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Household Investment through Migration in Rural China

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Rural areas in China have gone through a remarkable transformation since the post-Mao reforms began in 1978. The transformation has certainly affected agriculture, as grain production increased remarkably at the beginning of reforms (McMillan, Whalley, and Zhu, 1989; Lin, 1992; Huang and Rozelle, 1996). But perhaps the most significant development in the rural economy resulted from the rise of township and village enterprises (TVEs) in the 1980s, their privatization in the late 1990s, and steadily increasing access to off-farm employment in urban areas (Weitzman and Xu, 1994; Li and Rozelle, 2001; de Brauw et al., 2002). However, the development of rural industry and opportunities to work off the farm was quite uneven, which has led to largely uneven distributions of income and wealth across space, even among rural areas (e.g. Demurger et al., 2001; Rozelle, 1996).

Despite widespread growth, the mechanism by which rural *families* in different areas of the country have participated in the growth and begun to transform themselves into wealthier, more productive households is not as well-known. From the household perspective, economic development involves making its resources more productive, it seems that the search for understanding how households enter the development process should begin with the study of one of the main resources they can employ, their labor. Although in the early years of reform most employment opportunities outside agriculture were in or around the village, as off-farm labor markets have developed, increasing numbers of rural residents have found employment in both local and distant labor markets, and this process has accelerated in the late 1990s (Parish, Zhe, and Li, 1995; de Brauw et al., 2002).

Despite the abundance of labor in China's rural areas, households are not restricted to using their labor to facilitate rising living standards. They often have access to land and potentially to other resources which can be used to increase their incomes. Households can make investments in their land, such as wells and terracing, to either make it generally more productive, or to transform it in a way that allows household members to participate in new, specific economic activities such as planting orchards or building greenhouses. Some households have also started businesses, using their household's endowment of land, housing stock, other resources, and always their labor.

However, households in rural China still face multiple constraints or face high costs in their pursuit of on- and off-farm production, especially in the area of

capital markets (Benjamin and Brandt, 2000). To increase the earnings potential of their economic enterprises, households must increase their capital base. In rural China, however, households often lack access to formal sources of credit necessary to do so (Park, Brandt, and Giles, 2001). Although informal credit is widely available, in many communities households can only borrow from these sources for emergency needs; after, for example, a bad harvest or to pay a one-time medical bill. Furthermore, households typically lack resources with which they can finance investments other than labor. Households typically have little land, less than one-half hectare, and poor households tend to have few assets that they can use to self-finance.

Research on households in rural China provides evidence that households have, in fact, frequently turned to off-farm labor, and in particular migration, in order to increase per-capita household incomes and accumulate the resources needed for investment (Rozelle, Taylor, and de Brauw, 1999; Bai, 2000). In one commonly observed strategy, households send out migrants to higher earning jobs. While away, migrants can either send money home as remittances, or save where they are and bring the capital back with them when they finish their migration spell. Such households can then use the remittances or migrants' savings for productive investments, such as land enhancing projects or family businesses, or consumptive investments, which includes investment in housing or consumer durables. In summary, households may use migration to finance a move to improved production technologies and/or to increase its living standard. Of course, there is a cost to this method of financing investment. While migrants are away, households may incur substantial costs, and the costs may or may not be made up for by remittances or savings that migrants bring back (e.g. Brown, 1997).

This paper strives to better understand how household investment is affected by participation in migration in rural China. To meet this goal, we have three specific objectives. First, we will document the ways that labor market activity, specifically migration, is associated with source community income generation and investment. Second, we identify the linkages by which household labor activities can facilitate investment. The theoretical model generates an empirically testable hypothesis, specifically that migration leads to long-run increases of investment levels and consumption in the source household, both while migrants are away and when they return. Third, we empirically test the hypothesis in order to better identify a mechanism by which rural households can increase their middle to long term welfare. To address concerns of possible endogeneity between migration activities and investment, we use retrospective data and panel data methods that control for household effects in the analysis.

The paper proceeds as follows. First, we introduce the data set that will be used for analysis. Next, we discuss in more detail the ways that households in rural China invest, how they participate in migration, and describe potential linkages between migration, household income, and investment. Third, we develop a theoretical model of migration and investment that takes into account institutional features of rural China, a model extending the framework established in the New Economics of Labor Migration (NELM) literature (Stark, 1991). Fourth, we empirically test the hypotheses generated by the model, and report on the results. The final section concludes.

1 Data

The data for this study were collected in a randomly selected, nearly nationally representative sample of 60 villages in 6 provinces of rural China. The provinces are Hebei, Liaoning, Shaanxi, Zhejiang, Hubei, and Sichuan.[1] To ensure broad coverage within each province, one county was randomly selected from within each income quintile for the province, as measured by the gross value of industrial output. Two villages were randomly selected within each county. The survey teams used village rosters and a census of households not included in the village's list of households to randomly choose the twenty households; both households with their residency permits (*hukou*) in the village and those without. A total of 1199 households were surveyed.

The household survey gathered detailed information on member demographics, wealth, agricultural production, non-farm activities, and investment over time. In all villages, village leaders were also asked to fill out a community level questionnaire that inquired about economic and demographic statistics regarding the village (e.g. the village population, number of households, agricultural production, etc.), including a detailed description of the composition of the village labor force.

Several sections of the household survey were designed to collect information about production- and consumption-oriented investments. All of the households in the sample were asked a comprehensive set of questions about investments they

[1]The data collection effort involved students from the Center for Chinese Agricultural Policy, Renmin University, and China Agricultural University. It was led by Loren Brandt of the University of Toronto, Scott Rozelle of the University of California at Davis, and Linxiu Zhang of the Center for Chinese Agricultural Policy. Households were paid 20 yuan and given a gift in compensation for the time that they spent with the survey team.

may have made over the past ten to twenty years. *Productive* investments include all land improvements aimed at increasing agricultural productivity (for example, terracing), land use changes for commercial agriculture (e.g. investments in orchards and greenhouses), and investments in non-farm enterprises. Enumerators also asked farmers about their purchases of farm equipment and draft animals. *Consumptive* investments include housing and durable goods. Residences built for the household itself, for the household's children who had moved out of the primary residence, and any major housing improvements made since 1990 were classified as housing investments. Enumerators recorded the year and cost of purchase for all durable goods, such as TVs, radios, and bicycles. Since we have data on any investments or purchases made since 1995, we can create both an annual investment variable and a variable that measures total investment since 1995, which we will call *cumulative* investment.

Another part of the survey focused on current and past migration experiences of all household members and children of the household head. Enumerators questioned all household members about their participation in off-farm work, the location of their employment (local or not), their wages, and if identified as a migrant, any remittances sent back to the household by migrants in 2000.[2] In addition, enumerators completed a twenty-year employment history form for each household member and each child of the household head in roughly half of the households (610 out of 1199). For each year between 1981 and 2000, the form gathered information on the main type of off-farm work performed (if any), the place of residence while working (at home in the village, or outside the village– i.e. local or migrant), the location of employment, whether or not the individual was self-employed, and the level of involvement in farming. We define migrants as any individual who had not formally split from the household, worked off-farm, and lived outside of the household while working. We can then further identify *return migrants* as household members who had migrated in the past but subsequently returned to the household.[3]

[2]For the survey year itself, 2000, migrants were identified as follows. All household members were first divided into two groups, those who lived outside the household three or more months and the children of the household head who had not formally left the household to set up their own (*fen jia*), but were not present for more than two months per year. Migrants were identified in the former group as people who held an off-farm job outside the village, and did not live at home while doing the job. In the latter group, migrants were identified as the children who left the household for employment, rather than to go to school or another reason not related to employment.

[3]When using these data, information on past migration and return migration activity, and any other time varying information, the paper will refer to the 610 households in the employment history sample.

2 Investment, Migration, and Financial Constraints in Rural China

In this section, we primarily lay out observed facts about investment and migration in rural China. First, we discuss why households might turn to migration to finance investment, both in developing countries in general and in rural China in particular. Next, we describe investment by households in our sample during the late 1990s. After discussing migration and return migration trends over time, we show how the descriptive data suggest that there is a correspondence between participation in migration and investment.

2.1 Migration as a Substitute for Credit Markets

Rural households in developing countries often lack formal sources of credit. As a result, many institutions have developed to help alleviate constraints on investment. The lack of access to capital is thought to be a major impediment to improving household incomes in developing countries (e.g. Bardhan and Udry, 1999). In some places, households may borrow from informal sources of credit, such as moneylenders or participate in NGO-managed microfinance institutions (e.g. Pitt and Khandker, 1998). In other places, households in some areas often accumulate wealth in order to be able to invest.

