2005; Liu and Sicular, 2009; Démurger *et al.*, 2010). Educated workers, men and party members have a higher probability of working out of agriculture as wage earners. Moreover, participation in non-agricultural activities decreases with land holdings and is lower in poor townships. Finally, our results confirm that workers closer to urban areas benefit from a higher probability of being involved in the non-agricultural sector, as estimated by Knight and Song (2003) and de Janvry *et al.* (2005).

Turning to the income equation, it appears that, as for urban areas (Li, 2003; Hering and Poncet, 2010; Démurger *et al.*, 2012), hourly wages in rural China are an increasing function of a worker's age, education and experience. Men and party members also benefit from higher wages. Regarding our two indicators of interest, remote workers are paid lower wages. The result is particularly robust for workers living in the vicinity of a middle or a large city given that the coefficient is significant at the 1% level in all fourth cases. Specifically, workers not living in a suburban rural areas are paid from 12.5% to 15.8% less for one hour worked. Regarding the distance to rural town, a 1-kilometer increase in the distance to the county seat decreases hourly wage by 0.2%. However, the result is not so strong for rural towns given that the coefficient is not significant in estimation (2). This is not surprising given that agglomeration economies are likely to be much stronger in the vicinity of cities where population, population density and industrial density are higher than in towns. Controlling for the higher living costs due to urban proximity does not change the results. Workers are paid more where living costs are higher and, as living costs are higher close to urban areas, this leads to a small decrease in the coefficient associated with the indicators of interest. However, the coefficients remain negative and statistically significant. This suggests that spatial differences in *real* wages exist across rural areas, according to their distance to urban areas. Finally, the results regarding frictional distance variables (road and topography) are broadly relevant. As for physical distance, wages decrease with frictional distance. Indeed, participation and wages are significantly higher in villages linked by a road. In addition, living in a mountainous area has a negative, but not robust, effect on wages.

[Table 3]

4.2. Robustness Checks: controlling for endowments

Differences in regional characteristics are one major source of spatial differences in wages, as endowments, such as a favorable climate, can affect workers' productivity (Hanson, 2000). Endowments not only refer to natural conditions (climate, natural resources) but also include institutions and technology (Combes *et al.* 2008). Moreover, endowments are one major source of spatial agglomeration, so that they may be correlated with our indicators of urban proximity, leading to estimation bias. According to Hering and Poncet (2010), endowments are likely to vary across Chinese provinces so that provincial dummies should control for such differences. However, to ensure robustness, we successively carry out two more tests to control for endowments. First, we estimate equation (2) substituting provincial dummies with county level dummies. Second, we follow Fally *et al.* (2010) and estimate equation (2) by excluding of our analysis sectors which depend on natural resources[19].

Estimation results are reported in Table 4. Introducing other controls for endowments does not change the findings given that the coefficients associated with the indicators of remoteness remains negative and significant (in fact, the magnitude of the coefficients even

[19]Specifically, these workers are no longer considered as wage-earners (their hourly wage is set to zero) and are part of the censored observations.

increases). These robustness checks confirm that results are not driven by differences in endowments and that the closer to urban areas, the higher the hourly wages.

[Table 4]

4.3. Does migration enable remote workers to compensate for lower wages?

Until now, we have tested for spatial differences in wages across rural areas so that we have only considered local workers' wages. However, non-agricultural employment is composed both of local and migratory work, the latter being a very significant component of rural non-agricultural work in China (de Brauw *et al.*, 2002; Shi *et al.*, 2007)[20]. It has been shown that migratory work has traditionally been better paid than local non-agricultural work (Zhao, 1999; Guang and Zheng, 2005). Moreover, Chinese remote workers, who have scarcer opportunities to work out of agriculture locally, would be more likely to migrate than workers close to urban areas (Knight and Song, 2003). Thus, migration could be a way for remote workers to get access to better paid non-agricultural jobs. In this case, even if wages are higher in rural areas close to cities, remote workers could compensate by migrating more to cities. Finally, what really matters in terms of well-being is to check whether remote workers are, on average, paid lower-wages[21]. To test whether, and to what extent, remote workers manage to compensate for lower local wages through migration, we estimate equation (2) on the whole sample of rural non-agricultural wage-earners. As it has been shown that remote workers migrate more and that migration is better paid, we expect the coefficients associated with the variables of interest to decrease and/or to lose their significance.

