Migrant Labor Markets and the Welfare of Rural Households in the Developing World: Evidence from China*

Alan de Brauw
International Food Policy
Research Institute

John Giles
Department of Economics
Michigan State University

April 15, 2007

Abstract

In this paper, we examine the impact of reductions in barriers to migration on the consumption of rural households in China. Change in the size of the village migrant network is identified using exogenous variation across counties in the timing of national ID card distribution and interactions of timing with the variance of local rainfall, which affects rate of migrant network formation. We show that timing of ID card distribution is unrelated to local rainfall shocks affecting demand for migration, and not related to proxies reflecting time-varying changes in village policy or administrative capacity. We find that increased migration from rural villages leads to significant increases in consumption per capita, and that this effect is stronger for poorer households within villages. Household income per capita also increases with out-migration, and increases more for poorer households. We also establish a causal relationship between increased out-migration and investments in productive assets related to agricultural production, land per capita under cultivation and investments in durables and housing, and these investment effects of migration are stronger for poorer households within villages.

Key Words: Migration, Migrant Networks, Consumption, Poverty, Wealth, Rural China
JEL Codes: O12, O15, J22, J24

*This paper has benefitted from conversations with Loren Brandt, from helpful comments on an earlier draft from Albert Park and discussions with participants at the following conferences: NEUDC 2006 at Cornell University, the 2006 Beijing Forum, the January 2007 ASSA Meetings in Chicago. We are grateful to Xiaohui Zhang, Liqun Cao, and Changbao Zhao from the Research Center for the Rural Economy (RCRE) at China's Ministry of Agriculture for assistance with the design and implementation of a supplemental survey to match RCRE's ongoing village and household panel surveys. We are grateful for financial support from the National Science Foundation (SES-0214702), the Michigan State University Intramural Research Grants Program, the Ford Foundation (Beijing) and the Weatherhead Center for International Affairs (Academy Scholars Program) at Harvard University.

1 Introduction

In developing countries, barriers to the movement of labor are a common institutional feature contributing to the persistence of geographic poverty traps. Whether maintained by formal institutions, by cultural or linguistic differences across regions, or simply by high transaction costs associated with finding migrant employment, obstacles to the movement of labor help maintain an inefficient allocation of resources across regions and may influence levels of investment in poor areas.[1] When barriers to cross-regional mobility of labor are removed, the resulting improved efficiency of resource allocation can have important consequences for the well-being and living standards of rural residents in the developing world.[2] Remittances to household or family members remaining in rural areas may supplement income earned locally and directly reduce exposure to poverty. Income earned from migrant employment may also have indirect effects on welfare within the communities migrants are leaving, either in the form of increased wages due to the depletion of the local labor force, or because income earned from migrant employment may be used for investment in local production.[3]

A growing body of research examines the impact of international migration on investment and growth in migrant home countries, but the impact of internal migration on development in home communities has received relatively little attention. While researchers have documented *correlations* between migration of a family member and household economic outcomes, existing research on the impact of internal migration generally lacks strategies that identify a robust *causal* relationship between ability to migrate and outcomes in migrant home communities.

In this paper, we examine the impact of migrant opportunity on consumption in rural areas of China. We first extend a standard household model to include a migrant labor market, and use this model to frame the possible mechanisms through which migrant opportunity may affect consump-

[1] Jalan and Ravallion (2002) demonstrate that geographic poverty traps may play a significant role in limiting the scope for household consumption growth in rural China.

[2] Adams and Page (2003) study the effects of international migration and remittances on poverty in a cross-country context and suggest that migration is poverty reducing. Yang (forthcoming) finds that remittances to the Philippines from migrant family members are positively associated with human capital investment and investment in more capital-intensive household enterprises.

[3] Woodruff and Zenteno (2007) examine effects of international migration from Mexico to the US on investment levels in Mexico. They find that attachment to migrant networks in the US is associated with higher levels of investment and higher profits of entrepreneurs in migrant home communities.

tion outcomes. We next implement an IV strategy that allows us to estimate the causal impact of migration on outcomes in source communities. Specifically, we use a reform in the residential registration (*hukou*) system that made it easier for rural migrants with national identification cards (IDs) to live legally in cities after 1988. National IDs, which were first available to urban residents in 1984, were not available in all rural counties as of 1988. While allowing for the possibility that the timing of ID distribution may be related to fixed unobserved characteristics of villages, we show that the annual change in the village migrant population is a non-linear function of the time since residents of a county received IDs. After controlling for village-specific trends, we identify the change in cost of migrating by exploiting differences in the timing of access to IDs and the non-linearity in the relationship between the annual change in size of the village migrant network and the time since IDs were distributed. To ensure that the timing of ID card distribution is plausibly exogenous to demand for ID cards driven by households wishing to participate in the migrant labor market, we show that the timing of ID card distribution is not related to exogenous rainfall shocks that affect earnings in the local economy and out-migration. We further show that the timing of ID distribution is not systematically related either to changes in variables measuring time-varying local policies, which may affect the returns to labor or self-employment locally, or to time-varying proxies reflecting local administrative capacity, which could be related to village leader responsiveness to local demand for IDs.

To better identify differences in rate of migrant network growth across villages, we interact the non-linear function of years since IDs were distributed with the variance of county rainfall. Specifically, we interact a quartic in years since IDs were distributed with the variance of county rainfall, under the assumption that after directly controlling for all village fixed effects (including inherent riskiness of the local environment), the interaction will identify differences in the importance of IDs for the formation of village migrant networks. We also examine the plausibility of this expanded set of instruments.

