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“Empty Villages” in Poor Areas of China: A Case Study of Rural Migration in North Shaanxi?

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“Empty Villages” in Poor Areas of China: A Case Study of Rural Migration in North Shaanxi¹

Bin WU and Shujie YAO²

Abstract: Uneven regional growth and distribution of incomes in China over the last three decades have accelerated rural-urban migration across the country, leading to the emergence of many “empty villages” in mountainous, remote and resource-poor areas, posing a serious policy challenge on China’s future rural development and urbanisation. This paper uses village level data, to understand the causes and consequences of migration, from two prefectures of North Shaanxi based on the Second National Agricultural Survey. The dataset covers 8,914 villages, 1.1 million households and 4.9 million people who are among the poorest in rural China. Detailed statistical analysis and results from a multivariate regression provide information on the patterns, causes and consequences of migration. The key conclusions are as follows: Poorer households within the same locality or people living in more adverse conditions are more likely to migrate than others. Furthermore, the behaviour of household migration is distinctively different from that of labour migration. This point has been largely ignored in the literature but is critical for policies relating to regional development and poverty reduction. Instead of a ‘negative approach’ which treats rural migration as a standalone issue irrelevant to the country’s overall development objective, we propose a ‘positive approach’ which considers rural migration as an important part of the national strategy on urbanisation and rural-urban integration.

JEL: E24, I31, J43, N35

Key Words: Rural Migration, Poverty, Empty Villages, China

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1. Introduction

Rapid economic growth and urbanisation in China since 1979 have had a profound impact on rural communities, resulting in large-scale rural-urban and inter-regional migration across the country. The Second National Agricultural Census (SNAC) showed that by 2006, there were 746 million people actually living in the countryside, which was only 91% of the 820 million registered rural population. This huge discrepancy between the census and registered rural population implied that there were some 76 million rural people permanently settled in the cities but still regarded as rural residents. Moreover, this figure did not include rural-rural migrants between different areas. If the number of rural-rural migrants were taken into account, the actual number of total migrants would be much greater, in some cases up to 20% of the total rural population.

Compared with the first national agricultural census in 1996, the recorded rural population from the SNAC declined by 128 million, or 14.6%. Given the vast diversity of social, environmental and economic conditions in rural China, there is no doubt that rural labour and population changes vary greatly between provinces, counties, or even villages, leading to different patterns of rural migration. In addition, rural-urban and interregional migration may be caused by different factors, which in turn have different consequences on local environment, economic and social developments. These considerations present challenges to policy makers who seek to alleviate poverty, improve local development conditions and reduce spatial income inequality. Understanding the latest development and consequences of rural migration is thus important for both academics and policy makers at various levels.

In the literature, migration is regarded as an effective way for the rural poor to find off-farm employment and to escape from poverty (Guang and Zheng, 2005; Du and Wang, 2005; Ravallion and Chen, 2007; Taylor and Dyer, 2009; Xing, et. al., 2009). Rural migration also has important and complicated consequences on urbanisation and rural development (Zhu, 2007; De Braun and Rozelle, 2008; Gu, Aranda and Silverstein, 2009).

The migratory decision is mainly determined by two factors: employment opportunities and earning potentials. Off-farm employment in the cities is likely to offer higher earnings than farming, especially in the remote and poor rural areas. The discrepancy between farm and non-farm wage rates is an important attraction of labour migration, although it is not the only factor affecting migration decision. In China, economic reforms have resulted in massive spatial income inequalities, implying that even rural employment in the prosperous rural areas in eastern China would draw people from inland rural areas to relocate to earn higher incomes. Such rural-rural migration forms an aspect that has been largely ignored in existing literature on migration.

The basic model of migration is developed by Harris and Todaro (1970) who focus on rural-urban migration in Africa. The model is based on a two-sector economy, in which migration decision is centred on equating the expected earnings between the rural and urban sectors. As the urban sector is more productive, it will be able to pay higher wages than the rural agricultural sector. This model has a critical limitation as it ignores the importance of non-farm production in the rural areas. Rural non-farm production in China has been dominated by the so-called village and township enterprises (TVEs). The TVEs provide highly-paid employment opportunities to rural labour in most parts of the country, especially in the coastal provinces. These enterprises are major employers of rural workers coming from the poor inland provinces.

In China, the change from a capital-intensive development strategy before economic reforms started to a labour intensive one post 1978 has enabled the urban economy to create many more jobs. Coupled with a relaxation of regulation of rural-urban migration, the urban economy has been able to absorb tens of millions of rural migrants. In the meantime, rapid development of rural non-farm industries has also allowed large numbers of rural workers to move out of agriculture without having to relocate to the cities. This explains why there are fewer peasants moving to the cities than there would have been under Harris-Todaro's model in China. In the literature, many studies show that rural migrants working in the cities are more educated than those left behind in the countryside. However, Zhao (1999) shows that the rural industrial sector tends to attract the best educated rural workers in Sichuan, which is China's most populous province supplying the largest number of out-migrants to other provinces. Song (2002) suggests that rural non-farm employment is an important outlet for peasants to diversify their risk of labour allocation before they make their decisions on migration. Without the rural

industries, there would have been many more rural workers moving to the cities than seen today.