For poor households with no access to informal credit, it has been suggested that households may send out migrants in order to finance investments. Despite being plausible, almost all of the work on this topic is either theoretical or anecdotal (Stark, 1991; Karayalcin, 1994; Dustmann, 1997). When migrants leave, their remittances or savings can help alleviate cash or credit constraints on household production. For example, in the short run households might use remittances to rent factors of production factors in order to increase yields or raise the productivity of labor. In the longer run, migrant remittances or savings may help households make either productive or consumptive investments. Remittances may allow households to make purchases that add to the household's physical capital. Upon their return, migrants can (and often do) bring money back to make investments in businesses or other productive activities (e.g. Brown, 1997; Woodruff and Zenteno, 2001). Unfortunately, there is little convincing empirical evidence to support this hypothesis (an exception is Lucas, 1987).

As in other countries, economic growth in China's rural economy has led to a rapid increase in the demand for credit (Shen, 1999). Unfortunately, as in other de-

veloping countries credit markets are incomplete in some areas of rural China. In some richer areas, rural banks have been willing to make loans, providing households with opportunities for investment (Park et al., 2001). In poorer areas, however, formal credit is almost impossible to obtain. In those areas, households need to either accumulate savings or use other informal credit sources, such as family or microcredit schemes, to finance investments (e.g. Park and Ren, 2001). Migration has been discussed as a potential source of capital for households in rural China (Bai, 2001).

Data from our sample demonstrate that in 2000, credit markets were still relatively underdeveloped in rural China, Households have significant trouble obtaining credit from formal sources. Although 48 percent of households had obtained at least one loan of over 500 yuan in the past five years, only 19 percent were from more formal sources of credit such as private moneylenders, credit cooperatives, or banks. The rest of the loans were typically from relatives or friends.[4]

The type of imperfect land and labor markets that could cause households to use migration as a substitute for capital markets do exist in rural China. Although land rental has increased since 1995 (reported by Benjamin and Brandt, 2000), rental levels are still low. Of the land endowed to households in these data, an average of 5.3% of the land is rented in and 6.8% of it is rented out.[5] Agricultural labor markets are quite thin, but the village level data indicates households in more villages may be employing workers for specific agricultural tasks. Only 11 percent of households hired any agricultural laborers at all. Of those households, 65 percent of them hired labor for only ten days or less.[6] Therefore, households in most of rural China have limited access to additional land and labor if and when they want to allocate labor to other tasks, such as migration, to complete work that migrants (or other off-farm workers) may have done on the farm. Instead, they may be turning more and more to services they must pay for, to substitute for departed migrant labor.

[4]Here I have defined private moneylenders as "formal" sources, which is uncommon in the literature. Less than 10 percent of households have received their loans from banks or co-ops, which are more traditionally defined as formal sources of credit. Some of the informal loans may be considered private transfers, which have been studied in China by Secondi (1997).

[5]The figure is much higher in Zhejiang, the richest province in the survey. In Zhejiang, 12% of land is rented in and 14% is rented out by surveyed households.

[6]An accompanying village survey corroborates this evidence; it finds that although people have begun to be employed at harvest in a quarter of the villages in the sample since 1995, more villages have begun using harvesters or harvesting services. Villagers in 22 of the 60 villages have begun to rent harvesting equipment over the same time period.

2.2 Types of Investment in Rural China

Regardless of the source of investment capital, households in rural China have been making investments over the past twenty years and have been investing in much more than just agriculture. In fact, they make a wide variety of investments which are categorized here as *productive* or *consumptive* investments. Productive investments can be characterized as agricultural or non-agricultural. Agricultural investments include improvements in agricultural productivity, purchases of agricultural capital goods, and commercial agricultural investments. Agricultural productivity investments include land improvements meant to improve yields in grains and legumes. Agricultural capital goods include purchases of tractors, plows, or even bullocks that are used to perform tasks in agricultural production. Commercial agricultural investments are defined as investments in orchards, fishponds, forests, and similar changes in land use that lead to the production of high value crops. All other businesses that households run are considered non-farm enterprises, which take on many forms, ranging from small village stores to relatively large factories. Consumptive investments are investments that improve the quality of life for members of the household, rather than helping them increase their production. The investments included in this category are investments in housing and durable goods that cost more than 500 yuan.[7]

In the remainder of this section, I will discuss which categories of investment are the most frequent and costly within the two types of investment. I will concentrate on the amount invested by households since 1995. Although we have data on most categories of investment over longer periods of time, I choose to aggregate investments since 1995 for two reasons. First, over a shorter time horizon, it is likely that households have not been discarding many of their assets, nor have they faced much potential expropriation of other, land-based investments.[8] Second, and perhaps most importantly, the data set includes other information about the household that varies since 1995 or 1996, so we can create a retrospective panel on migration activity, investment, and other economic and demographic aspects of the household. After discussing each type of investment, I will describe

[7] All nominal values in this paper have been normalized by the rural CPI to their value in 2000 (ZJTJNJ, 2001). The official exchange rate in 2000 was approximately 8.27 yuan to the dollar.

[8] I have evidence that both of these reasons are true. Less than one percent of agricultural capital goods were sold or discarded in 2000, indicating that if I am underestimating the amount of capital goods held by households in years prior to 2000, the magnitude of that underestimation is fairly small. Additionally, in the whole sample only *five* households have completely lost land on which they had made an investment since 1980. In other cases in which households lost land on which they had invested, they received some form of compensation.

differences in average investment levels across time and space. Finally, I will discuss how investment differs in rich and poor areas *within* provinces.

2.2.1 Productive and Consumptive Investment

Although not all households invest every year, many households in our sample undertake some kind of productive investment between 1995 and 2000. The average total amount invested ranged from 3655 yuan in 1995 to 9365 yuan in 2000 (Table 1; row 1).[9] In any given year, between 16 and 25 percent of households made a productive investment (row 2). While not every household made a productive investment during the 5 year study period, a majority of them made at least one productive investment (53.9 percent; row 2). Moreover, as the percentage of households making an investment grows, so does the cumulative productive investment measure, increasing from 3655 yuan in 1995 to 11754 yuan in 2000 (row 1). The average amount of productive assets being held by households in the sample is increasing rapidly.

Households that choose to make investments might not choose to invest in production, but rather to invest in housing or durable goods that improve their quality of life. In fact, across all years, consumptive investment activity occurs more frequently than productive investment, and the average amount invested is larger (Table 1; rows 3 and 4). The value of the mean investment each year is driven by housing investments, which are typically the largest investments made by households in the sample.[10] Since households typically make only one housing investment over the sample period, the mean cumulative consumptive investment is relatively constant (Table 2; row 3). A larger proportion of households purchase durable goods than build housing in any given year, although the variability of these investments, not surprisingly, is larger than for housing. Between 13 and 20 percent of households report a large durable good purchase each year between 1995 and 2000, accounting for a significant portion of the frequency of consumption investments.

[9]The average has fluctuated a great deal over the past six years, due to a few very large investments in non-farm enterprises by certain households, which is made apparent by the large standard deviations found in some years (e.g. 1996).

[10]Of housing investments, 77 percent have been new houses; the other 23 percent are additions or renovations. Only renovations involving over 3000 yuan were enumerated. Housing and durables investment are summarized in Appendix Table 1.

2.3 Total Investment, across time and space

Since 1995, investment in rural China has also grown over time, although the rise varies both between and within the sample provinces. To track *total* investment by households, the cumulative measures of consumptive and productive investment are combined (Table 2; columns 5 and 6). By 2000, a large majority of households (83.6 percent) have undertaken some sort of investment, and the average amount of investment is over 26000 yuan (rows 5 and 6). The rapid increase in assets is consistent with a rapidly increasing standard of living in rural areas over the late 1990s, which is somewhat surprising given the Asian financial crisis of 1997 and claims of economic stagnation in China by some researchers (Rawski, 2001).

The amounts of investments made by rural households, however, vary significantly across China's provinces (Figure 1). Farmers in Zhejiang, for example, by far invest the most, which is not surprising given that Zhejiang has the highest rural per-capita income in China (ZGTJNJ, 2001). Total investment between 1995 and 2000 averaged around 50000 yuan in Zhejiang, almost double the next most active province (Liaoning). In poorer provinces, the investment levels are even lower. In Sichuan, for example, the average total investment amount was around 10 thousand yuan. Despite such a relatively low level of investment, almost 80 percent of households made an investment. In other provinces, participation rates were slightly higher, indicating that investment participation *rates* were high across the entire sample.

Within provinces, investment also differs significantly by county. We use each county's average GVIO, as reported by the SSB (2001), to characterize one county in each province as *rich* and label the others as *poor* (Table 3). Across all provinces, the rich counties have average investment levels that are roughly two and a half times higher than poorer counties (column 1). In richer areas, households are apparently better able to self-finance production or may have better access to credit, so they are more able to invest.