After showing that migration is positively associated with household consumption per capita, we next examine the distributional effects of migration within sending communities and then examine evidence on the mechanisms through which migration raises consumption. We briefly preview several results important for understanding the role that migration plays in the development of

migrant sending communities.

First, expanded migration is associated with reductions in inequality within villages.[4] Poorer households within sending communities experience a more pronounced growth in consumption when the cost of migration falls. Using the same data source, Benjamin et al (2005) demonstrated that remittance income is inequality-reducing within villages, but the decomposition exercise employed is not appropriate for assigning a causal relationship. We find that increases in out-migration lead to increases in household income per capita, and that poorer households experience more rapid income growth. In China, these observed reductions in inequality with migration provide important insight into our understanding of inequality dynamics in a specific institutional context. If households differ in their ability to take advantage of off-farm opportunities and higher ability individuals or families are starting enterprises or finding non-agricultural employment, it is not surprising that early research found local wage income to be associated with increasing inequality within village communities.[5] We also expect that higher ability individuals will find it easier to migrate and receive higher returns in migrant labor markets. The fact that migration leads to a reduction in inequality within villages suggests that access to local connections may have been an important dimension of "ability" that was rewarded earlier in the reform period, and that the ability to migrate allows households with individuals lacking local connections to increase consumption levels.[6]

A second important finding relates to the impact of migration on investment in rural areas. We find that increases in migration are associated with productive investment related to agriculture, and investment in housing and consumer durables, but do not find evidence of a significant relationship between migration and investment in non-agricultural productive activities. Again, these effects are more pronounced for poorer households within communities. This raises the prospect that ability to migrate leads to greater specialization within villages, and this possibility is underscored further by increases in land under cultivation by poorer households with growth of the village

[4] McKenzie and Rapoport (2006) document a similar effect of international migration on rural communities in Mexico.

[5] Rozelle (1994) and Gustaffson and Li (2002) emphasize the disequalizing effect of non-agricultural income. They use data sources that pre-dated the dramatic increase in labor mobility and migrant employment opportunities for rural residents.

[6] Morduch and Sicular (2000) suggest that one benefit of political status might be access to higher return employment or income earning activities outside of agriculture.

migrant network. Thus, those individuals lacking skills appropriate for the migrant labor market may nonetheless benefit through expanding the scale of their activities in agricultural production.

The paper proceeds as follows. In section 2 we provide additional background on rural-urban migration in China and introduce the RCRE Household and Village surveys used for our analyses. Section 3 introduces the household model which provides a framework for the empirical methodology discussed in section 4. In section 5, we present our results and a final section concludes.

2 Background

Rural-Urban Migration in China

China's labor market experienced a dramatic change during the 1990s, as the volume of rural migrants moving to urban areas for employment grew rapidly. Estimates using the one percent sample from the 1990 and 2000 rounds of the Population Census and the 1995 one percent population survey suggest that the inter-county migrant population grew from just over 20 million in 1990 to 45 million in 1995 and 79 million by 2000 (Liang and Ma, 2004). Surveys conducted by the National Bureau of Statistics (NBS) and the Ministry of Agriculture include more detailed retrospective information on past short-term migration, and suggest even higher levels of labor migration than those reported in the census (Cai, Park and Zhao, 2007).

Before labor mobility restrictions were relaxed, households in remote regions of rural China faced low returns to local economic activity, reinforcing geographic poverty traps (Jalan and Ravallion, 2002). A considerable body of descriptive evidence related to the growth of migration in China raises the possibility that migrant opportunity may be an important mechanism for poverty reduction. Studies of the impact of migration on migrant households suggest that migration is associated with higher incomes (Taylor, Rozelle and de Brauw, 2003; Du, Park, and Wang, 2006), facilitates risk-coping and risk-management (Giles, 2006; Giles and Yoo, 2006), and is associated with higher levels of local investment in productive activities (Zhao, 2003).

Institutional changes, policy signals and the high return to labor in urban areas each played a role in the expansion of migration during the 1990s. An early reform of the household registration (*hukou*) system in 1988 first established a mechanism for rural migrants to obtain legal temporary residence in China's urban areas (Mallee, 1995). In order to take advantage of this policy change,

rural residents required a national identity card to obtain a legal temporary worker card (*zanzu zheng*), but not all rural counties had distributed IDs as of 1988.[7] As China recovered from its post-Tiananmen retrenchment, some credit a series of policy speeches made by Deng Xiaoping in 1992 as signals of renewed openness toward the marketization of the economy, including employment of migrant rural labor in urban areas (Chan and Zhang, 1999). Combined with economic expansion, these institutional and policy changes led to increased demand for construction and service sector workers, and catalyzed the growth in rural-urban migration that continued throughout the 1990s.

The use of migrant networks and employment referral in urban areas are important dimensions of China's rural-urban migration experience. Rozelle et al (1999) emphasize that villages with more migrants in 1988 experienced more rapid migration growth by 1995. Zhao (2003) shows that number of early migrants from a village is correlated with the probability that an individual with no prior migration experience will choose to participate in the migrant labor market. Meng (2000) further suggests that variation in the size of migrant flows to different destinations can be partially explained by the size of the existing migrant population in potential destinations.[8]

Descriptive evidence from a survey of migrants living in cities in China confirms the likely importance of migrant networks for lowering the cost of finding employment. In a survey of rural migrants conducted in five of China's largest cities in late 2001, more than half of the migrants reported that they secured employment before their first migration experience, and more than 90 percent moved to an urban area where an acquaintance from their home village lived (Table 1).[9] Notably, before migrating over half of migrants surveyed had a member of their extended family

[7] Legal temporary residence status does not confer access to the same set of benefits (e.g., subsidized education, health care, and housing) typically associated with permanent registration as a city resident.