Economic reforms and uneven regional economic development have created an unprecedented environment for massive rural-urban migration in the past decades (Fan and Stark, 2008; Liu, 2008; Brosig, et. al., 2007). Wu and Li (1996) survey the literature on China's rural-to-urban labour migration. Liang and White (1997) examine how economic conditions, foreign capital investment, and the presence of rural enterprises influence inter-provincial migration. Wang and Zuo (1999) point out that China's widened urban-rural divide arises from the socialist industrialization process, which creates a hastened heavy-industrial base at the expense of its rural population. The urban-rural gap in social and economic well-being, together with a massive reservoir of rural surplus labour and an acute shortage of consumer goods, formed the driving forces of China's change of migration-control policy and the rapid increase of rural migrants in Chinese cities (Wu and Yao, 2003; Yao, Zhang and Hanmer, 2004).

The existing literature provides an important insight in understanding the actual situation of migration in China, but there is no study that provides a clear analysis of the various patterns of migration at the village level, using national census data. This paper aims to fill this literature gap as it will use the SNAC data for all the population, villages and households in two Shaanxi prefectures. As these prefectures are among the poorest areas in China, they provide representative samples for a thorough understanding of migratory behaviour of the poor or low-income households, especially those residing in the western parts of the country.

The sample prefectures are located at the centre of the Loess Plateau where environmental conditions for agricultural and industrial development are poor. Large-scale migration therefore offers new opportunities for the millions of rural poor families of this region to not only secure their livelihoods, and also reduces the pressure of population growth on the local ecological environment. From this perspective, many important topics have emerged regarding the development and impacts of rural migration, including:

- The scale of migration;
- The impact on the rural demographic structure as a result of massive migration;
- The likelihood of migration among different kinds of villages or population groups;

- The effects of migration on poverty alleviation and on ecological improvement;
- The main determinants of migration;
- Policy implications of migration for local, regional and national governments.

All these issues are important for China in dealing with the migration problem and helping disadvantaged areas and people fight poverty. These issues can be thoroughly understood by carrying out a detailed analysis of a dataset extracted from the SNAC. With a geographic focus on North Shaanxi, the dataset contains information on all 8,914 administrative villages, 1.1 million households and 4.9 million people living in Yanan and Yuling prefectures (now municipals). Furthermore, relevant information from household questionnaires are aggregated and integrated into the village dataset.

The rest of this paper is organised as follows. The next section will provide a background and outline of all villages within the region. Section 3 discusses the profiles and group division of rural migration. Section 4 identifies relevant factors which are correlated with migration patterns. Section 5 explores the relationship with agricultural resources. Section 6 discusses the key research findings. The final section concludes with some policy recommendations.

2. Village profiles

North Shaanxi is at the heart of the Loess Plateau which is dominated by numerous hills and mountains. The data sample includes 8,914 villages in Yanan and Yuling prefectures. More than 5,600 villages, or 63% of all the villages, are located in mountainous areas, while over 3,200 villages, or 36%, are located in hilly areas, and only about 1% in plain areas. The topographical structure implies that most of the villages are in adverse living environments.

The Loess Plateau and North Shaanxi are among the poorest areas in China, suffering from massive poverty. The central government has tried to help the rural poor by identifying and targeting poor villages in the allocation of poverty alleviation aid and projects. About 2,600 villages, or nearly 30% of all the villages, are recognised by either provincial or county governments as poor villages. Interestingly, there is no significant difference in the distribution of poor villages between hilly and mountainous areas. However, it is interesting to note that villages located in plain areas are less likely to be

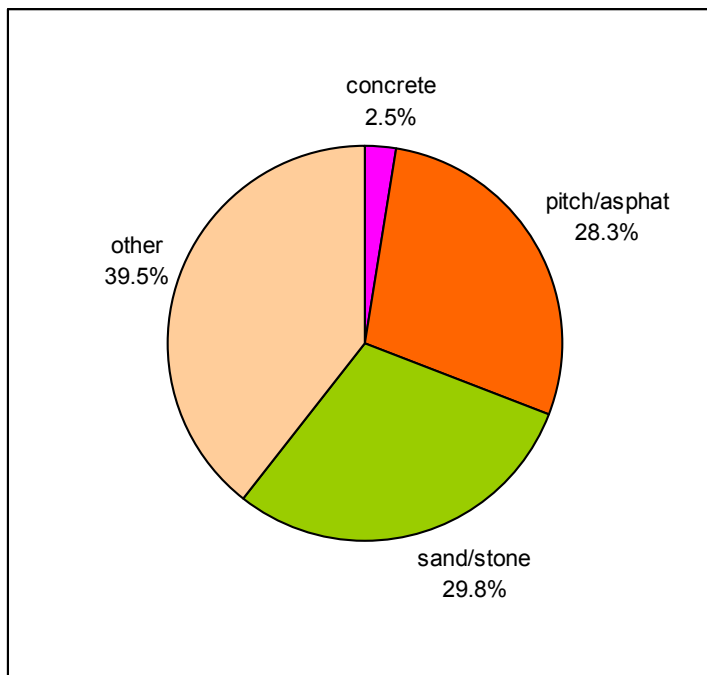
designated as poor villages. On average, 30% of all villages are categorised as poor villages but among those located in plain areas only 13.1% are poor villages.