We can better characterize variation within provinces by comparing Zhejiang with all other regions (Table 3, columns 2-3). Yiwu county, the richest county surveyed in Zhejiang, has average investment levels five times higher than those for the richest counties in other provinces, and for other counties in Zhejiang. However, from the perspective of investment Zhejiang resembles the richest counties in other provinces. Average investment levels for the richest counties in *other* provinces are roughly the same as investment levels for the "poorer" parts of Zhejiang, and are about 60 percent higher than other relatively poor areas. Since investment differs so much between the rich counties and other counties, in the

rest of this paper we will compare two definitions of rich and poor areas. The first definition considers all of Zhejiang and the richest counties of all other provinces as rich areas, and all other counties as poor. The second definition includes only the richest county in all provinces as rich areas, and all other counties in the sample (including the latter four in Zhejiang) as poor areas.

2.4 Migration in Rural China

While aggregate household wealth has been growing throughout the late 1990's, trends in off-farm labor market participation, and specifically migration, have also been growing. Consistent with the trends described in Rozelle et al. (1999), our data show that the rural off-farm labor force grew significantly between the early 1980s and 1995 (Figure 2). By 1995, around 32 percent of the rural labor force in our sample worked off-farm, implying that the percent of the labor force working off-farm had more than doubled from the 15 percent that worked off-farm at the beginning of reforms in 1981. Despite the Asian financial crisis, China's own structural reforms, and a slowing of economic growth, rural off-farm employment continued to grow rapidly and perhaps accelerated during the late 1990s. By 2000, 43 percent of rural individuals in our sample participated in off-farm work, an increase of 11 percent over the late 1990s.

Migration has made up the fastest growing portion of the off-farm labor force throughout the 1990s (Figure 2). In 1981, less than 4 percent of the rural workforce were migrants; by 2000, that percentage had grown to 20 percent. In 1996, migrants became the largest component of the off-farm workforce, surpassing local wage earners.

While migration has grown rapidly in recent years, the flow of labor *back* to villages also has accelerated (Figure 3). The rise in return migration seems to lag behind the rise in out migration by three to six years. While migrant departures from the sample households began to rise in 1991, returns only begin to rise in 1994. The highest incidence of return migration occurs in 2000, when 31 individuals returned to the sample households. Neither the trend of new departures nor the trend of new returnees appear to be slowing down by the end of the sample period, which suggests that both the number of migrants leaving and returning to villages may increase in the years to come.

Migration and return migration is occurring in both rich and poor areas, with relatively similar frequencies. In 2000, using the first definition of rich areas, 46 percent of rich households had out-migrants, whereas 38 percent of poor households had migrants. However, return migrants lived in a larger percentage of rich

households than poor households. Again using the first definition of rich and poor areas, 27 percent of households in rich areas had return migrants living in them, whereas only 17 percent of poor households had return migrants living in them. Though there are less households with return migrants in poorer areas, return migrants may still have a larger effect on the economies of poor areas than rich ones.

2.5 Migration and Investment by Household Type

In the sample data, migration and return migration both appear to be positively correlated with investment activities (Table 4). Descriptive statistics indicate that migration may have longer term effects on household income. Return migrant households– that is, households with people living in them that in at least one year spent time working in a job away from the household– have higher total incomes and higher levels of wealth than households currently migrating and households that have not participated in migration (hereafter, non-migrant households). Furthermore, the average households with migrants currently out (hereafter, current migrant households) do not have higher incomes or wealth levels than households that have not sent out migrants. Therefore, return migrant households seem to be better off than other households.

Differences in income and investment levels are also apparent when households are categorized by residing in rich or poor areas (Table 5). In rich areas, return migrant households typically have much higher per-capita incomes than other households (rows 1-3, column 1). It is unclear from the descriptive statistics whether return migration has *caused* per-capita income to be higher, or if some other factor causes these households to have higher incomes and investment levels. In general,both current migrant and return migrant households also have higher investment levels than non-migrant households (column 2). However, households with out-migrants have lower levels of productive investment, which may mean they leave richer villages with less non-farm enterprises, as non-farm enterprises are the most capital intensive investments.

The descriptive statistics are somewhat different for poor areas than rich areas. Though migrant households in rich areas had lower per-capita incomes than non-migrant or return migrant households, in poor areas migrant households have roughly the same average income as return migrant households (Table 5; rows 4-5, column 1). Non-migrant households have much lower incomes on average (row 6, column 1). Investment levels are do not differ as much among households by migration in poor areas as in rich areas (rows 4-6; column 2). Though current migrant households have higher consumptive investment, they have lower pro-

ductive investment levels in general than non-migrant households. Therefore, if a causal link exists between migration and investment in poor areas, it is likely that migration causes consumptive investment. Such a finding would not be surprising, as poor areas often lack good business investment opportunities that would lead to higher investment levels.

3 A Two Period Model of Migration and Investment

Though Table 4 indicates that income, wealth, and investment levels are generally higher in return migrant households than other households, it does not indicate *how* return migration affects households. It may be that return and current migrant households were initially better off or at a different point in the life cycle than non-migrant households, and therefore have higher average levels of income and investment. Though households may ultimately achieve higher income and investment from migration, they also face tradeoffs when deciding whether or not to include migration in the household development strategy. In this section, we present a theoretical model that illustrates a mechanism by which migrants leaving and returning to households can increase household income through investment. The model generates an empirically testable hypothesis regarding linkages between migration and investment that will be tested in the following section.

Consider a household with specific characteristics X, a labor endowment $\overline{L}$, and a capital endowment K, that produces one good with its capital and labor, by a well-behaved production technology $f(K, L; X)$ in two time periods. It gains utility from consumption in the two periods according to a general utility function, $U(C_1, C_2)$, where C_i is consumption in period i, $i = 1, 2$. The household is assumed to consume the same amount in value as they produce, so consumption is equivalent to income. To add either to its first period consumption or to invest and add to its capital (which adds to its utility directly through consumption or indirectly through production), the household can send out migrant labor, M, to produce remittances, R, in the first period.[11] Remittances R are a function of migration, where $R = g(M; Z)$, and Z represent household factors that shape remittance behavior. For simplicity, we assume that migration always produces remittances to the household. In period one, the household can choose to invest

[11] Note that households could also save in period 1 in order to invest in period 2. Adding savings to the model, however, does not add to our understanding of the relationship between investment and migration, while it complicates the algebra significantly. Therefore, savings are not explicitly modeled.

a portion ϕ, where $0 < \phi < 1$, of its remittances in capital that is obtained and used in period two. The currency equivalent of capital in period two, therefore, is $K + \phi R$ if the household has sent out a migrant, and is K if they have not. From the perspective of period one, the relative output price in period two is expected to be p_2. Both functions, $f(\cdot)$ and $g(\cdot)$ are assumed to be concave, continuous, and twice differentiable. Implicitly, we assume that the household is credit constrained, and therefore it cannot borrow money in period one to finance greater production in period two (through investment in its productive capital). In order to break its liquidity constraint on generating additional consumption in period two, the household must send out a migrant.

Consumption in period one is equal to the sum of the amount produced in the household and the portion of remittances that are consumed, so $C_1 = f(K, \overline{L} - M; X) + (1 - \phi)g(M; Z)$. Consumption in period 2 is simply the amount that the household produces, so $C_2 = p_2 f(K + \phi g(M; Z), \overline{L}; X)$. Therefore, if a migrant is sent out, the household's consumption or income may drop in period one, due to the loss of labor in household production. This loss, however, may be mitigated by the immediate consumption of remittances. Households that both send out migrants *and* invest a portion of remittances will experience an increase in consumption or income in period 2, due to the increase in capital. The household's problem is to maximize its utility by choosing an amount of migration, M, and a portion of remittances, ϕ, to invest in later production:

$$\begin{aligned} \max_{M,\phi} \quad & U(f(K, \overline{L} - M; X) + (1 - \phi)g(M; Z), p_2 f(K + \phi g(M; Z), \overline{L}; X)) \\ \textbf{s.t.} \quad & 0 \leq \phi \leq 1 \end{aligned} \tag{1}$$

To ensure an optimum, two first-order conditions must be met. First, the household should gain no more utility from sending out more migrant labor.[12] The household will send out migrant labor until:

$$U_{C_1}(-f_L + (1 - \phi^*)g_M) + U_{C_2} p_2 \phi^* f_K g_M = 0 \tag{2}$$

where subscripts denote partial derivatives and arguments of functions have been suppressed. Since sending migrants out will decrease the amount the household will consume in period 1 (if $0 < \phi^* < 1$) and increase the amount it can consume in period 2, equation (2) shows that the household simply equates, in marginal

[12]The model describes labor as a continuous variable, which likely it is not, since a migrant must leave the household for a specified period of time.

utility terms, the cost of migration in period 1 with the gain from migration in period 2. If households participate in migration *and* invest, according to the model their income may decrease in period 1.