[8] Referral through one's social network is a common method of job search in both the developing and developed world. Carrington, Detragiache, and Vishnawath (1996) explicitly show that in a model of migration, moving costs can decline with the number of migrants over time, even if wage differentials narrow between source communities and destinations. Survey-based evidence suggests that roughly 50 percent of new jobs in the US are found through referrals facilitated by social networks (Montgomery, 1991). In a study of Mexican migrants in the US, Munshi (2003) shows that having more migrants from one's own village living in the same city increases the likelihood of employment.

[9] We use the migrant sub-sample of the China Urban Labor Survey (CULS), which was conducted in late 2001 by the Institute for Population and Labor Economics at the Chinese Academy of Social Sciences (CASS-IPLE) working in collaboration with local National Bureau of Statistics Survey Teams. Researchers from Michigan State University and the University of Michigan collaborated in funding, designing, implementing and monitoring the survey. Using the 2000 Population Census as a guide, neighborhoods were selected using a proportional population sampling procedure. Sample frames were then assembled from residents' committee records of migrant households, and public security bureau records of migrants living on construction sites. Very short-term migrants are unlikely to have been included in the sample frame.

living in the city, and over 65 percent knew hometown acquaintances in the city other than family members.[10]

2.1 The RCRE Household Survey

The primary data sources used for our analyses are the village and household surveys conducted by the Research Center for Rural Economy at China's Ministry of Agriculture from 1986 through the 2003 survey year. We use data from 90 villages in eight provinces (Anhui, Jilin, Jiangsu, Henan, Hunan, Shanxi, Sichuan and Zhejiang) that were surveyed over the 16-year period, with an average of 6305 households surveyed per year. Depending on village size, between 40 and 120 households were randomly surveyed in each village.

The RCRE household survey collected detailed household-level information on incomes and expenditures, education, labor supply, asset ownership, land holdings, savings, formal and informal access to credit, and remittances.[11] In common with the National Bureau of Statistics (NBS) *Rural Household Survey,* respondent households keep daily diaries of income and expenditure, and a resident administrator living in the county seat visits with households once a month to collect information from the diaries.

Our measure of consumption includes nondurable goods expenditure plus an imputed flow of services from household durable goods and housing. In order to convert the stock of durables into a flow of consumption services, we assume that current and past investments in housing are "consumed" over a 20-year period and that investments in durable goods are consumed over a period of 7 years.[12] We also annually "inflate" the value of the stock of durables to reflect the increase in prices of durable goods over the period. Finally, we deflate all income and expenditure data to 1986 prices using the NBS rural consumer price index for each province.

There has been some debate over the representativeness of both the RCRE and NBS surveys, and concern over differences between trends in poverty and inequality in the NBS and RCRE

[10] Categories of acquaintance type shown in Table 1 are not exclusive because many migrants were preceded to cities by both family members and other hometown acquaintances.

[11] One shortcoming of the survey is the lack of individual-level information. However, we know the numbers of working-age adults and dependents, as well as the gender composition of household members.

[12] Our approach to valuing consumption follows the suggestions of Chen and Ravallion (1996) for the NBS Rural Household Survey, and is explained in more detail in Appendix A of Benjamin et al. (2005).

surveys. These issues are reviewed extensively in Appendix B of Benjamin et al (2005), but it is worth summarizing some of their findings here. First, when comparing cross sections of the NBS and RCRE surveys with overlapping years from cross sectional surveys not using a diary method, it is apparent that high and low income households are somewhat under-represented.[13] Poorer illiterate households are likely to be under-represented because enumerators find it difficult to implement and monitor the diary-based survey, and refusal rates are likely to be high among affluent households who find the diary reporting method a costly use of their time. Second, much of the difference between levels and trends from the NBS and RCRE surveys can be explained by differences in the valuation of home-produced grain and treatment of taxes and fees.

2.2 Trends in Migration, Consumption Growth and Poverty

One of the benefits of the accompanying village survey is a question asked each year of village leaders about the number of registered village residents working and living outside the village. In our analysis, we consider all registered village residents who work outside the home county to be migrants.[14] Both the tremendous increase in migration from 1987 onward and heterogeneity across villages are evident in Figure 1. In 1987 an average of 3 percent of working age laborers in RCRE villages were working outside of their home villages, which rose steadily to 23 percent by 2003. Moreover, we observe considerable variability in the share of working age laborers working as migrants. Whereas only a small share of legal village residents are employed as migrants in some villages, more than 50 percent of working age adults from other villages were employed outside their home county by 2003.

The relationship between migration and consumption is of central concern for our analysis. The linear fit of the relationship between annual changes in migration and average village consumption growth in the RCRE data suggest a positive relationship (Figure 2). The lowess fit, however, suggests the presence of nonlinearities, particularly around zero. Indeed the prospect that out-migration may be driven by negative shocks which also depress consumption should raise concern

[13] The cross-sections used were the rural samples of the 1993, 1997 and 2000 China Health and Nutrition Survey (CHNS) and a survey conducted in 2000 by the Center for Chinese Agricultural Policy (CCAP) with Scott Rozelle (UC Davis) and Loren Brandt (University of Toronto).