In the dataset, there are on average 2.8 natural villages (or sub-villages) in each administrative village. This is lower than the average provincial (3.3) and national (5.3) figures. Although less densely populated compared to other parts of the country, infrastructure including transportation in North Shaanxi have been rapidly developed in the last decade. Over 90% of sub-villages have access to electricity and TV signals while 87% of sub-villages are connected with telephone lines, but more than one-fifth of all the sub-villages do not have roads accessible to motor vehicles.

Although the vast majority of sub-villages have access to a road for motor vehicles, the quality of roads vary significantly from one village to another, affecting the speed and quality of transportation. In rural China, roads are categorised into four different levels based on their surface materials: concrete (level 1), pitch/asphalt (level 2), sand and stone (level 3), others (level 4). The most reliable and highest-quality road surface is concrete, followed by pitch/asphalt, sand and stone, and others. The 'others' category usually means that the road surface is naturally formed of mud which is easily damaged by rains and other poor weather conditions.

Figure 1 shows the distribution of rural roads according to the above-mentioned categories in the sample villages of North Shaanxi, reflecting the geographical location, village resource endowment and economic conditions. It shows that only 2.5% of all the 8,914 administrative villages have access to concrete roads, 60% to pitch/asphalt and sand/stone roads, and 37.5% to other roads. The distribution of roads implies that despite most villages having access to roads, the overall quality of roads are low, a clear reflection of the adverse living and production conditions.

Figure 1 Access to different kinds of roads by administrative villages (N = 8,914)



This poor environment is reflected in the high proportion (30%) of villages designated as poor villages by different levels of governments. Designated poor villages are distinguished from others by various indicators such as remote geographic location, poor infrastructure and economic performance, low level of household incomes, etc. In China, different levels of authorities, from the central to provincial governments, use the “poor counties” and “poor villages” designations as the principal means to target the poor in China. Despite some fundamental weaknesses in this method, it has been used by different levels of governments to focus their poverty alleviation efforts for decades.

Access to bus stops, primary and middle schools is another important indicator of local living environments. On average, the mean distances of all villages to a bus stop, a primary school and a middle school are respectively 6.8, 3.6 and 10.4 kilometres. These figures imply that it must be difficult for most villagers having to travel long distances or to send children to schools, especially to primary schools.

For the designated “poor villages” and villages located in the mountainous areas, these distances are significantly longer than average. For instance, of the designated poor villages, the mean distances to a bus stop, a primary school and a middle school are respectively 7.5, 3.9 and 11.6 kilometres, or respectively 0.7, 0.3 and 1.2 kilometres

longer than the respective average distances. Compared to villagers in mountainous areas, those in plain areas fare much better in terms of travelling distance to a bus stop (1.2 km shorter), to a primary school (1.1 km shorter) and to a middle school (4.3 km shorter).

Our fieldwork observation suggests that the closure of village schools in recent years is an important reason driving rural parents to migrate to towns and cities. The huge distance that children have to walk to get to a primary school is probably the most critical deterrent to economic development in the most disadvantaged locations and an important incentive of rural migration. This can be further evidenced by the following analysis on the relationship between the probability of migration and the travelling distance to a bus stop, or a school.

Population size is a useful indicator of scale economy as larger villages are more able to offer community goods and services, such as schooling, transportation and health care. The village size is however critically constrained by topography. For instance, villages located in plain areas tend to be larger than those located in hilly areas, which in turn, are larger than those located in mountainous areas. The average numbers of households and people per village are respectively 189 and 755 in plain areas, 130 and 528 in hilly areas, and 114 and 458 in mountainous areas.

3. Migration patterns

Adverse living conditions, poor employment and earning prospects are key determinants of rural migration. The sample villages in North Shaanxi on the Loess Plateau provide excellent examples for studying the motivation of migration in rural China. The analysis in the previous section shows that despite significant improvements, access to transportation and education still pose difficulties for many villagers. But how do these adverse living conditions influence rural migration? This section will focus on the patterns of migration in the sample villages in order to identify the key determinants of rural migration. In particular, it aims to establish a framework to reveal the extent and nature of household/labour mobility and migration. This framework is then applied to the dataset to divide all villages into different groups before exploring the relevant factors in the next section.

While registered households (HD) and populations are still commonly used in official documents and research reports, such figures may be misleading as official demographic statistics underestimate the impact of rural migration which varies greatly between villages. There is a large number of rural households whose members cannot be found during the SNAC period as some families had moved to other places, mostly into towns and cities. On average, 20% of rural households and 19.1% of population respectively were involved with migration. It is remarkable that the outflow rates of plain villages are less than half of those of hilly or mountainous villages within the same prefectures. This implies that migration is significantly more evidenced in resource-poor villages than in resource-rich ones, although this point needs further evidence to support (Table 1).

Table 1 Outflow of registered households and population and topography

Location	Household (000)	Outflow (000)	%	Population (000)	Outflow (000)	%
Plain	11.5	1.13	9.8	46.1	4.0	8.7
Hills	418.7	84.4	20.2	1,704.9	334.6	19.6
Mountain	640.9	129.2	20.2	2,576.6	489.9	19.0
Total	1,071.1	214.7	20.0	4,327.7	828.5	19.1

Sources: Second National Agricultural Census of China (NBS, 2006). The data covers all households of Yanan and Yuling prefectures in Shaanxi Province.