Figure 4 illustrates the tradeoff between consumption in period 1 (C_1) and period 2 (C_2) that can be facilitated by migration. If a household does not participate in migration, then its budget constraint is B_n and the household can consume where its intertemporal indifference curve IC_n is tangent to the budget constraint. However, a household that participates in migration may be able to reach a higher indifference curve as follows. If the household receives remittances from the migrant and invests at least a portion of those remittances (e.g. $\phi > 0$), its budget constraint shifts to B_m, and it can reach indifference curve IC_m. In order to reach the indifference curve IC_m, the household may have to give up some consumption in period one in order to realize the higher consumption level in period two.

The second first-order condition is that the household maximizes utility with respect to the fraction of remittances invested in capital in period two. Defining μ as the Lagrange multiplier on the constraint that the household consumes all of its remittances in period one (corresponding to $\phi^* = 0$), the first order condition for the optimal fraction ϕ of remittances invested is:[13]

$$-U_{C_1} g(M^*; Z) + U_{C_2} p_2 f_K g(M^*; Z) + \mu = 0 \tag{3}$$

Equation (3) also equates a loss of consumption in period 1 and a gain in period 2. Given period 2's expected prices, the household equates the marginal utility of consuming remittances in period 1 with the marginal utility of those remittances in period 2, in terms of productive capital. In terms of Figure 4, if $\phi^* > 0$ and the household invests some of its remittances, the budget constraint may shift down to B_m from B_n on the vertical axis (period 1), but it shifts out in period 2 so that the household can consume on the higher indifference curve IC_m.

However, if the household does not invest any of its remittances (e.g. $\phi^* = 0$), then the household is constrained to have a higher relative marginal utility of consumption in period 1 than in period 2 at the optimum, because μ is positive. In terms of Figure 4, the household will not be able to reach a higher indifference curve than IC_N by investing, so they will maximize their income in period one by sending out migrants and consuming the remittances immediately.

[13] In analyzing this first-order condition, we ignore the possibility that the household might still be capital constrained despite participation in migration ($\phi^* = 1$). Even if households are still capital constrained despite participation in migration, empirically we will observe an effect of migration on investment. Therefore, in the context of this paper this possibility is not empirically interesting.

Equations (2) and (3) implicitly define optimal functions for migration (M^*) and the fraction of remittances invested (ϕ^*). To understand which factors affect migration and investment, it is useful to rearrange equations (2) and (3) as functions of the marginal product of labor and capital in periods 1 and 2, respectively. Beginning with the marginal product of capital f_K, equation (3) can be rewritten as:

$$f_K = \frac{U_{C_1}}{U_{C_2}} \frac{1}{p_2} \Big(1 - \frac{\mu}{g(M^*)} \Big) \tag{4}$$

Equation (4) states that the household attempts to set the marginal product of capital f_K in period 2 equal to the product of the relative utility in period 1, U_{C_1}/U_{C_2}, and relative prices in period 1, $1/p_2$. If the household does not fully invests its remittances ($\phi^* < 1$), then the shadow price of capital is zero ($\mu = 0$) and the household is able to equate the marginal product of capital in period 2 with its relative utility value in period 1. In this manner, migration acts as a substitute for credit. The household is able to substitute labor in period 1 (in the form of migration) for capital in period 2.

Rearranging equation (2) as a function of the marginal product of labor yields:

$$f_L = \Big((1 - \phi^*) + \frac{U_{C_2}}{U_{C_1}} p_2 \phi^* f_K \Big) g_M \tag{5}$$

Equation (5) suggests than in period one, the household equates the marginal product of labor within the household with some function of the marginal product of migrant labor. In fact, if $\phi^* < 1$, then inserting equation (4) into equation (5) simplifies to:

$$f_L = g_M \tag{6}$$

Equation (6) is essentially the result obtained by Harris and Todaro (1970), but from the household perspective. If the household is not constrained to consume all of its remittances in period 1, it will allocate labor to migration until the marginal product of within-household labor equals the amount it can make outside the household (in migration). From the perspective of period 1, the household is able to reach this first-best solution by adding up the *present* benefits from migration (in period 1) and the *future* benefits of migration, which come through investment.

The household may not be able to invest remittances in the first period if it is constrained to consume all of its remittances at the optimum in period one

($\phi^* = 0$). If $\phi^* = 0$, then the household will immediately consume all of the remittances sent back by migrants, if they send out migrants at all. If the marginal product of labor in the household, f_L, is higher than the marginal product of labor outside the household, g_M, then $M^* = 0$ and the household does not send out any migrants. Furthermore, if $\phi^* = 0$, then there is no link between the two periods. In this case, as implied by the Harris-Todaro model (Taylor and Martin, 2001), there is no rationale for remittances (or migration) to have an effect on the rest of household income or on investments.

According to the model's results, two types of households will not attempt to invest remittances. First, households that are rich or reside in richer areas might decide to forego migration altogether. Households in richer areas are likely to coincide with more robust off-farm labor markets (Mohapatra, 2001), and do not need to migrate to find a job to increase their income. Households that are rich tend to have more capital, and therefore they may be able to finance their own investment. Moreover, as suggested by Stiglitz and Weiss (1981), richer households or households that are situated in richer areas are more likely to have access to credit, so they likely do not need to send out migrants to finance investments. In summary, households in areas with better capital or labor markets may be less inclined to participate in migration to finance investment.

Second, extremely poor households might not be able to overcome the financial or informational costs of even sending out migrants. If they are able send out migrants, however, they may find remittances better suited for consumption or savings, either because the relative utility of present consumption or the discount rate may be high, (U_{C_1}/U_{C_2}), causing households to send out migrants.

4 Empirical Strategy and Results

In this section, we will test the hypothesis generated by of the theoretical model. The hypothesis states that despite the fact that consumption or income may suffer in the short term if a migrant leaves (Taylor, Rozelle, and de Brauw, 2002), the return of a migrant or the *expectation* of a migrant return will lead to investment at the end of the first period, which implies consumption will be higher in the second period. In this section, we will empirically test whether or not investment is higher in households participating in migration, and we will provide measurements of the effects of out migration and return migration on household investment.

4.1 Effects of Migration on Investment

The hypothesis generated by the theoretical model in Section 3 states that when migrants return to households, households allocate funds to investment. In terms of the model, if the optimal fraction of remittances, ϕ^*, that migrant households invest is positive, migration or past migration behavior should have a positive effect on investment (equations (2) and (3)). However, in measuring the effect of migration on investment, we must be concerned that the choice of the optimal number of migrants, M^*, may be affected by unobservable factors at the household level that are likely to affect both ϕ^* and M^* in the same manner. Therefore, to learn about the effects of migration or return migration on investment, we need to employ an empirical strategy to control for unobservable factors, or timing factors, at the household level. One such factor is household wealth at the beginning of the study period, which we would have trouble measuring accurately for all households in the sample.

To test the link between migration, return migration, and investment at the household level, we employ two strategies. Our first strategy is not investigate whether or not recent return migration affects a *current* investment decision. To do so, we create indicator variables for consumptive, productive, and total investment taking place in either 1999 or 2000. Although investment is available for all years, we only use the final two years of data to account for timing. We regress the indicator on a set of indicator variables that measure whether or not households have out migrants or have had a migrant return between 1995 and 1998. We also include dummy variables that indicate whether or not consumptive or productive investments took place between 1995 and 1998. By using lagged migration and return migration indicator variables, we hope to simply test whether there is a positive correlation between a previous decision to return and a present decision to invest. We add explanatory variables for household characteristics including wealth (as measured by the logarithm of the value of assets owned at the beginning of 1995), village characteristics, and provincial indicators to the model. Because of the nature of the dependent variable, we use a probit specification (Table 6).

Using this strategy, we find that an indication of returned migrants only leads to a statistically significant effect on the probability of consumptive investment. According to the model, if a migrant returned to the household between 1995 and 1998, that household is 21.4 percent more likely to invest in consumption goods (housing or durables) than a household that did not have a migrant return. The coefficients of the return migration variable in the other equations that explain the probability of investment are positive, but statistically insignificant. One reason

that return migration may not have a significant effect on productive investment is that the effect may vary across productive activities; Appendix Table 2 indicates that households with return migrants are 40 percent more likely to have invested in commercial agriculture, but return migration does not have a statistically significant effect on other activities.

Though the results reported in Table 6 confirm that return migration affects the probability of consumptive investment, it leaves two concerns. First, although we try to line up the variables for migration and investment to capture the causality expected, the regressions are still cross-sectional. Because there is no way to control for unobserved factors that vary across households, the coefficient on the return migration variable may be in part capturing unobserved heterogeneity. Second, the results do not demonstrate the *magnitude* of the effect of return migration on investment.