[14] From follow up interviews with village leaders, it is apparent that registered residents living outside the county are unlikely to be commuters and generally live and work outside the village for more than six months of the year.

that size of the migrant network and consumption may be endogeneous and driven in part by shocks affecting both variables.

Even if consumption grows with an increase in the number of residents earning incomes from migrant employment, it is of important policy interest to understand which residents within villages are experiencing increases in consumption. Changes in the village poverty headcount are negatively associated with the change in the number of out-migrants, suggesting that poverty declines with increased out-migration (Figure 3). Nonlinearities in the bivariate relationship are again evident in the lowess plot of the relationship. Whether obvious non-linearities are either related to the simultaneity of shocks and increases in out-migration and poverty for some villages or to the simple fact that we have not controlled for other characteristics of villages, establishing a relationship between migration and increased consumption of poorer households within villages requires an analytical framework where we eliminate bias due to simultaneity and potential sources of unobserved heterogeneity.

3 Model

Below we present a simple model to highlight the direct and indirect mechanisms through which expanded migrant opportunity may affect household consumption. The model illustrates the relationship between the size of the migrant network, family income from earnings in local and migrant labor markets, and the impact of migrant networks on credit constraints that may influence the household's ability to invest in self-employed productive activity. Essentially the model highlights the ways in which the migrant network affects permanent household income, and thus also household consumption.

Assume that in each period households may choose to invest in physical capital, K_t, used in agricultural or non-agricultural household self-employment activity. Households earn income from some or all of the following activities: agricultural production, non-agricultural self-employment and employment in migrant labor markets. Home production utilizes household physical and human capital, $y_t^h = \theta_t F\left(K_t, H_t, L_t^h\right)$, where θ_t is a multiplicative productivity shock with a mean of one, K_t and H_t are the current stocks of physical and human capital, respectively, and L_t^h is the labor used in self-employment activities. Household income from the local and migrant labor markets is

$y_t^l = w^l(H_t, M_{jt})L_t^l$, and $y_t^m = w^m(H_t, M_{jt})L_t^m$, where L_t^l and L_t^m are labor allocated to local and migrant employment, and $w^l(H_t, M_{jt})$ and $w^m(H_t, M_{jt})$ are the corresponding wages that can be earned in the local and migrant labor markets, respectively.[15] We assume that as M_{jt} increases, the cost of migrating falls. The household will thus accumulate physical capital according to

$$K_{t+1} = K_t + \theta_t F\left(K_{t-1}, H_t, L_t^h\right) + w^l(H_t, M_{jt})L_t^l + w^m(H_t, M_{jt})L_t^m - c_t \tag{1}$$

We further restrict $K_t, K_{t+1} \geq 0$, which amounts to a credit constraint that affects ability to borrow against future income for current expenditures on consumption. We expect the size of the migrant network, M_{jt}, to be positively associated with the net return to migrant employment, w_t^m, by lowering the cost of participating in the migrant market and improving the quality of job referrals for migrants.[16] The migrant network may also have general equilibrium effects on wages in the local economy as the shift of labor into migrant activities reduces the local non-agricultural labor supply enough to put upward pressure on the local off-farm wage, and further, to the extent that migrant employment relaxes household credit constraints, new investments in productive activities and housing construction may stimulate local labor demand.

Current utility is an additively separable concave function of consumption, c_t, and the leisure of household members ($l_t = 1 - L_t^h - L_t^l - L_t^m$). The household's objective function is to maximize

$$E_0\left[\sum_{t=0}^{T} \delta^t U\left(c_t, l_t\right)\right] \tag{2}$$

subject to (1) and the borrowing constraint, where δ^t is the subjective discount factor and E_0 is the expectations operator. Households are uncertain about future values of θ_t, $w(\cdot,\cdot)$, and T.

The first-order conditions for an interior solution are:

[15] We consider wages earned in the migrant labor market as net returns to the household from migrant employment. The migrant network may influence net income from migration by both lowering the cost of migration and by facilitating matches to higher quality jobs. These effects will be observationally indistinguishable, as they both raise the net return to participating in the migrant labor market. This effect of the migrant labor market on net wage is an implication of the literatures on the importance of referral on job search (Montgomery, 1991) and specifically, the role of networks for the placement of mighrants (Munshi, 2003).

[16] These effects are observationally indistinguishable, as they both raise the net return to participating in the migrant labor market.

$$U_c(t) = \lambda_t \tag{3}$$

$$U_l(t) = \lambda_t \left(\theta_t F_{L_t^h} \left(K_{t-1}, H_t, L_t^h \right) + w^l(H_t, M_{jt}) + w^m(H_t, M_{jt}) \right) \tag{4}$$

where λ_t is the time-varying shadow value of physical capital that will be scaled by the discount factor, δ^t. Solving the system of equations yields a consumption demand function of the form:

$$c_t^* = c^* \left(\lambda_t, \theta_t F_{L_t^h} \left(K_{t-1}, H_t, L_t^h \right), w^l(H_t, M_{jt}), w^m(H_t, M_{jt}) \right) \tag{5}$$

Because preferences are additively separable, current period decisions depend on past decisions and expected future prices only through the shadow price of physical capital, λ_t. Further, after controlling for λ_t, the borrowing constraint will only influence intertemporal decisions through the intertemporal Euler equation and have no affect on intratemporal decisions.