Taking the percentage of migrating households rather than population, all sampled villages can be divided into three types according to their outflow rates: low, medium and high. Table 2 shows the distribution of the sample villages based on household migration rates. Over one-third (35%) of the sample villages have a migration rate of below 10%. A similar proportion of sample villages have an outflow rate between 10% and 30%. About 30% of the sample villages have a migration rate of 30% or more. Some villages (8.6% of the sample) even have a migration rate of more than 50%.

Table 2 Distinction of Sample Villages in Outflow Rate

Migration rate	Number of villages	%	Division
0	1,480	16.8	Low
<10%	1,633	18.5	
10-20%	1,634	18.5	Middle
20-30%	1,439	16.3	
30-40%	1,112	12.6	High
40-50	779	8.8	
>=50%	758	8.6	
Total	8,835	100	--

Sources: the same as Table 1.

In our data, one in five rural households has moved their entire family to a town or city, or to another rural village located in a more prosperous region.

However, the most popular migration model in the past has been one in which some family members -- normally young males and unmarried female workers -- move out of the village, leaving behind other family members, usually the old people and children, to tend to their private plots of land or engage in other local farm activities or petty village-level services. Therefore, the migration pattern can also be analysed based on the migration of labour rather than population. To measure labour migration from the SNAC, migratory labour is defined as those working outside the same township for more than one out of 12 months in 2006. The labour migratory rate is measured as the proportion of migratory labour against total residential labour in each village.

Of the 4.22 million registered residents in the sample villages, there are 2.13 million (49.3% of the total population) labourers. On average, each village has 239 labourers, but the number of labourers varies significantly among different types of villages, ranging from 226 in a mountainous village to 456 in a plain village. With the total 18% labour migration rate, some important facts relating to the migration pattern emerge.

- The labour migration rate is slightly lower than the population migration rate, suggesting that rural migration has shifted from a pattern dominated by labour movement to one characterised by household (population) movement.

- Labour and household migration rates are lower in plain villages than in hilly or mountainous villages.
- The household and labour migration rates in our sample villages are lower than national or provincial averages which are respectively 24.8% and 25.2% (NSB 2008: 243).

At the national level, 84% of migrant workers work outside their villages for 7 months or longer, and the other 16% six months or less. In Shaanxi, 79% of migrant workers work more than six months outside their villages (NSB 2008: 242). Due to limited information in our dataset, it is not possible to calculate the duration of migration from the sample villages.

Among all the industrial sectors employing migrant workers, construction is the most important industry, accounting for nearly 40% of all migrant workers employed, followed by urban services (19%) and transport (15.7%). As only 14% of all the migrant workers (N = 53,700) from the sample villages have information about their employment destination, caution is necessary in interpreting the results.

In China, labour migration can be classified into five different types based on where the labourers move to: within county, within prefecture (or municipal), within province, outside province and international. For the whole country, 49% of all migrants move outside their provinces, and 31% outside their counties but within the same provinces (NSB 2008: 243). The respective figures for Shaanxi migrants are 38% and 38%. The other 24% of Shaanxi migrants move out of their villages but within their own counties, compared with the national average of only 19%.

It is useful to do a cross-check to understand the relationship between household migration and labour migration. Household migration can be classified into three types -- low, medium and high -- based on the household outflow rate, which is defined as the ratio of the number of outflow households over the number of all registered (*hukou*) households. Labour migration can be classified into four types -- few, low, medium and high -- based on the rates of labour migration, which is defined as the ratio of the number of migratory labourers over the number of all residential labourers. As a result, labour and household migration rates can be cross-tabulated in Table 3 which shows a clear and

significant correlation between the two types of migration: the higher the household migration rate, the higher the possibility of village labour seeking outside employment. In other words, if a village has more people moving out, the same village will also have more labour moving out.

Table 3 Distribution of labour and household migration

Household \ Labour		Few	Low	Medium	High	Total
		<1%	1-10%	10-30%	>=30%	
Low	1<10%	36.5	28.0	18.1	17.3	35.2
Medium	10-30%	19.6	18.0	28.1	34.3	34.8
High	>=30%	26.5	13.7	20.8	39.0	30.0
Total		27.6	20.3	22.4	29.7	100.0

Sources: see Table 1.

Through simultaneously examining labour and household migration rates, more useful information can be obtained regarding the migratory pattern of rural households and labour. For instance, all villages can be divided into five distinctive groups based on different combinations of two indexes as shown in Table 4. Each of the combination in Table 4 can be regarded as a special pattern of migration among the sample villages. These different patterns can further be used to understand the diversity and trend of rural migration and to identify the critical factors or dynamics of migratory behaviour.

Table 4 Village division by migration characteristics

Type	N	%	Definition
I	1,032	12.2	High in both labour and HD migration
II	1,603	18.9	High and medium in labour and HD migration
III	2,260	26.7	Medium in both labour and HD migration
IV	1,610	19.0	Medium and low in labour and HD migration
V	1,975	23.3	Low or few in labour and HD migration
Total	8,480	100	

Notes: HD = household. N = number of villages.

Sources: see Table 1.

Based upon the village division in Table 4, features of different types of villages can be summarised in Table 5. Using the number of registered households as a key indicator, the mean size of village increases from 105 in Type I to 133 in Type V. Clearly, the smaller

the village size, the higher the number of households involved in migration in both relevant and absolute terms. This also applies to labour migration. Bringing the two migration rates together, a combined migration index defined as the mean of household and labour migration rate ranges from 49.6 in Type I to only 2.1 in Type V.