To control for factors that vary across households, and to learn about the magnitude of the effect of return migration on investment, we try a second approach. We specify an equation to estimate the effects of the last period's out migrants and return migrants (e.g., M_{t-1} and R_{t-1}, where R represents return migrants living in the household) on household wealth accumulation in the current period, holding constant all non-time varying and supra-household effects. We do so with a fixed effects approach:

$$W_{ht} = \alpha_h + \zeta_M M_{h,t-1} + \zeta_R R_{h,t-1} + \zeta_Z Z_{ht} + \varepsilon_{ht} \tag{7}$$

where W_{ht} is the total wealth acquired by household h by period t since the beginning of the study period, and α_h is the household level fixed effect. In this regression, we begin measuring wealth as zero at the end of 1995, and the effect of any capital owned by the household in 1996 is absorbed into the fixed effect.[14]

Before estimating equation (7), there are two econometric concerns that must be considered. First, since we are estimating an equation that measures the accumulation of a stock over time, the error terms across periods may be autocorrelated. As a consequence, we need to test for autocorrelation of the estimated residuals, and correct for autocorrelation should it be found. Second, since approximately 15 percent of households do not invest during the sample period, and 30 to 40 percent of households do not invest in either productive or consumptive

[14]The goal of this regression is to test what effect migration has had on investment since the beginning of the study period. Since the amount of wealth held by each household at the beginning of the study period is in effect constant, its effect on further wealth accumulation is absorbed into the fixed effect.

goods, the dependent variable in our model is censored and may create bias. To account for the potential censoring bias, while continuing to hold all unobservables at the household level constant, we use both a least squares fixed effects estimator and the fixed effects tobit estimator developed by Honoré (1992). We use the measures of consumptive investment, productive investment, and total investment as dependent variables in separate specifications.

After accounting for first-degree autocorrelation, participation in migration and migrants returning to the household both have a positive effect on the change in household consumptive and total investment (Table 7).[15] For each additional migrant sent out, the household is able to increase its consumptive investment by 3981 yuan and its total investment by 4401 yuan (row 1, columns 1 and 3). An additional migrant returning is associated with a 3374 yuan increase in consumptive wealth (row 2, column 1). The coefficients on productive investment are also of the expected sign (positive), but they are statistically insignificant. Therefore, the effect of migration on *productive* investment may not be as strong. These results are a strong indication that migration has a positive effect on investment. In other words, households that send out migrants seem to take advantage of remittances and savings brought home by migrants to invest in items that improve the quality of their lives, rather than items that will produce more income in the future.

The estimated coefficients presented in Table 7 are the *average* effects of migration on investment across the entire sample, and therefore they may not represent the way migration affects investment in different areas. To test whether migration and return migration affect investment by households in rich and poor areas differently, we split the sample into rich and poor areas by the two methods discussed in subsection 2.2 (Table 8).[16] Both definitions of rich and poor consistently show a marked difference between the effects of migration on households in rich and poor areas. When rich areas are defined as all of Zhejiang and the richest county in all of the other provinces, only out migrants have a positive, significant effect on investment, and the effect is quite large; each out migrant is associated with a 6184 yuan increase in consumptive investment (row 1, column 1). However, return migration has no statistically significant effect on any type investment, and the effects of both migration variables on total investment are both statistically insignificant (column 1, rows 4-6). The results for rich areas are even

[15] We also test whether the data are generated by an AR(2) process, but find that the data are generated by an AR(1) process.

[16] For the purposes of estimation, alternative definitions of "rich" and "poor" were also considered. The results were qualitatively very similar. Full sets of results are presented in de Brauw (2002).

stronger for the second definition, when the relatively poor counties in Zhejiang are excluded from rich areas; in this case, none of the coefficients of interest are even remotely statistically significant. These results suggest that migration may not have a strong effect on households in richer areas, where credit is typically more available in developing countries than in places where incomes are low (e.g. Park et al., 2001).

According to both definitions of poor areas, the effects of migration on investment are different. Considering all counties that are not the richest in the province and not in Zhejiang, return migration has a positive, statistically significant effect on consumptive and total investment. Migrants returning are associated with a 3610 yuan increase (column 2; row 4) in consumptive investment and a 4160 yuan increase in total investment (column 2; row 6). The additional investment attributable to return migrants is roughly the same as the difference between average consumptive investment in non-migrant households and return migrant households (3550 yuan; Table 5). Out migration also has a positive effect on investment, though not as large as for households from rich areas. An additional out migrant is associated with a 2960 yuan increase in consumptive investment, and a 3286 yuan increase in total investment (column 2; rows 1 and 3). These results imply that households in poor areas depend upon migrants to facilitate investment. Using the second definition of poor areas, the results confirm the that households in poorer areas tend to use migration to facilitate consumptive investment (column 4). Furthermore, they suggest that even the relatively poor counties in Zhejiang, though they have average wealth levels close to those of rich counties in other provinces, depend upon migration to spur investment. Even if the business environment in or around the village is poor, households use migration to invest in housing or consumer durables to improve their living standard.

One econometric issue remains, and that is whether or not censoring bias affects the estimates in Tables 7 and 8. To confirm that the results are not affected by censoring bias, we estimate equation 8 using estimates for $\hat{\rho}$ listed at the bottom of Table 7 and Honoré's fixed effects tobit estimator. For the Honoré method to yield consistent estimates of ζ_M and ζ_R, the error terms must be independently distributed. Given the first-order autocorrelation found in the least squares regressions, to ensure that the error terms in the Honoré estimates are independent we first transform equation (7) as follows:

$$\begin{aligned} W_{ht} - \hat{\rho}W_{h,t-1} &= \zeta_M(M_{h,t-1} - \hat{\rho}M_{h,t-2}) + \zeta_R(R_{h,t-1} - \hat{\rho}R_{h,t-2}) \\ &\quad +\zeta_Z(Z_{ht} - \hat{\rho}Z_{h,t-1}) + \upsilon_{ht} \end{aligned} \tag{8}$$

where $\upsilon_{ht} = \epsilon_{ht} - \hat{\rho}\epsilon_{h,t-1}$. If $\hat{\rho}$ eliminates the correlation between residuals, then the transformed error terms $\{\upsilon_{ht}\}_{t=1}^{4}$ will be independent and the estimates are consistent.

Though the results of the Honoré estimates are qualitatively very similar to the least squares results in Tables 7 and 8, the magnitudes of the statistically significant coefficients are all much larger (Table 9). For the sample that includes all households, migration and return migration have a positive, statistically significant effect on consumptive and total investment (rows 1 and 2, columns 1 and 3). However, the magnitudes of the coefficients are much higher. An additional out migrant is associated with an additional 16000 yuan in consumptive investment, and an additional 13400 yuan in total investment. Return migrants are also associated with large increases in investment. A return migrant is associated with a 14900 increase in consumptive investment, and a 12370 yuan increase in total investment. In light of descriptive results which show that average total consumptive investment is 17510 yuan over the sample period, these results seem to overstate the true amount of investment caused by migration.[17]

In summary, the effect of migration on investment seems to be stronger in households in poorer areas than in richer areas. These results are consistent with the idea that households in richer areas are better able to self-finance investments or have better access to credit. In lieu of credit access, households in poorer areas must turn to their labor to provide themselves with capital to invest. Furthermore, they may lack productive investment opportunities, so they use money earned by migrants to build houses or to purchase consumer durables. If we take the least squares estimates to be a lower bound on the effect of migration on consumptive investment, and the Honoré estimate as an upper bound, then out migrants create between 4280 and 16230 yuan of additional wealth in poorer households, and return migrants create between 4613 and 16980 yuan.

[17]When the counties are split into rich and poor areas again, statistically significant effects of migration on investment are found using the second definition of rich areas. Each out migrant is associated with a 16230 yuan increase in investment, and a total increase of 14840 yuan. Return migrants are associated with an increase of 16980 yuan of consumptive and 15970 yuan of total investment. Once again, there are no statistically significant effects of migration on investment in richer areas.

5 Conclusions

In this paper, we have explored the determinants of migration and the interactions between migration, household income, and household-level investment in rural China. Using a data set covering much of rural China, the paper first describes investment and migration behavior in households, and empirically tested two hypotheses. Descriptively, we find that many households have accumulated wealth over the late 1990s, in terms of both productive and consumptive assets. Households have also increased their participation in migration over the late 1990s, and that participation trends seem likely to continue upward into the next decade.

To test for linkages between rising levels of migration and investment, we first present a theoretical model that links them, generating the hypothesis that households participating in migration will have higher income levels. Second, we use a variety of econometric methods to test whether migration leads to increased investment. Using a cross-section of households for which time varying information is available, the paper finds that across the *entire* sample, households to which migrants have returned by 1998 have about a 20 percent larger probability of investing in consumption goods in either 1999 or 2000. When the amount of cumulative investment is regressed on the out migrants and return migrants from a household, holding *everything* constant that does not vary over time, it finds that both out migration and return migration have an effect on investment; according to our base fixed effects estimates, it increases across the entire sample by about 4000 yuan for either migration or return migration.

Though households in richer areas seem to benefit more in the short term from migration, households in poorer areas benefit more in the long term from both out and return migration. Defining rich areas as the villages in the richest county in each province in the sample, no migration variable has a statistically significant effect on household investment. However, households in poorer areas benefit both while migrants are out and when they return. The benefits are typically in consumptive rather than productive investments, so households use migration as a way to accumulate more consumer durables or to improve their housing. It may be that households in these areas simply do not have viable productive investment opportunities, and therefore they invest their income in improving their everyday lives.