Using equations (3) and (4), we can trace out the potential effect of an increase in the village migrant labor network on demand for leisure and consumption goods. First, since income earned in the off-farm market will increase, the shadow price of physical assets, λ_t, will fall. The wealth effect eases credit constraints associated with accumulating assets for productive activities (both agricultural and non-agricultural) and non-productive uses (e.g., investments in housing). We should also observe increases in household consumption if a potentially binding credit constraint previously led households to consume less in each period (and save more) as a precaution against future uncertain shocks to production.

The second effect of an increase in size of the village migrant network operates through the shadow price of household labor time, and thus if leisure is a normal good, the net effect on family labor supply is indeterminate. A substitution effect will lead families to provide more labor to productive activities, but an income effect may lead to a reduction in family labor supply. Our analyses below will focus on the impact of the migrant market on household consumption and investment in productive and non-productive assets.

We further simplify the consumption demand function by recognizing that household productiv-

ity will be a function of potentially time varying household endowments and other characteristics, $\mathbf{X}_{it}$, that are related to wealth, skills, and unobservables, u_i, related to risk preferences and competencies of the household. Among these characteristics are human capital, which also affect the potential returns that family members may earn both in the labor market and through household activities (e.g. Yang, 2004). We thus write the consumption demand function as:

$$c_{it}^{*} = c^{*}\left(w_{it-1}, \theta_t, \mathbf{X}_{it}, M_{jt}, u_i\right) \tag{6}$$

where consumption of household i in period t is a function of the determinants of household income, and include: household wealth at the end of the previous period, w_{it-1}, which is a combination of the value of productive assets and financial wealth affecting the shadow price of physical capital, productivity shocks, θ_t,household endowments and characteristics, $\mathbf{X}_{it}$, the size of the migrant network, M_{jt}, and household unobservables, u_i.

4 Empirical Methodology

Estimating the Effect of Migration on Consumption

Our theoretical model above suggests the following empirical specification for household consumption, c_{it}:

$$c_{it} = \beta_1 w_{it-1} + \beta_2 M_{jt} + \beta_3 (w_{it-1} \cdot M_{jt}) + \mathbf{X}_{it}'\alpha + \mathbf{Z}_{jt}'\gamma + u_i + v_j + \mathbf{t}_j + \varepsilon_{ijt} \tag{7}$$

The log of household consumption per capita in period t will be a function of measured household physical and financial wealth per capita at the end of period $t-1$, w_{it-1}, the size of the village migrant labor force and household endowments and characteristics, M_{jt} and $\mathbf{X}_{it}$, respectively. Since ability to participate in the migrant labor market may affect households differently depending on where they are in the distribution of wealth within the village, we will also be explicitly interested in the interaction, $w_{it-1} \cdot M_{jt}$. We include time-varying village variables to pick up heterogeneity across villages in policies and economic conditions, $\mathbf{Z}_{jt}$, that may influence consumption through effects on productivity. Other observable and unobservable fixed characteristics of villages that may

affect consumption, such as location, connections to off-farm markets and proximity to employers, are measured with village indicator variables, v_j. Additionally, village specific trends, $\mathbf{t}_j$, related to underlying endowments and initial conditions in the village, may further affect consumption. At the household level, we also expect fixed unobservables, u_i, related to preferences and ability to affect consumption, income, and the ease with which the household participates in the migrant labor market.

Household wealth is typically difficult to measure accurately because the valuation of productive asset stocks depends upon assumpions about depreciation and the useful life of assets, and the value of financial assets is frequently under-reported in household surveys. Moreover, access to transfers and loans from non-resident family members and friends will have an impact on expected lifetime wealth and current consumption, but ability to receive transfers and loans will be unobservable to the econometrician. As a proxy for lagged household wealth in equation (7), we use lagged household consumption, implicitly assuming that lagged consumption is strongly correlated with perceptions of lifetime wealth.[17] Thus, we rewrite equation (7) as:

$$c_{it} = \beta_1 c_{it-1} + \beta_2 M_{jt} + \beta_3 (c_{it-1} \cdot M_{jt}) + \mathbf{X}'_{it}\alpha + \mathbf{Z}'_{jt}\gamma + u_i + v_j + \mathbf{t}_j + \epsilon_{it} \tag{8}$$

In order to control for fixed effects at the household and village level, we first-difference equation (8) to obtain:

$$\Delta c_{it} = \beta_1 \Delta c_{it-1} + \beta_2 \Delta M_{jt} + \beta_3 \Delta (c_{it-1} \cdot M_{jt}) + \Delta \mathbf{X}'_{it}\alpha + \mathbf{\Delta Z}'_{jt}\gamma + \mathbf{d}_j + \mathbf{p} \otimes \mathbf{yr} + \Delta\epsilon_{it} \tag{9}$$

Differencing the village-specific trend leaves us with a vector of village dummy variables, $\mathbf{d}_j$, which control for differences in consumption growth trends across villages. We further include province-year interactions, $\mathbf{p} \otimes \mathbf{yr}$, to control for the potential effects of province-wide macroeconomic shocks on consumption growth.