The results are reported in Table 5. Several interesting results can be found when considering both local and migrant wage-earners. First of all, regarding the determinants of participation, the coefficients associated with the variable *male* increases whereas

[20] This is confirmed in our sample in which a large proportion of non-agricultural workers are migrants (considering individuals' primary occupation, around 30% of non-agricultural workers are migrants).

[21] Note, however, that beyond the question of earnings, migration leads to many costs such as separation with family and inferior work and living conditions in cities (Zhao, 1999; Guang and Zheng, 2005). As a result, migration is very often a "second best" choice for Chinese rural workers who prefer to work locally, even for lower wages, rather than to migrate to urban areas.

the sign associated with *age* begins negative. This confirms that migration is mainly composed of young men. In addition, in the selection model, the coefficients of interest decrease and are insignificant in two cases. Thus, when considering both migratory and local non-agricultural rural workers, location variables are less significant determinants of participation than when one only considers local work. In other words, remote rural workers, who face scarcer opportunities to work out of agriculture locally, do engage more in migration than workers closer to cities. These results highlight that the determinants of participation vary according to the category of non-agricultural work considered as estimated by Shi *et al.* (2007).

Second, turning to the income equation, location variables are less important determinants of wages when considering both migrants and local workers. On the one hand, the coefficient associated with rural town is insignificant in all cases. By migrating more, remote workers manage to compensate for the difference in remuneration they suffer in comparison to that of workers closer to rural towns. On the other hand, both the magnitude and the level of significance of the coefficient associated with distance to city decreases. However, the coefficient remains negative and significant in every fourth cases which suggests that, even when migration is taken into account, rural workers living close to cities benefit from higher real wages. Thus, workers far away from cities only manage to compensate partially for lower local wages by migrating more than workers closer to urban areas.

These results underline that restrictions on migration hurt remote workers more than other workers because they suffer both from fewer opportunities to work out of agriculture locally and from lower wages.

[Table 5]

5. Conclusion

Since the beginning of the economic reforms, rural workers have diversified out of agriculture, which has enabled most of them to get out of poverty. However, not all workers benefit from these new employment opportunities. Besides, one major source of the rise of intra-rural inequality is the uneven development of non-agricultural activities across rural areas. More specifically, non-agricultural work is concentrated in rural areas surrounding urban centers. Previous studies focus on the nexus between rural workers' location and their participation in non-agricultural employment. This paper attempts to study more deeply how remoteness affects non-agricultural employment by investigating whether remote workers engaged in different *types* of non-agricultural work and particularly in poorly remunerated jobs. In this way, we try to provide additional explanations for why poverty is concentrated in remote rural areas. This issue is particularly relevant for China, where birthplace still plays a significant role in determining an individual's place of work, earnings and well-being.

Contrary to previous studies on rural non-agricultural earnings, we do not estimate the determinants of annual non-agricultural wages, which depend on both the intensity of participation in the non-agricultural sector and on the hourly wage. As urban proximity increases the intensity of participation in non-agricultural work, it would over-estimate the effect of urban proximity on earnings. As a result, we estimate the determinants of non-agricultural hourly wage, controlling for a broad set of individual and village level characteristics. We find that remote workers are paid lower real wages. The result is particularly strong for workers who reside far away from cities. By demonstrating that non-agricultural wages vary according to the distance from urban centers, we shed additional light on intra-rural inequality and on the geographic repartition of poverty in China. In this context, rural development policies not only must pay attention to the individual determinants of job access and earnings but also to their spatial determinants, in order to reduce poverty and inequality in rural China.