The results in this paper have strong implications for China's regulations that hinder population movement. This paper provides evidence that households that participate in migration are better able to invest in housing and consumer durables when they participate in migration, and that the effects of migration are strongest

in places that cannot be considered well-off. Therefore, constraints that are placed on movement from rural areas may be hindering household investment. One way China's government can increase the flow of money into rural areas would be to increase the flow of labor out of those areas.

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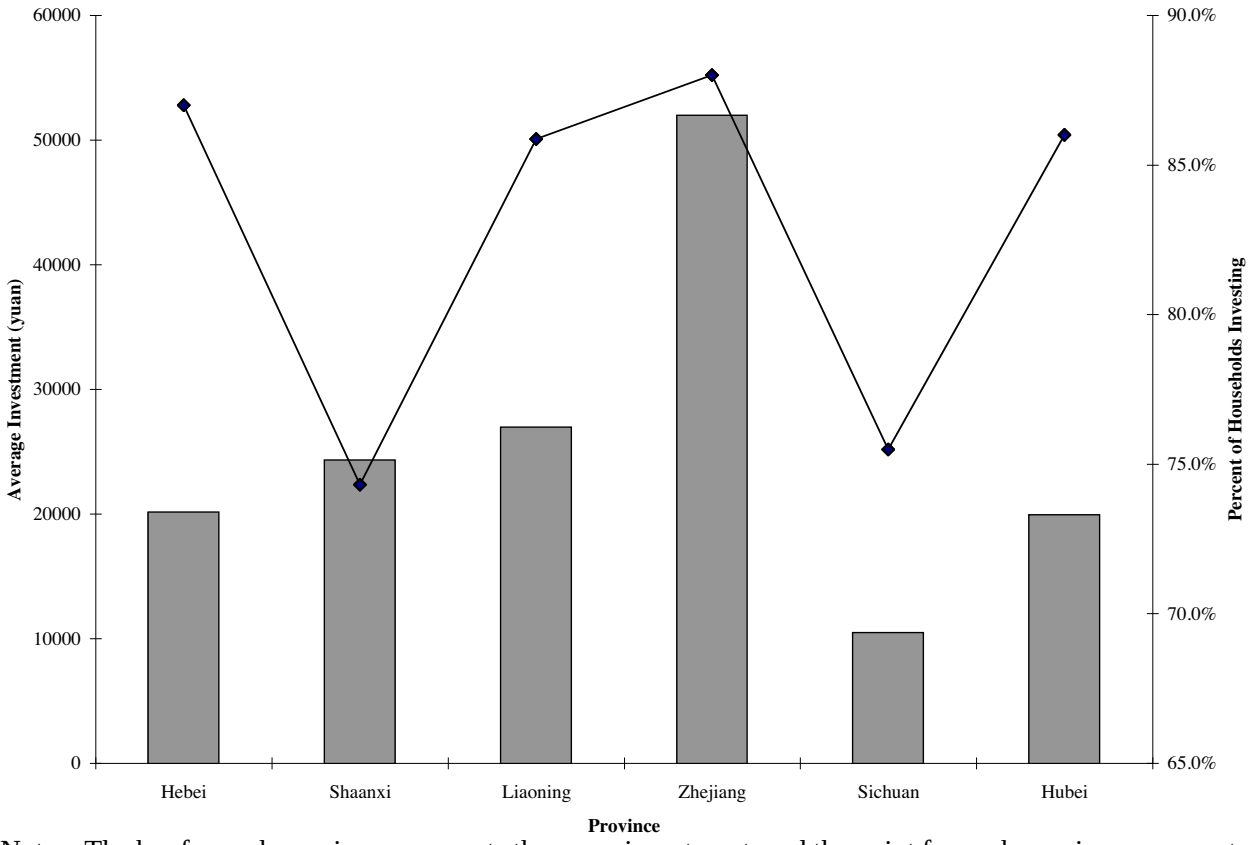


Notes: The bar for each province represents the mean investment, and the point for each province represents the percentage of households that had invested between 1995 and 2000.

Figure 1: Cumulative Investment since 1995, by Province

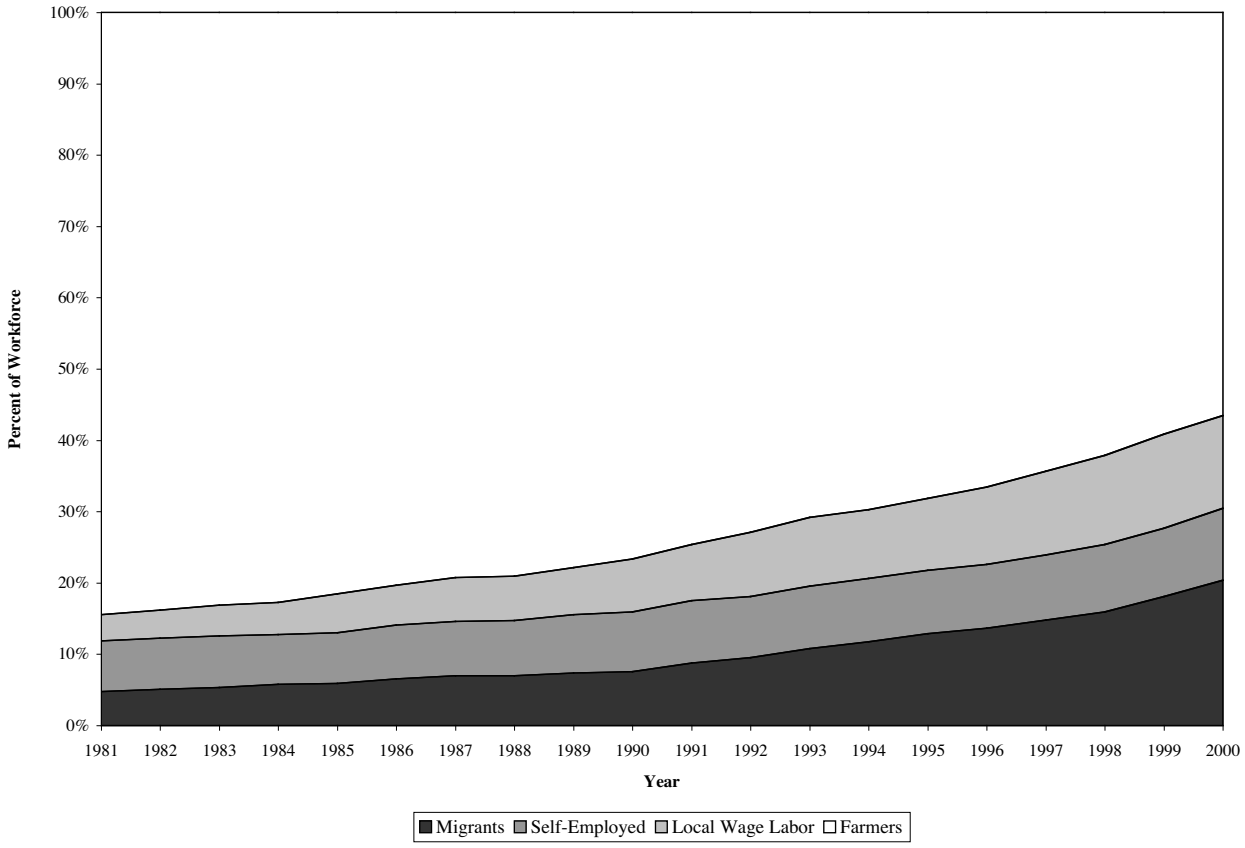
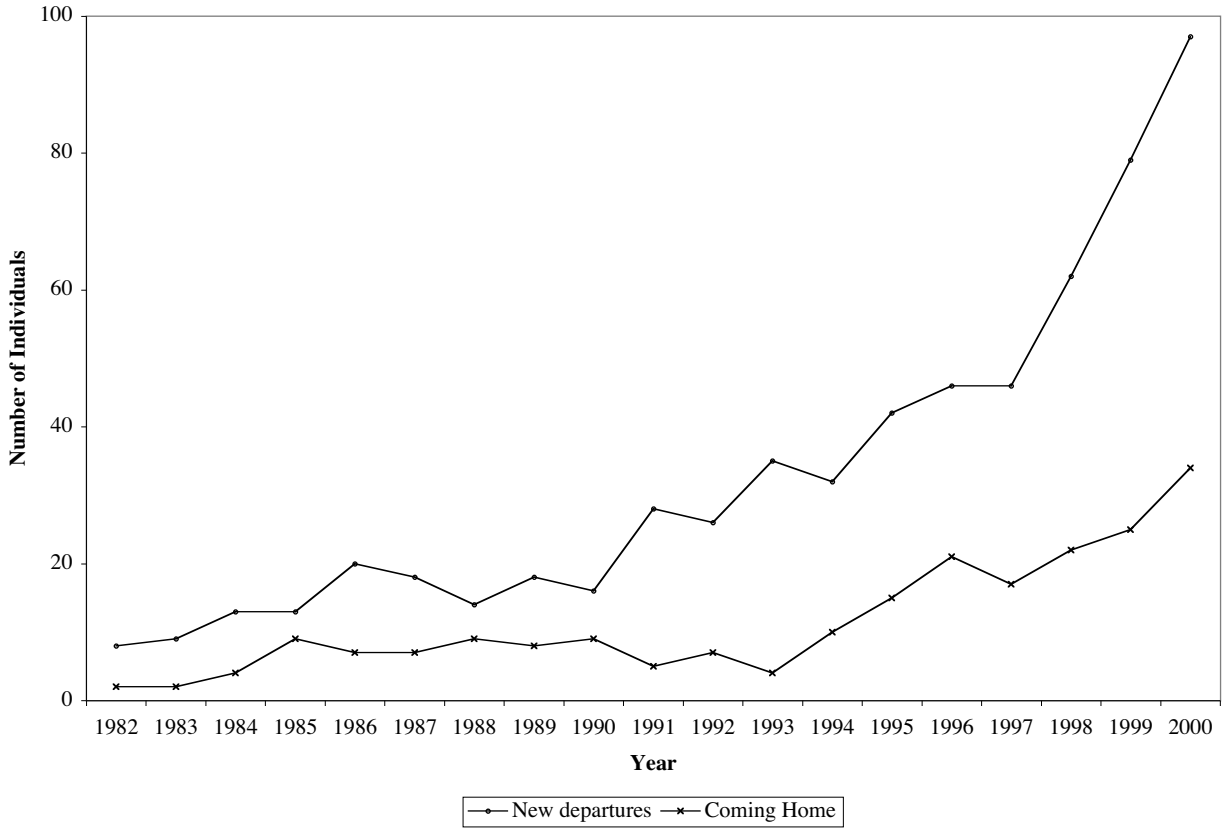