We are most interested in coefficients β_2 and β_3, which capture the effect of the migrant labor market on consumption at different lagged consumption levels. For any given level of lagged

[17] This approach is common in empirical estimation of dynamic models of consumption decisions. See Banks, Brugiavinni and Blundell (2001) for another example and additional references.

consumption, the marginal effect of migration on present consumption is $\eta = \beta_2 + \beta_3 c_{it-1}$. If out migration has a positive effect on household per capita consumption, we expect β_2 to be positive, and the sign of β_3 will tell us which households within the village experience faster consumption growth as the size of the migrant network expands. A positive estimate for β_3 would suggest that wealthier households will have faster consumption growth, whereas a negative estimate would indicate that poorer households within village experience faster consumption growth with migration.

Endogeneity Concerns

The first three terms in equation (9), Δc_{it-1}, ΔM_{jt}, and $\Delta(c_{it-1} \cdot M_{jt})$ suffer from well known endogeneity problems. Errors in the measurement of lagged log consumption, c_{it-1}, will be present in both the dependent variable ($\Delta c_{it} = c_{it} - c_{it-1}$) and a regressor ($\Delta c_{it-1} = c_{it-1} - c_{it-2}$), and these will be correlated with the differenced error term, $\Delta \epsilon_{it}$. We instrument Δc_{it-1} with c_{it-3} under the assumption that c_{it-3} is correlated with Δc_{it-1} but not $\Delta \epsilon_{it}$. We then use an additional lag, c_{it-4}, to provide for overidentification.[18]

Change in our proxy for the cost of migration, the size of the village migrant labor force, ΔM_{jt}, is endogenous as it reflects factors that influence changes in both the demand for and supply of migrants from the village. Disruptions to the local economy, for example, will lower levels of household consumption per capita while also raising the relative return to migrant employment in more distant locations, and thus potentially lead us to observe a negative relationship between increases in migration and consumption growth. To identify the effect on consumption of increases in family income that may come through remittances or the relaxation of credit constraints as migration from the village increases, it is necessary to find an instrument that is correlated with the number of migrants living outside the village, but otherwise unrelated to factors affecting growth within the village.

To instrument for migration, we make use of two policy changes that, working together, affect the strength of migrant networks outside home counties but are plausibly unrelated to the demand for and supply of schooling. First, a new national ID card (*shenfen zheng*) was introduced in 1984.

[18] Anderson and Hsiao (1982) actually suggest that the $t-2$ lag might be sufficient, but shocks to consumption have sufficiently long memory that we must use the $t-3$ lag. In a GMM framework, Arellano and Bond (1991) showed that all available lags back to period 1 may be used. Wooldridge (2002) cautions, however, that if correlation between the regressor Δc_{it-1} and distant lags are weak, then adding large numbers of additional weak instruments may introduce bias.

While urban residents received IDs in 1984, residents of most rural counties did not receive them immediately. In 1988, a reform of the residential registration system made it easier for migrants to gain legal temporary residence in cities, but a national ID card was necessary to obtain a temporary residence permit (Mallee, 1995). While some rural counties made national IDs available to rural residents as early as 1984, others distributed them in 1988, and still others did not issue IDs until several years later. The RCRE follow-up survey asked local officials when IDs had actually been issued to rural residents of the county. In our sample, 41 of the 90 counties issued cards in 1988, but cards were issued as early as 1984 in three counties and as late as 1997 in one county. It is important to note that IDs were not necessary for migration, and large numbers of migrants live in cities without legal temporary residence cards. However, migrants with temporary residence cards have a more secure position in the destination community, hold better jobs, and would thus plausibly make up part of a longer-term migrant network in migrant destinations. Thus, ID distribution had two effects after the 1988 residential registration (*hukou*) reform. First, the costs of migrating to a city should fall after IDs became available. Second, if the quality of the migrant network improves with the years since IDs are available, then the costs of finding migrant employment should continue to fall over time.[19]

As a result, the size of the migrant network should be a function of both whether or not cards have been issued and the time since cards have been issued in the village. Given that the size of the potential network has an upper bound, we expect the years-since-IDs-issued to have a non-linear relationship with the size of the migrant labor force and we expect growth in the migrant network to decline after initially increasing with distribution of IDs. In Figure 4, we show a lowess plot of the relationship between years since IDs were distributed and the change in number of migrants from the village from year $t-1$ to t. Note the sharp increase in migrants from the time that IDs are distributed and then a slowing of the increase over time (which would imply an even slower growth rate). This pattern suggests non-linearity in the relationship between ID distribution and new participants in the village migrant labor force. We thus specify our instrument as a dummy variable indicating that IDs had been issued interacted with the years since they had been issued,

[19] Our identification strategy makes no attempt to explicitly identify the direct effect of the migrant network, as in Munshi (2003). Our purpose in using a function of years-since-IDs-issued is to identify the net effect of migration under the plausible assumption that networks of earlier migrants with legal residence may contribute to reducing the cost of migration.

and then experiment with quadratic, cubic and quartic functions of years-since-IDs-issued. We settle on the quartic function for our instruments because we find it fits the pattern of expanding migrant networks better than the quadratic or the cubic functions.

In order to exploit additional heterogeneity across villages in how the timing of ID card distribution affects the growth of migrant networks, we interact the quartic with the variance of historic village rainfall between July and November, or during the prime growing season.[20] Whether or not it is appropriate to interact the years-since-IDs were issued with the rainfall variance merits careful consideration. We expect that in low variance villages, agricultural income is more predictable, and therefore the returns to labor and their income are well known. As a result, households might be less likely to respond to ID cards with migration and IDs will have less impact on the growth of the migrant network from these villages because households have less need for a risk-coping strategy. These interaction terms are valid instruments under the assumption that a village fixed effect controls for fixed differences across villages in the riskiness of the local environment, and that the rainfall variance interactions are picking up differences in the rate of growth in networks across villages.