In addition, we find that remote workers manage to compensate, at least partially, for lower local wages by migrating more than workers closer to urban areas. This last result highlights that restrictions on migration hurt remote workers more than other workers because they suffer from scarcer opportunities to work out of agriculture and are paid lower wages locally. Thus, one way to reduce intra-rural inequality and poverty in remote rural areas would be to facilitate labor mobility. However, such a policy must come together with policies aiming at developing non-agricultural job opportunities in remote areas, in order to avoid that remote areas be drained of their most efficient workers.

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Appendix A. Definition of explanatory variables

Variables	Definition	Unit
	Individual characteristics	
Age	Number of years	Year
Education	Number of years of schooling (not including years spent on repeating a grade)	Year
Experience	Number of years since when the worker starts a non-agricultural activity as his primary activity	Year
Party member	Dummy equal to 1 if the worker is member of the Communist Party, 0 otherwise	
Male	Dummy equal to 1 if the worker is a man, 0 otherwise	
Minority	Dummy equal to 1 if the worker is an ethnic minority, 0 otherwise	
	Household characteristics	
Land per capita	Total amount of land possessed per capita in the household	Mu
	Village characteristics	
Distance to town	Distance from the nearest county seat	Kilometers
Distance to city	Dummy equal to 1 if the village is not a suburb of a large or middle city, 0 otherwise	
Road	Dummy equal to 1 if a road reaches the village, 0 otherwise	
Topography	Variable equal to 1 if the village is located in a plain, 2 if in a hilly area and 3 if in a mountainous area	
Township	Dummy equal to 1 if the township the village is in is a province level poverty township	
Living costs	Average market price of six non-staple foods (meat, eggs, edible oil, sugar, vegetables, fruit and melons) (in logarithm form)	Yuan

Appendix B. Descriptive statistics

	All workers		**Non-agricultural wage earners**		**Other workers**	
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Age	38.83	13.46	39.86	11.81	38.54	13.88
Education	7.07	2.77	7.91	2.57	6.83	2.78
Experience	2.07	4.90	6.01	7.49	0.96	3.05
Party member	0.08	0.27	0.17	0.37	0.06	0.23
Male	0.53	0.50	0.75	0.43	0.46	0.50
Minority	0.12	0.32	0.07	0.25	0.13	0.34
Land per capita	1.92	2.10	1.55	1.71	2.03	2.18
Distance to town	24.37	20.99	19.81	16.64	25.66	21.90
Distance to city	0.93	0.25	0.89	0.32	0.94	0.23
Road	0.96	0.19	0.97	0.18	0.96	0.19
Topography	1.73	0.77	1.63	0.74	1.76	0.78
Township	0.14	0.34	0.09	0.29	0.15	0.36
Living costs	4.65	0.60	4.69	0.58	4.63	0.61
Total	22652		4986		17666	

Table 1: Employment in rural China

	Effective	%
Agricultural workers	22427	89.29
Non-agricultural workers	9802	39.03
Of which: wage-earners	8414	33.50
Of which: local wage-earners	5325	21.20
Both agricultural and non-agricultural workers	7109	28.30
Total workers	25116	100

Table 2: Non-agricultural hourly wages and distance to towns and cities in rural China

	1^{ary} and 2^{ndary} activities				Only 1^{ary} activity			
	Mean	Std. Dev.	Median	Difference	Mean	Std. Dev.	Median	Difference
Distance to county seat								
0-20 km	3.07	3.64	2.34		3.02	3.46	2.34	
21-40 km	3.42	5.34	2.37		3.36	5.27	2.38	
41-60 km	3.05	4.32	2.28		2.87	2.92	2.28	
61-80 km	2.15	1.43	1.96		2.15	1.49	1.96	
More than 80 km	2.58	1.77	2.21		2.33	1.47	2.14	
Suburban village								
Yes	3.51	4.70	2.50	0.44***	3.47	4.71	2.50	0.46***
No	3.07	4.03	2.29	(-2.37)	3.01	3.77	2.29	(-2.58)

Note: *, **, *** indicate significance at the 10%, 5% and 1% levels respectively. t-statistics in parenthesis.