Table 5 Features of sample villages by migration pattern

Type	Registered		Resident		Combined Migration index (%)
	Households Per village	Migration rate (%)	Labour Per village	Migration rate (%)	
I	105	43.2	131	56.0	49.6
II	118	28.4	178	41.9	35.2
III	112	27.5	200	20.8	23.2
IV	131	13.8	296	8.4	10.9
V	133	2.3	347	2.0	2.1
Total	121	21.1	240	22.3	21.4

Notes: Combined migration index is the simple average of the household and labour migration rates.

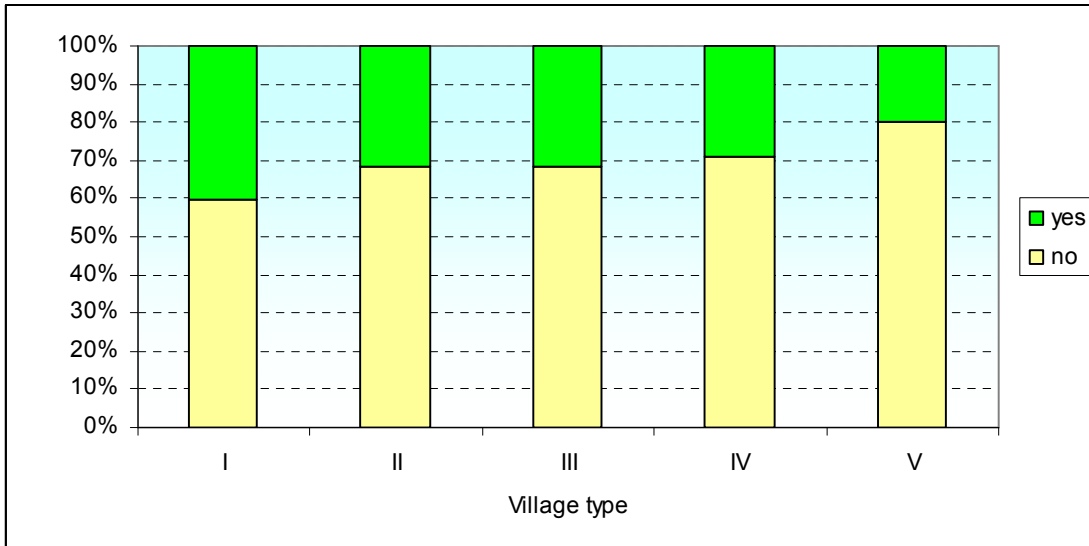
Sources: see Table 1.

4. Village comparison by migration pattern

Having divided the sample villages into five different groups in the previous section, this section attempts to identify the major factors affecting the patterns of migration. The first important factor that may influence migration is poverty. Information on income in the sample villages is not available but there is information on whether a particular village is designated by local and national authorities as a poor village. If a village has been designated as a poor village, it is assumed that poverty in this village would be more prevalent than in a non-poor village.

In order to measure whether poverty has an impact on migration, it is useful to see the relationship between the migratory pattern and the designated poverty status of villages. As shown in Figure 2, there is a clear relationship between poverty and the migratory index. For instance, 40% of the type I villages which have the highest migratory index are poor villages. The likelihood of villages being poor declines gradually from Type I to Type V which has the lowest proportion of poor villages (20%) and the lowest migratory index. This implies that households (and labour) are much more likely to move out if their villages are poor compared to those living in non-poor villages.

Figure 2 Distribution of poor villages by migration pattern



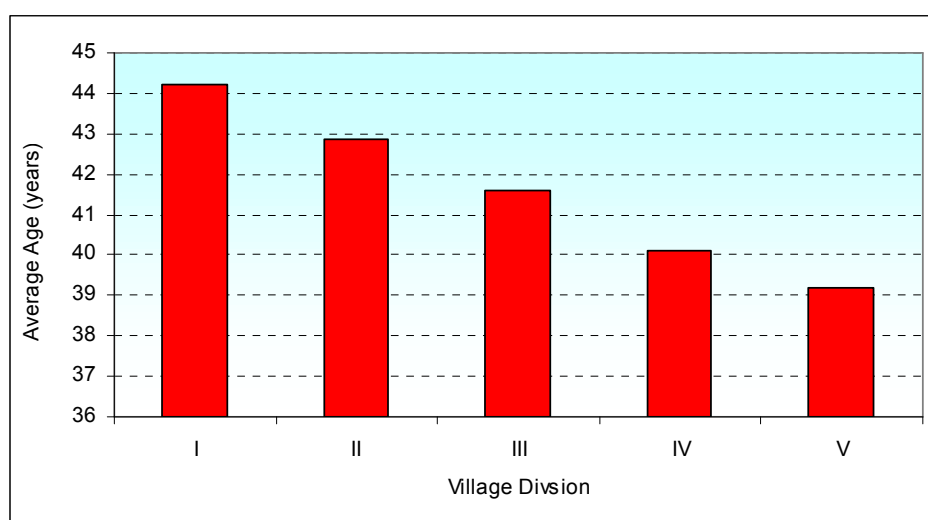
Notes: Yes = designated poor villages, No = non designated poor villages. I = highest migration tendency, V = lowest migration tendency.