Figure 2: Off-Farm Labor Participation in Rural China over time, by Type



Source: Authors' survey.

Figure 3: Observed Migrant Departures and Returns in Sample, 1982 to 2000

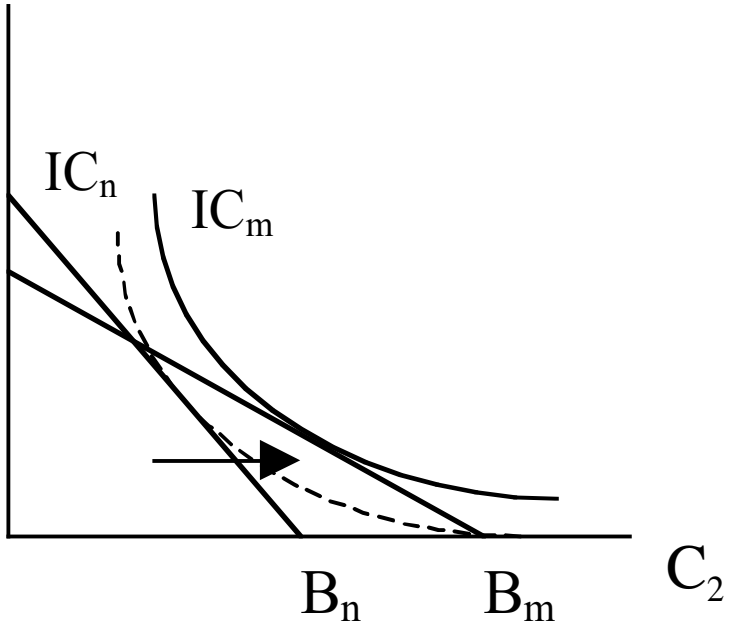


Figure 4: Intertemporal Tradeoff in Consumption Facilitated by Migration

Table 1: Average Household Investment, by Type and Year, in Rural China

	1995	1996	1997	1998	1999	2000
Productive Investment						
Average Amount	3642	8176	3882	5466	4697	9365
	(7640)	(33600)	(6980)	(19340)	(13660)	(44960)
Percent Investing	16.9	16.6	16.6	20.3	20.0	25.2
Consumptive Investment						
Average Amount	16765	14296	9809	11333	11004	12803
	(47897)	(32168)	(16580)	(26930)	(32810)	(26990)
Percent Investing	19.3	18.7	16.4	19.7	24.1	16.1
Total Investment						
Average Amount	12520	13060	8076	9890	9243	12040
	(39010)	(37950)	(14200)	(26220)	(27840)	(41880)
Percent Investing	30.8	30.8	27.9	33.8	38.9	36.7

Notes: All figures in year 2000 yuan. Figures in parentheses are standard deviations. Means are conditional on investment taking place, and exclude any agricultural assets or durables purchased for less than 500 yuan.
Source: Authors' survey.

Table 2: Average Cumulative Household Investment in Rural China, 1995 to 2000

	1995	1996	1997	1998	1999	2000
Productive Investment						
Average Amount	5228	9345	9050	9899	10276	13098
	(8772)	(30348)	(26680)	(27349)	(27396)	(39652)
Percent Investing	11.6	21.0	28.9	37.7	45.6	53.9
Consumptive Investment						
Average Amount	16935	17039	16542	17792	19471	21381
	(48082)	(42622)	(38623)	(40454)	(45017)	(46337)
Percent Investing	19.2	34.9	45.9	55.4	64.4	68.7
Total Investment						
Average Amount	13887	16758	17122	19578	21776	26079
	(40815)	(43473)	(42446)	(49480)	(56076)	(66225)
Percent Investing	27.9	47.4	59.8	69.7	79.3	83.6

Notes: All figures in year 2000 yuan. Figures in parentheses are standard deviations. Means are conditional on investment taking place, and exclude any agricultural assets or durables purchased for less than 500 yuan.
Source: Authors' survey.

Table 3: Average Total Investment in 2000, by Type of County

Category	All Provinces	*Zhejiang*	All Other Provinces
Richest Counties	41523	123518	25446
	(119622)	(219102)	(80747)
All Other Counties	16537	26282	14626
	(31915)	(40467)	(29641)

Notes: Standard deviations in parentheses. All measures are the average amount of investment calculated from 1995 to 2000.
Source: Authors' survey.

Table 4: Income and wealth levels in households with migrants

Category	Per-Capita Income, 2000	Total Wealth,2000	Cumulative Investment, 1995-2000
Return Migrant	3609	58920	34670
Households	(12200)	(123500)	(96630)
Current Migrant	7960	31030	17860
Households	(9230)	(42420)	(33840)
Non-Migrant	6920	34270	18304
Households	(13380)	(63820)	(55680)

Notes: All figures are expressed in yuan. The category "current migrant households" does not include households that also have return migrants living in them. Standard deviations in parentheses.

Table 5: Income and Investment Levels in Households, by Migration Status and by Rich and Poor Areas

Category	Per-Capita Income	Total Investment	Consumptive Investment	Productive Investment
Households in Rich Areas				
Households with	7577	24360	15660	8685
Return Migrants	(22820)	(32280)	(28220)	(15290)
Households with	2470	24120	22340	1780
Out Migrants	(2321)	(45770)	(45330)	(5440)
Households with	4146	14380	7480	6900
no Migration	(7059)	(25610)	(12162)	(22070)
Households in Poor Areas				
Households with	2140	17510	12420	5096
Return Migrants	(2770)	(22890)	(18560)	(10360)
Households with	2550	16658	14880	3022
Out Migrants	(3300)	(29640)	(31970)	(7530)
Households with	1493	13910	8870	5560
no Migration	(1867)	(23090)	(16590)	(15650)

Notes: All figures are expressed in yuan. The category "households with out migrants" does not include households that also have return migrants living in them. Standard deviations in parentheses. "Rich areas" include the richest county in all provinces.

Table 6: Effects of Previous Migration and Return Migration on Investment in 1999-2000, by Type

	Consumptive Investment	Productive Investment	Total Investment
Previous Migration and Investment (1995-1998)			
Migrant	0.214	0.129	0.138
Returned	(2.36)**	(1.44)	(1.51)
Migrant	0.043	-0.068	-0.071
Left	(1.14)	(1.37)	(1.46)
Production	0.151	0.158	0.119
Investment	(3.17)**	(3.77)**	(2.80)**
Consumption	0.029	0.116	0.071
Investment	(0.72)	(2.34)**	(1.40)
Household Human Capital and Demographics			
Education of	0.012	0.024	0.023
Head (Years)	(1.37)	(2.42)**	(2.33)**
Experience of	0.003	0.000	0.003
Head	(1.63)	(0.19)	(1.26)
Household	-0.002	0.023	0.023
Size	(0.14)	(1.44)	(1.57)
Household Physical Capital			
Log of HH	0.013	-0.016	-0.010
Wealth	(0.91)	(1.13)	(0.73)
Total	-0.001	-0.003	-0.003
Land (mu)	(0.68)	(1.47)	(1.24)
Village-Level Variables			
Distance to	0.001	0.000	0.001
County	(0.69)	(0.03)	(0.73)
Percent HHs	-0.017	0.171	-0.005
with Phone	(0.10)	(1.34)	(0.04)
Dummy,	0.037	0.066	0.083
Hilly Village	(0.57)	(1.06)	(1.58)
Dummy,	0.029	0.067	0.115
Mountainous	(0.50)	(0.93)	(2.09)**

Notes: Asymptotic z-statistics are in parentheses. *-indicates significance at the 10 percent level; **-indicates significance at the 5 percent level. Coefficients are reported as marginal effects, or discrete jumps for indicator variables. The first four variables are *all* indicator variables. Provincial fixed effects are included in all equations. Standard errors were corrected for clustering. Sample size is 610 households.