Table 3: Urban proximity and local non-agricultural wages in rural China

	1^{ary} and 2^{ndary} activities				Only 1^{ary} activity			
	(1)		(2)		(3)		(4)	
	Selection	Income	Selection	Income	Selection	Income	Selection	Income
Individual characteristics								
Age	0.012***	0.054***	0.012***	0.054***	0.008***	0.055***	0.008***	0.055***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age^2	-0.014***	-0.061***	-0.014***	-0.062***	-0.010***	-0.063***	-0.010***	-0.063***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education	0.010***	0.037***	0.010***	0.037***	0.009***	0.041***	0.009***	0.041***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Experience	0.043***	0.052***	0.043***	0.050***	0.037***	0.065***	0.037***	0.063***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$Experience^2$	-0.105***	-0.111***	-0.105***	-0.107***	-0.089***	-0.144***	-0.088***	-0.137***
	(0.000)	(0.003)	(0.000)	(0.003)	(0.000)	(0.001)	(0.000)	(0.001)
Party member	0.079***	0.180***	0.078***	0.175***	0.064***	0.202***	0.064***	0.196***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Male	0.137***	0.349***	0.138***	0.352***	0.113***	0.388***	0.114***	0.389***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Minority	-0.001	-0.043	-0.004	-0.050	-0.015	-0.047	-0.017	-0.055
	(0.911)	(0.375)	(0.758)	(0.310)	(0.202)	(0.386)	(0.131)	(0.312)
Village characteristics								
Distance town	-0.001***	-0.002*	-0.001***	-0.001	-0.001***	-0.002**	-0.001***	-0.002**
	(0.000)	(0.079)	(0.000)	(0.101)	(0.000)	(0.032)	(0.000)	(0.041)
Distance city	-0.079***	-0.136***	-0.076***	-0.125***	-0.072***	-0.158***	-0.069***	-0.147***
	(0.000)	(0.003)	(0.000)	(0.005)	(0.000)	(0.002)	(0.000)	(0.004)
Road	0.037**	0.120**	0.034**	0.105*	0.047***	0.207***	0.044***	0.193***
	(0.014)	(0.037)	(0.022)	(0.068)	(0.001)	(0.002)	(0.002)	(0.003)
Topography	0.001	-0.019	-0.0004	-0.021	-0.006	-0.038**	-0.007	-0.040**
	(0.886)	(0.275)	(0.933)	(0.231)	(0.185)	(0.045)	(0.113)	(0.035)
Township	-0.048***	-0.168***	-0.044***	-0.153***	-0.030***	-0.188***	-0.025***	-0.172***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.006)	(0.000)
Living costs			0.140***	0.579***			0.153***	0.563***
			(0.000)	(0.000)			(0.000)	(0.000)
Household characteristic								
Land per capita	-0.005***		-0.005***		-0.006***		-0.006***	
	(0.002)		(0.002)		(0.001)		(0.000)	
Constant	-2.889***	-1.490***	-3.827***	-2.433***	-2.589***	-1.915***	-3.682***	-2.824***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mills ratio		0.361***		0.354***		0.521***		0.509***
		(0.004)		(0.005)		(0.001)		(0.001)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Provincial dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22652		22652		22652		22652	
Uncensored observations	4986		4986		4535		4535	
P-value of Wald test	0.000		0.000		0.000		0.000	

Note: *, **, *** indicate significance at the 10%, 5% and 1% levels respectively. P-values in parenthesis.
For the selection model, the marginal effects at the mean values of the independent variables are given. The marginal effect gives the change in the probability of participation given a small change in an explanatory variable (or given a change from 0 to 1 for a dichotomous variable).