The differenced interaction term in equation (9), $\Delta(c_{it-1} \cdot M_{jt})$, is comprised of two endogenous regressors, and we identify them with interactions of $t-3$ and $t-4$ lagged log consumption and the eight instruments for the size of the migrant network, M_{jt}. The coefficient on this term will be of interest for identifying the impact of migration at different levels of the wealth distribution within villages. However, it could be that the interaction term proxies for nonlinearities in the effect of past shocks on current consumption growth. To check for robustness to this effect, we also estimate the model including $\Delta(c_{it-1}^2)$ as a regressor. We instrument it with $t-3$ and $t-4$ values of log consumption squared. We then examine whether including the higher order term, $\Delta(c_{it-1}^2)$, affects the coefficient estimate on $\Delta(c_{it-1} \cdot M_{jt})$.

Finally, the regressors included in $\Delta\mathbf{X}_{it}$ and $\mathbf{\Delta Z}_{jt}$ might not be strictly exogenous either. For example, income shocks that affect household consumption decisions may also have an impact on household composition, land characteristics or village policy. Below, we proceed by first estimating

[20] Giles and Yoo (2006) analyze the crop calendar and different combinations of monthly rainfall shocks, and demonstrate that for these villages and households negative shocks between July and November are the strongest predictor of negative shocks to agricultural production. Since larger negative shocks implies a larger long term variance, here we use the variance to measure the long term exposure to shocks.

models that exclude $\Delta \mathbf{X}_{it}$ and $\mathbf{\Delta Z}_{jt}$, then successively adding village and household regressors, treating them as exogenous and then as pre-determined but not strictly exogenous. For models in which regressors are treated as pre-determined, we use a standard panel data approach to control for possible endogeneity bias. Specifically, we instrument first-differenced predetermined variables with their $t-2$ lagged levels $[\mathbf{X}_{it-2}, \mathbf{Z}_{jt-2}]$ in specifications which include these regressors. $\mathbf{X}_{it-2}$ and $\mathbf{Z}_{jt-2}$ will be valid instruments as long as they are correlated with $\Delta \mathbf{X}_{it}$ and $\mathbf{\Delta Z}_{jt}$, but uncorrelated with any time-varying household unobservables included in the differenced error term, $\Delta \epsilon_{it}$.[21]

The Plausibility of the Years-Since-IDs Instrument

Since ID distribution was the responsibility of county level offices of the Ministry of Civil Affairs, which are distinctly separate from agencies involved in setting policies affecting land, credit, taxation and poverty alleviation (the Ministry of Agriculture and Ministry of Finance handle most decisions that affect these policies at the local level), it is plausible that ID distribution is not be systematically related to unobservable policy decisions with more direct relationship to household consumption. Still, using a function of the years since IDs were issued is not an ideal identification strategy. Ideally, a policy would exist that was randomly implemented, affecting the ability to migrate from some counties but not others. As the differential timing of the distribution of ID cards was not necessarily random, we must be concerned that counties with specific characteristics or that followed specific policies were singled out to receive ID cards earlier than other counties, or that features of counties receiving IDs earlier are systematically correlated with other policies affecting consumption growth. These counties, one might argue, were "allowed" to build up migrant networks faster than others.

To evaluate the plausibility of using years-since-ID-distribution as an instrument, we first categorize villages as receiving cards prior to 1988, in 1988, or after 1988, and look for significant differences in observable average village characteristics measured in 1988 (Table 2). In the third row of each characteristic, we report the p-value of t-tests of the equality of the mean within each quality with the combined mean of the other two categories. Several significant differences appear between villages that were early and late recipients of IDs, and we observe a general patter consistent with the likelihood that early recipients of IDs were less remote, had smaller households, were

[21] Wooldridge (2002) provides a helpful introduction to standard panel data approaches to control for endogeneity bias of regressors that are predetermined but not strictly exogenous.

less concentrated in agriculture and had higher consumption levels. In the fourth line for each item of Table 2, we report p-values of t-tests for equality of means across categories after partialling out province fixed effects and dummies for whether the village was located in the hills or mountains. This exercise shows that after controlling for some geographic features, we observe fewer differences across villages in 1988 that are systematically related to timing of ID availability. Still, the differences that exist suggest to us that we should control for these and other unobserved differences across villages by including village fixed effects in all our estimated models, and then identify the effect of migrant networks off of non-linearities in the years since ID cards were distributed.

Even after controlling for village location with village fixed effects, one might be concerned that the timing of ID card receipt was endogenous. Specifically, local demand for migration may have led county officials to issue IDs in response to a sharp rise in migration from villages. If true, issuing IDs would have little to do with new migration, but might be correlated with existing migration flows. The lowess plot of change in number of migrants versus years-since-IDs were issued indicates that out-migration accelerates immediately after or as IDs are issued and then slows by 10 years after IDs were issued (Figure 4).[22] The pattern confirms that the relationship between the changes in the size of the village migrant outflow and the years since ID cards were issued is non-linear.