Village infrastructure is another important factor affecting migratory decision. People are more likely to move out if they live in villages with poor road conditions or with a longer distance to a bus stop or school. For instance, for Type I villages with the most migratory activities, only 1.6% of roads are covered by concrete, compared to 4.4% for Type V villages. The mean distances to a bus stop and a primary school for the Type I villages are respectively 7.4 kilometres and 4.2 kilometres, compared to 5.8 kilometres and 3.2 kilometres for Type V villages. This implies that people living in villages that have poorer road access and longer distances to bus stops and primary schools are more likely to move out of their villages than those living in villages with better road access and shorter distances to bus stops and schools.

Education is one more factor important for migration. Contrary to some existing studies that show education having a positive effect on migration, the sample villages show a very different picture. The average number of years of schooling is lowest in Type I villages (5.7 years), with that figure rising gradually from Type I to Type V villages where the average number of years of schooling is the highest (7.4 years). This suggests that there is a clear reverse relationship between the level of education and the tendency of outward migration at the village level.

The average age of the working population is significantly affected by migration. The average age of labourers is the highest in Type I villages with the highest migration rate. It declines steadily from Type I to Type V villages -- from 44 years to 39 years. This implies that as younger people move out of their villages, the average age of the remaining villagers goes up. Figure 3 illustrates clearly the consequences of rural migration which has resulted in the emergence of the "aged society" in China's countryside in general and in poor villages in particular.

Figure 3 Mean age of village labourers by migration pattern



While the differences in schooling years may be attributed to different endowment of education facilities, the gap in the mean ages between villages is better explained by the consequences of migration. The impact of rural migration can be seen by comparing North Shaanxi figures with Shaanxi Province and National averages in terms of education and schooling years as shown in Table 6.

Table 6 Comparison of education and age between region, provincial and national average

	N. Shaanxi	Shaanxi	National
Education	6.6	8.0	7.8
Age	41.3	36.6	36.8

Notes: Figures of Shaanxi and National averages are estimated by the authors based on NSB (2008: 204-205).

Migration has an impact on the gender mix of village labour as well. While the national and provincial mean ratios of male to female labour are 1.046 and 1.006 respectively, the

figure in North Shaanxi is 1.086, which is much higher than the national and provincial averages. Different male-female labour ratios are significantly related to village migration patterns. Generally, the higher the rates of village migration (e.g. village I and II), the higher the possibility of having male labour involved in migration. This is in contrast to Types IV and V villages where either more female or less male labour are involved in migration resulting in a higher ratio of male to female labour. This is particularly true for Type V villages where it is likely that more females are involved in migration. The male-female ratio increases from 1.031 in type I villages to 1.161 in type V villages.

Rural migration is also related to or has an impact on the endowments of different agricultural resources. Table 7 lists several key variables for comparison purpose including: farmland, forest land, orchard, irrigation, areas of animal shelters, temporary greenhouse, as well as utilisation of chemical fertilisers. A few findings can be drawn from data on agricultural resources measured on a per capita basis.

- There is no big difference in the distribution of farmland and forest land amongst villages although Type V villages have a slightly smaller ratio than the average.
- Given that animal husbandry is a labour-intensive sector which has increasingly depended upon animal shelters for feeding since nomadic husbandry has been prohibited, it is not surprising that Type I villages have fewer animal shelters for animal husbandry. This is in contrast to Type II villages where animal husbandry plays a more important role in household income resulting in more shelters built there. Interestingly, Type V falls at the bottom of this category which is significantly differentiated from either Type I villages, or Type IV villages where animal husbandry is still an important part of household income.
- Compared with other villages, Type V villages are particularly strong in orchards farming, double the average of this region, and five times more than the area found in Type I villages. This indicates that orchards have become a major source of household income in Type V villages, which provides an income-generating opportunity for more labour to work at home, reducing incentives for labour and household migration.
- The Loess Plateau and North Shaanxi suffer from severe water shortage and frequent droughts, therefore access to irrigation systems is crucial to the security of livelihoods

in this region. Table 7 shows that on average, there is about half a *mu* (1 *mu* = 1/15 hectares) per capita irrigated land in Type VI and Type V villages, double the figures for Type I villages. Considering that only 13.5% of Type I villages and 20.5% of Type II villages have access to irrigation, compared with the regional average of 27.8%, it is clear that poor conditions of agricultural production are important reasons driving migration out of Type I and II villages.

Table 7 Comparison of agricultural resources by migration pattern

Item	Unit	I	II	III	IV	V	Total
Farmland	mu/hd	11	12	12	12	8	11
Forested land	mu/hd	8	7	9	11	7	8
Shell for animals	m ² /hd	10	17	12	13	9	12
Orchards	mu/village	103	147	156	221	566	273
Irrigation	mu/person	0.19	0.29	0.33	0.46	0.48	0.38

Note: HD = household.

Large-scale migration is also related to many government intervention programmes in recent years including poverty alleviation, "grain for green," subsidies for grain production, information and training support for migration, etc. Focussing on government aid at the household level, the distribution of government poverty alleviation and other forms of aid by village migration pattern shows a roughly equal distribution of poverty alleviation aid to all types of villages where around 3.5% of households receives benefits. This is in contrast to other types of aid (mainly reforestation projects) which have benefited 88% of all households in general, and those in Types I, II and III villages in particular. It is obvious that poverty alleviation has had a positive impact on migration directly or indirectly.