Table 4: Robustness checks: controlling for endowments

	Robustness check 1: county level dummies				Robustness check 2: sectors that do not depend on NR[a]			
	1^{ary} and 2^{ndary} activities		Only 1^{ary} activity		1^{ary} and 2^{ndary} activities		Only 1^{ary} activity	
	(1)		(2)		(3)		(4)	
	Selection	Income	Selection	Income	Selection	Income	Selection	Income
Individual characteristics								
Age	0.012***	0.054***	0.008***	0.054***	0.011***	0.055***	0.008***	0.056***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age^2	-0.015***	-0.061***	-0.011***	-0.061***	-0.013***	-0.063***	-0.010***	-0.064***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education	0.010***	0.039***	0.009***	0.042***	0.010***	0.039***	0.009***	0.044***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Experience	0.041***	0.049***	0.035***	0.057***	0.041***	0.051***	0.035***	0.063***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$Experience^2$	-0.102***	-0.106***	-0.086***	-0.129***	-0.098***	-0.108***	-0.084***	-0.137***
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.003)	(0.000)	(0.001)
Party member	0.079***	0.179***	0.064***	0.187***	0.077***	0.184***	0.064***	0.205***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Male	0.147***	0.361***	0.122***	0.387***	0.128***	0.344***	0.106***	0.375***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Minority	0.006	0.060	0.002	0.055	0.004	-0.022	-0.011	-0.022
	(0.704)	(0.356)	(0.915)	(0.435)	(0.724)	(0.657)	(0.337)	(0.685)
Village characteristics								
Distance town	-0.002***	-0.002*	-0.001***	-0.002**	-0.001***	-0.001*	-0.001***	-0.002**
	(0.000)	(0.051)	(0.000)	(0.024)	(0.000)	(0.084)	(0.000)	(0.031)
Distance city	-0.067***	-0.170***	-0.051***	-0.172***	-0.075***	-0.123***	-0.068***	-0.143***
	(0.000)	(0.003)	(0.002)	(0.005)	(0.000)	(0.007)	(0.000)	(0.006)
Road	0.021	0.059	0.038**	0.121*	0.027*	0.098*	0.038***	0.187***
	(0.184)	(0.316)	(0.014)	(0.064)	(0.065)	(0.089)	(0.007)	(0.004)
Topography	0.014*	0.037	0.014**	0.038	-0.006	-0.036**	-0.012***	-0.059***
	(0.059)	(0.152)	(0.049)	(0.165)	(0.186)	(0.047)	(0.007)	(0.003)
Township	-0.007	-0.073*	0.001	-0.106**	-0.044***	-0.165***	-0.024***	-0.179***
	(0.504)	(0.092)	(0.888)	(0.021)	(0.001)	(0.000)	(0.006)	(0.000)
Living costs	0.102**	0.417**	0.107**	0.386**	0.146***	0.573***	0.156***	0.549***
	(0.029)	(0.016)	(0.015)	(0.037)	(0.000)	(0.000)	(0.000)	(0.000)
Household characteristic								
Land per capita	-0.001		-0.002		-0.005***		-0.006***	
	(0.726)		(0.217)		(0.000)		(0.000)	
Constant	-3.681***	-1.983**	-3.597***	-2.222**	-3.829***	-2.458***	-3.675***	-2.818***
	(0.000)	(0.015)	(0.000)	(0.011)	(0.000)	(0.000)	(0.000)	(0.000)
Mills ratio		0.359***		0.472***		0.365***		0.513***
		(0.002)		(0.001)		(0.005)		(0.001)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Provincial dummies	No	No	No	No	Yes	Yes	Yes	Yes
County dummies	Yes	Yes	Yes	Yes	No	No	No	No
Observations	22652		22652		22652		22652	
Uncensored observations	4986		4535		4853		4419	
P-value of Wald test	0.000		0.000		0.000		0.000	

[a] NR refers to natural resources.

Note: *, **, *** indicate significance at the 10%, 5% and 1% levels respectively. P-values in parenthesis.

For the selection model, the marginal effects at the mean values of the independent variables are given. The marginal effect gives the change in the probability of participation given a small change in an explanatory variable (or given a change from 0 to 1 for a dichotomous variable).