Table 7: Effects of Previous Migration and Return Migration on Change in Cumulative Investment, by type

	Consumptive Investment	Productive Investment	Total Investment
Previous Out and Return Migration (lagged one period)			
Number of	3981	500	4401
Out Migrants	(4.12)**	(0.46)	(3.02)**
Number of	3374	676	3718
Migrants Returned	(1.75)*	(0.31)	(1.28)
Other Controls			
Number of	-23.7	3362	3090
Children	(0.02)	(2.85)**	(1.96)**
Household	676	2402	2707
Workforce	(0.75)	(2.36)**	(1.99)**
Land	-5.67	-3.49	-8.35
Endowment (mu)	(0.25)	(0.10)	(0.24)
$\hat{\rho}$	0.57	0.42	0.55

Notes: *- indicates significance at the 10 percent level; **- indicates significance at the 5 percent level. Household fixed effects are included in each equation. Sample size in each regression is 3050. Residuals are assumed to be determined by an AR(1) process and the Durbin-Watson hypothesis test for autocorrelation can be rejected in a transformed equation for each dependent variable.

Table 8: Effects of Previous Migration and Return Migration on Change in Cumulative Investment, by type of investment and by rich and poor

	Definition One		*Definition Two*	
Investment Type	Rich Households	Poor Households	Rich Households	Poor Households
Effect of Out Migrants on:				
Consumptive	6184	2960	4839	4240
Investment	(2.55)**	(3.80)**	(1.11)	(5.34)**
Productive	168	431	-1702	546
Investment	(0.05)	(1.11)	(0.26)	(1.60)
Total	6151	3286	2588	4679
Investment	(1.55)	(3.75)**	(0.33)	(5.32)**
Effect of Return Migrants on:				
Consumptive	2997	3610	-390	4613
Investment	(0.62)	(2.32)**	(0.05)	(2.86)**
Productive	522	633	-430	704
Investment	(0.08)	(0.82)	(0.04)	(1.03)
Total	2772	4160	-2551	5266
Investment	(0.35)	(2.38)**	(0.16)	(2.95)**

Notes: **- indicates significance at the 5 percent level. Household fixed effects are included in each equation. Definition one refers to the definition of rich areas as Zhejiang and the richest county in other provinces, and poor areas as all other counties. For that definition, the sample size in the rich households regression is 1010; sample size for poor households is 2040. Definition two refers to the definition of rich areas as the richest county in all provinces, and poor areas as all other counties. For that definition, sample size is 610 for the rich households and 2440 for poor households. Residuals are assumed to be determined by an AR(1) process and the Durbin-Watson hypothesis test for autocorrelation can be rejected in a transformed equation for each dependent variable.

Table 9: Effects of Previous Migration and Return Migration on Change in Cumulative Investment, by type of investment and by rich and poor, using Honoré's Estimator

		Definition One		*Definition Two*	
Investment Type	All Households	Rich Households	Poor Households	Rich Households	Poor Households
Effect of Out Migrants on:					
Consumptive	16060	17940	13250	15930	16230
Investment	(2.04)**	(1.88)*	(1.12)	(0.65)	(2.02)**
Productive	707	-7708	1996	1386	2536
Investment	(0.22)	(0.17)	(1.04)	(0.08)	(1.37)
Total	13430	13490	11230	16820	14840
Investment	(2.19)**	(1.63)	(1.38)	(0.77)	(2.19)**
Effect of Return Migrants on:					
Consumptive	14940	10520	14670	4813	16980
Investment	(1.83)*	(0.86)	(1.19)	(0.17)	(2.04)**
Productive	783	-7136	3060	9.38	3495
Investment	(0.21)	(0.16)	(1.51)	(0.01)	(1.55)
Total	12370	5731	13110	6577	15970
Investment	(1.82)*	(0.56)	(1.51)	(0.28)	(2.24)**

Notes: **- indicates significance at the 5 percent level. Household fixed effects are included in each equation. Definition one refers to the definition of rich areas as Zhejiang and the richest county in other provinces, and poor areas as all other counties. For that definition, the sample size in the rich households regression is 808; sample size for poor households is 1632. Definition two refers to the definition of rich areas as the richest county in all provinces, and poor areas as all other counties. For that definition, sample size is 488 for the rich households and 1952 for poor households.

Appendix Table 1: Average Total Consumptive Investment, by Year

	Housing		*Durables over 500 yuan*	
Year	Percent of Households	Average Investment (Std. Dev.)	Percent of Households	Average Investment (Std. Dev.)
1995	7.2%	29612.5 (31140.3)	13.4%	8236.1 (46531.4)
1996	5.7%	31116.7 (43010.3)	13.8%	6436.8 (21454.1)
1997	4.4%	25261.7 (18787.0)	13.0%	3783.0 (5534.6)
1998	5.6%	26456.7 (35054.3)	15.9%	4747.1 (18465.6)
1999	6.1%	32113.5 (56967.6)	19.7%	3578.5 (4438.6)
2000	6.2%	28299.0 (38196.4)	11.1%	3167.3 (2710.1)

Notes: Only includes investments among the employment history sample. Amounts are in year 2000 yuan. Columns 3-4 only include investments that cost less than 500 yuan. Mean investment amounts are conditional on investment taking place. Standard deviations in parentheses.

Appendix Table 2: Effects of Previous Migration and Return Migration on Investment in 1999-2000, by Type

Explanatory Variables	Agricultural Cap. Goods	Non-Farm Enterprise	Commercial Agriculture	Consumer Durables	Housing
Previous Migration and Investment (1995-1998)					
Migrant	0.066	0.055	0.125	0.007	0.001
Returned	(1.07)	(0.83)	(1.84)*	(0.10)	(0.03)
Migrant	0.033	0.022	-0.008	-0.016	-0.049
Left	(1.76)*	(0.70)	(0.32)	(0.36)	(1.63)
Production	-0.012	0.081	0.139	0.015	0.013
Investment	(0.59)	(2.56)**	(4.37)**	(0.46)	(0.45)
Consumption	-0.014	0.060	0.026	0.143	0.020
Investment	(0.67)	(2.09)**	(0.85)	(3.48)**	(0.62)
Household Human Capital and Demographics					
Education of	0.002	0.001	0.008	0.000	0.006
Head (Years)	(0.66)	(0.25)	(1.46)	(0.03)	(1.11)
Experience of	0.002	-0.002	0.002	-0.003	0.000
Head	(2.24)**	(1.53)	(1.29)	(1.73)*	(0.11)
Household	0.006	0.005	-0.003	0.014	0.012
Size	(0.75)	(0.45)	(0.38)	(1.11)	(1.06)
Household Physical Capital					
Log of HH	0.001	0.006	-0.004	0.011	-0.009
Wealth (95)	(0.20)	(0.63)	(0.44)	(0.72)	(0.91)
Total	-0.001	-0.002	0.000	-0.002	-0.002
Land (mu)	(0.50)	(1.20)	(0.12)	(0.74)	(1.32)
Village-Level Variables					
Distance to	0.000	-0.001	0.000	-0.000	-0.002
County	(0.11)	(0.89)	(0.50)	(0.38)	(1.96)
Percent HHs	-0.250	0.219	-0.047	0.202	0.018
with Phone	(3.90)**	(2.33)**	(0.48)	(2.51)**	(0.27)
Dummy,	0.036	0.036	-0.016	0.050	0.003
Hilly Village	(0.99)	(0.95)	(0.44)	(1.06)	(0.07)
Dummy,	0.026	0.069	-0.085	0.077	0.003
Mountainous	(0.57)	(1.60)	(2.13)**	(1.32)	(0.07)

Notes: Asymptotic z-statistics are in parentheses. *-indicates significance at the 10 percent level; **-indicates significance at the 5 percent level. Coefficients are reported as marginal effects, or discrete jumps for indicator variables. The first four variables are *all* indicator variables. Provincial fixed effects are included in all equations. Standard errors were corrected for clustering. Sample size is 610.