Migration is significantly influenced by the media and communication. Over 80% of rural families have TV sets as well as mobile phones, which are more popular than fixed-line telephones. The diffusion of computers in this region is in its early stage, with less than one quarter of villages having one computer or more. However, the penetration rate of the above-mentioned items except telephones differs significantly between villages: the higher the migration rate, the lower the penetration rate. For instance, the poorest villages (Type I villages, 10% of households) have much fewer computers than the better-off ones (Type V villages, 31% of households).

5. Multivariate regressions for rural migration

The analysis in the previous sections reveals the relationship between migration and a number of social and economic variables. To confirm our analysis and conclusion, this section uses a multivariate regression to identify the key determinants of rural migration.

The key determinants are identified as follows: village location: hilly and mountainous (dummy variable); infrastructure: distances to bus stops, primary and middle schools; poverty status: designated poor village and government aids; demography: age of village labour, ratio of male to female labour; resources: farmland, reforestation, animal shelters, farmland transfers within or across villages and mobile phones.

The summary statistics of the above-mentioned variables after data cleaning and exclusion of missing values and outliers are presented in Table 8.

Table 8 Summary statistics of variables

Item	N	Units	Mean	Std.	Min.	Max.
To bus stop	8912	Km	6.8	10.2	0	99
To primary school	8913	Km	3.6	5.0	0	60
To middle school	8913	Km	10.4	8.9	0	90
Labour schooling	8926	Year	7.1	0.9	3.9	10.7
Labour average age	8926	Year	41.3	3.2	27.6	54.5
Male to female ratio	8913	Ratio	1.1	0.3	0.2	4.5
Government aid	8862	per hd	0.3	0.1	0.0	0.9
Mobile	8766	per capita	0.2	0.1	0	1.17
Farmland	8674	mu/person	3.3	2.7	0.1	27.1
Animal shelters	6806	m ² /hd	3.7	3.9	0	58
Reforestation	7583	mu/person	2.7	3.2	0	46.4
Farmland transfer	8752	Ratio	0.2	0.4	0	8.8

Sources: see Table 1.

The logarithms of household migration rate and labour migration rate are used as two alternative dependent variables, which are regressed against the explanatory variables. Two sets of regression results are presented in Table 9.

Except for the poverty status of villages, all the explanatory variables in the household migration equation are statistically significant with expected signs. In the labour migration equation, village location, distances to bus stops and middle schools, education, farmland areas and land transfers are found not to have any significant impact. All the other variables are statistically significant.

The regression results imply that the behaviour of household migration is distinct from that of labour migration. This difference is striking because in the literature of rural migration few studies have paid attention to this issue. Our finding here has an important policy implication relating to the management of migration activities in China.

The migration of entire households is affected by many more factors than labour migration. Based on our results, it is clear that households wish to move out of their villages because of a complex set of reasons. Poor locations (hilly and mountain), lack of access to transportation and schooling are the key factors propelling household migration because migrants are seeking to find a better and permanent location for their families so that their children will have easier access to education and to escape poverty.

As a result of household migration, there is a number of important consequences on the villages where entire families move out. The average age of villagers, male-female labour ratio, and average agricultural resources (farmland, animal shelters, reforestation and land transfers) increase. These changes may have some positive effects on local villages as more resources become available to those left behind. Some changes may have significant and negative impacts on local production and the living environment. For instance, an increase in the average age of the working population and male-female ratio means that fewer young people and women are left behind in the villages, indicating a smaller labour force available for local economic production while single men may find it harder to get married.

The factors that have a significant effect on household migration may not have the same effect on labour migration. For instance, village location, distances to bus stops and middle schools do not affect labour migratory decision. Labour migration is only affected by their poverty status (designated poor villages, or villages receiving more government aid).

The consequences of labour migration are also different from those caused by household migration. For example, land transfer is not affected by labour migration. Like household migration, reforestation increases as more labour moves out, but labour migration tends to reduce the area of animal shelters, implying that less labour is available to develop local animal husbandry.

The effect of education on household migration is opposite to that on labour migration. If villagers are on average more educated, there will be less household migration. Better education may be due to easier access to schools and/or resource endowments, reducing the incentives for household migration. Conversely, labour migration is positively related to education, implying that more educated labour is more likely to migrate.

Table 9 Multivariate regressions to household and labour migration rates

Variables	Household migration rate		Labour migration rate	
	Coefficient	t-value	Coefficient	t-value
(Constant)		-8.49		-20.4
Hilly	0.25	2.66	0.12	1.3
Mountain	0.23	2.39	0.10	1.2
D-bus stop	0.06	4.56	0.00	0.0
D-P school	0.06	4.12	-0.06	-4.1
D-M school	-0.08	-5.86	-0.01	-0.6
Education	-0.22	-15.48	0.02	1.6
Age	0.14	9.01	0.36	25.1
M-F ratio	0.06	4.55	-0.19	-16.0
Poor village	0.00	0.05	0.06	5.6
Government aid	0.20	12.01	0.27	19.3
Mobile phone	-0.17	-12.96	0.06	4.9
Farmland	0.09	6.83	-0.02	-1.3
Shelters	0.05	3.84	-0.07	-5.6
Reforest	0.09	6.96	0.13	10.5
Land transfer	0.10	8.05	0.01	0.9

Notes: All the dependent and independent variables are in logarithms except for the dummy variables of hilly and mountain which specify the village locations. Definitions of all the other variables are given in Table 8.