Table 5: Migrants and local workers

	1^{ary} and 2^{ndary} activities				Only 1^{ary} activity			
	(1)		(2)		(3)		(4)	
	Selection	Income	Selection	Income	Selection	Income	Selection	Income
Individual characteristics								
Age	-0.011***	0.048***	-0.010***	0.045***	-0.014***	0.043***	-0.014***	0.042***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age^2	0.003*	-0.054***	0.003	-0.050***	0.007***	-0.050***	0.007***	-0.048***
	(0.077)	(0.000)	(0.186)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education	0.014***	0.028***	0.015***	0.029***	0.012***	0.029***	0.013***	0.030***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Experience	0.091***	0.040***	0.091***	0.041***	0.077***	0.050***	0.076***	0.045***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
$Experience^2$	-0.245***	-0.091***	-0.244***	-0.096***	-0.206***	-0.118***	-0.205***	-0.109***
	(0.000)	(0.005)	(0.000)	(0.002)	(0.000)	(0.003)	(0.000)	(0.003)
Party member	0.077***	0.123***	0.082***	0.117***	0.054***	0.131***	0.058***	0.114***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Male	0.217***	0.261***	0.227***	0.260***	0.178***	0.278***	0.187***	0.265***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Minority	-0.037**	-0.087**	-0.017	-0.028	-0.054***	-0.110***	-0.016	-0.045
	(0.013)	(0.022)	(0.434)	(0.587)	(0.000)	(0.009)	(0.439)	(0.400)
Village characteristics								
Distance town	-0.001***	0.0003	-0.001***	0.0001	-4.35e-04**	0.0003	-0.001**	0.0003
	(0.000)	(0.541)	(0.000)	(0.795)	(0.026)	(0.581)	(0.021)	(0.651)
Distance city	-0.049***	-0.073**	-0.041	-0.137***	-0.047***	-0.071*	-0.018	-0.124**
	(0.003)	(0.043)	(0.102)	(0.005)	(0.002)	(0.062)	(0.427)	(0.014)
Road	0.024	0.195***	0.038*	0.110**	0.037**	0.242***	0.054***	0.143***
	(0.204)	(0.000)	(0.063)	(0.016)	(0.035)	(0.000)	(0.006)	(0.004)
Topography	0.015**	-0.021	0.019*	0.031	0.005	-0.028*	0.018*	0.032
	(0.012)	(0.147)	(0.052)	(0.152)	(0.393)	(0.070)	(0.059)	(0.148)
Township	-0.014	-0.145***	0.001	-0.071**	0.002	-0.154***	0.006	-0.100***
	(0.235)	(0.000)	(0.921)	(0.020)	(0.834)	(0.000)	(0.618)	(0.002)
Living costs	0.004	0.377***	-0.065	0.317**	0.053	0.361***	-0.006	0.314**
	(0.925)	(0.000)	(0.275)	(0.014)	(0.185)	(0.000)	(0.912)	(0.018)
Household characteristic								
Land per capita	-0.009***		-0.004*		-0.009***		-0.006**	
	(0.000)		(0.073)		(0.000)		(0.014)	
Constant	-1.357***	-1.675***	-1.142*	-1.302*	-1.291***	-1.763***	-1.285**	-1.352*
	(0.000)	(0.000)	(0.051)	(0.071)	(0.000)	(0.000)	(0.026)	(0.064)
Mills ratio		0.213***		0.221***		0.297***		0.264***
		(0.006)		(0.003)		(0.003)		(0.006)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Provincial dummies	Yes	Yes	No	No	Yes	Yes	No	No
County dummies	No	No	Yes	Yes	No	No	Yes	Yes
Observations	22652		22652		22652		22652	
Uncensored observations	7726		7726		7136		7136	
P-value of Wald test	0.000		0.000		0.000		0.000	

Note: *, **, *** indicate significance at the 10%, 5% and 1% levels respectively. P-values in parenthesis.
For the selection model, the marginal effects at the mean values of the independent variables are given. The marginal effect gives the change in the probability of participation given a small change in an explanatory variable (or given a change from 0 to 1 for a dichotomous variable).