6. Conclusions and Policy Implications

The purpose of this paper is to reveal the latest development and impact of rural migration in poor areas of China, particularly in the Loess Plateau. Focussing on North Shaanxi, we use the Second National Agricultural Census (SNAC) data covering all the administrative villages within this region. Several important research findings and conclusions can be drawn to fill in a literature gap on rural migration in China.

Firstly, migration is no longer limited to individual behaviour or a family strategy of livelihood diversification as nearly 40% of the rural population have been involved in migration either temporarily or permanently. Such a scale of rural migration has had a profound impact on the rural ecological, economic and social systems, giving rise to many complex consequences and uncertainties.

Secondly, two types of rural migration have prevailed in this region -- labour and household migration. Labour migration as a traditional migration model refers to one or more family members involving in short-term or long-term migration without the relocation of whole families. Household migration, by contrast, refers to a movement or resettlement of entire families although they are officially registered as village residents (in term of *hukou*) and are entitled to village land.

The two types of migrations have a similar percentage (around 20%) of the rural population and labour. These two types of migration are also related to each other. A high household migration rate is closely related to a high labour migration rate, suggesting that rural migration is approaching a new stage of development, that is, labour migration is gradually substituted by household or population migration.

Thirdly, rural migration is uneven across villages in both absolute size and percentage terms. We categorise all villages into five different types according to the combined levels of household and labour migrations. The most important finding of this study is that people living in poorer villages, measured in terms of resource endowments, location, infrastructure and education are more likely to migrate than those living in better conditions.

In other words, large-scale rural migration is more likely to occur from the marginal, remote and resource-poor areas than in the central, advanced or resource-rich locations. This seems to enhance the first conclusion that rural migration is not merely a consequence of individual behaviour or household preference, but a result of many complex factors and conditions. One such factor is that global climate change in recent years has made it increasingly difficult for local people to make a decent living from farming due to severe weather conditions and soil erosion. The declining importance of agriculture in the national economy and low prices of agricultural goods have also made farming unattractive compared to industrial and commercial activities outside the local villages and townships.

Fourthly, rural migration has positive and negative consequences. On the one hand, migration provides a great opportunity for raising household incomes. It can also reduce the pressure of population growth and the over-cultivation of farmland. In addition, it accelerates land transfers between households and across villages to exploit economies of scale in agricultural production. Migration also accelerates urbanisation in the prosperous coastal areas as well as in towns and cities of the inland regions.

On the other hand, migration tends to accelerate ageing in the local labour force, abandonment of farmland, a decline in the school-age population, and hence closures of primary schools. In particular, there has been a "brain-drain" effect in this region which has many village leaders to ask such questions as: "Who will be in charge of agricultural production and the new countryside movement in the near future if such large-scale migration is to continue?"

Fifthly, the unprecedented scale and speed of rural migration shown in this paper has raised a series of theoretical questions, including the generalisation of migration patterns across the Loess Plateau, other regions of Shaanxi and beyond; the relationships between poverty alleviation and migration; migration and urbanisation; as well as migration and regional/social inequality, etc.

Finally, it is striking and important to find that household migration is affected by more factors than labour migration. The key difference is that education and transportation conditions are two important factors influencing migratory decision for entire households. Villages with better education and transportation facilities tend to reduce household

migration, suggesting that local governments can play an important role in helping villagers to stay home through the provision of good education and transportation facilities.

The research results have important policy implications. The “negative approach” which ignores the existence of rural migration considers migration as a matter of individual and household behaviour or preference which is irrelevant to rural environment, sustainable development and poverty alleviation. A typical example is that local official statistics, reports and development plans are based upon the *hukou* population, leading to a distorted picture of rural income, poverty incidences, the demand for, and the effects of rural development projects.

Without accurate information to reflect the latest changes in village population and labour, unsurprisingly, many projects have failed to achieve their objectives. One such example is perhaps the on-going “new countryside movement” in some poor villages where a large number of village population has resettled in urban towns or moved to a long-distance location. Based on a standard blueprint designed by urban professionals, however, all villages selected by this programme have been required to build similar types of accommodation, family yards, or standard buildings to serve as primary schools as well as village offices. Regardless of the limited financial capacity of poor households, the small number of school-age children in such villages has led to wastage of project funds.

Instead of the “negative approach,” we call for a “positive approach” which views rural migration as an opportunity for poverty alleviation and ecological restoration in the short-term, and for sustainable rural and urban development in the long-term. In terms of poverty alleviation and ecological restoration, we make the following suggestions for policy actions:

- Redefining the rural population by providing both *hukou* and residential figures;
- Initiating a critical review of current rural policies and projects in one or two selected counties of North Shaanxi based upon the framework of this paper;
- Developing a package of aid policies to encourage and induce rural migration to desirable locations and sectors including information services, training courses, housing credits, access to urban school and welfare system, etc.;
- Encouraging farmland transfers between villagers;

- Encouraging the inflow of urban capital and talents to the countryside.

All these policies will help to achieve a long-term rural development goal. This goal will include a clear policy incentive for migrants to settle down in towns and cities with a decent and permanent living environment, including opportunities for their children's education. It will also help local villages strengthen their production conditions and employment prospects so that villagers left behind will have adequate resources to secure good and sustainable livelihoods. The empirical results from this paper show that village education, agricultural resources and production diversification (e.g., orchards and animal husbandry) are important elements in achieving sustainable development in the poor areas of rural China.

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