Next, it is important to consider how growth of the village migrant network with access to ID cards varies with local rainfall variance. To do so, we plot changes in the number of migrants in each village against years-since-IDs were issued by terciles of rainfall variance, using the lowess estimator (Figure 5). For villages in the first tercile, with a low rainfall variance, we find that migrant networks are slower to build after the introduction of ID cards; the slope of the relationship between changes in migration and years-since-IDs is not as steep as the other two terciles in the first few years after cards are issued. In contrast, migrant networks in the highest rainfall tercile respond rapidly to the introduction of ID cards; the slope of the lowess plot is much steeper than that for the other two terciles. The relationships shown in Figure 5 suggest that, after we control for fixed village characteristics, interacting the quartic in years-since-IDs with rainfall variance will be useful for identifying the size of the village migrant network.

[22] To ensure that this pattern was not driven by the 41 counties receiving IDs in 1988, we plotted the figure with these villages removed and observed no difference in the relationship between years-since-IDs were issued and migration.

The observed lowess plots in Figures 4 and 5 do not rule out the possibility that the distribution of IDs was driven by demand for migration that arose either in the same year or in the year or two preceding ID distribution. To directly address this possibility, we estimate a discrete time duration model for ID distribution and test whether exogenous rainfall shocks which would make migration more attractive, are also significantly related to the distribution of IDs. Rainfall shocks affect local agricultural productivity and returns to labor in both local agricultural and non-agricultural sectors. Large shocks will be positively associated with household desire to supply labor to the migrant labor market, and if this desire drives distribution of IDs, then we should observe an impact of rainfall shocks on ID distribution.[23] To implement this test, we estimate a logit model using village level data in which the dependent variable is equal to one in the year that IDs are distributed, zero before distribution, and the village is no longer in the sample after ID distribution. Regressors include province dummies and July-November rainfall shocks for year t, $t-1$ and $t-2$. We find no significant relationship between this exogenous shock to the local economy and distribution of IDs, and thus we have some confidence that demand for migration is not driving the timing of ID card distribution.[24]

5 Results

5.1 The First-Stage

Before estimating equation (9), we first establish that our instruments, period $t-2$ values of a polynomial function of the years since ID cards were issued and interactions with the variance of July-November rainfall, are significantly related to the change in the size of the village migrant labor force. We first estimate the relationship with only province-year and village dummies included with years-since IDs were issued specified as a quadratic, cubic, and quartic function (Table 3, columns 1 through 3) and then include interactions with the July-November rainvall variance (columns

[23] Note that in this test we use the actual value of lagged shocks, rather than the long term persistence of shocks, which is measured by the variance. This procedure is more similar to the regression strategy in Giles and Yoo (2006), who show that the lagged July-November rainfall shock is strongly related to increased participation in migrant labor markets, increased number of days in migrant employment and increased migrant remittances.

[24] Neither the t, $t-1$ nor $t-2$ rainfall shocks have a statistically significant independent effect on ID distribution. Moreover, the p-value on a chi-square statistic of the joint significance of July-November rainfall shocks for year t, $t-1$ and $t-2$ is 0.326 when we include province dummies, and 0.321 when we do not.

4 through 6). Each potential specification suggests a strong relationship between our candidate instruments and the change in the size of the village migrant network. We favor the quartic function and interactions with share of households in a major patrilineal clan for two reasons. First, this instrument set (with the quartic) allows for the most flexibility in determining the effects of ID card distribution on the migrant network.[25] Second, the partial R^2 increases significantly from the quadratic to the quartic, and thus reduces the potential for bias in instrumental variables regression.[26]

In columns 7 and 8 we add controls for village and household level economic conditions that vary over time and may be related to both consumption growth and migration. Anticipating models in which we control for endogeneous changes in village or household variables, we include the two period lag village controls in column 7 and two period lag village and household controls in column 8. At the village level, we include the size of the village labor force to control for local returns to labor, the cultivable share of village land, total village land, and the share of land planted in orchards to control for the returns to capital in agriculture, and the share of village assets controlled by collectives to control for the returns to capital outside agriculture as well as government control of the economy. At the household level, we control for the share of the household that is male and female as well as the size of the household labor force, household land per capita, and the average education level of adults in the household. These variables control for the household labor, capital, and human capital endowments, respectively. In both cases, the relationship between the migrant network variable and the instruments for migration remains strong.

5.2 The Timing of ID Distribution and Changes in Village Policy and Administrative Capacity

While results shown in Table 3 suggest that the timing of ID distribution is systematically related to changes in the size of the village migrant labor force, one might be concerned that the set of instruments may be systematically related to changes in other time-varying village level policies or administrative capabilities. In turn, these policies may affect both changes in migration and

[25] The quartic was first favored in studies of empirical age earnings profiles as far less restrictive than the typical second order polynomial in age (Murphy and Welch, 1990).

[26] Since the bias in instrumental variables estimation is inversely proportional to the partial R^2, a higher partial R^2 also implies lower bias so long as each additional instrument is strongly correlated with the endogenous variable.

change in log consumption per capita. For example, village leaders have considerable control over implementation of grain procurement policy and land use by village residents, and so it is of interest to know whether changes grain procurement policy or land use are systematically related to the timing of ID distribution. If a systematic relationship exists, we might be concerned that our instruments proxy for factors other than migration that influence consumption growth within the village. In addition, even though IDs became available at the county level and each county typically includes hundreds of villages, one might still be concerned that changes in village administrative capacity will be systematically related to timing of ID distribution within the county.

We construct proxies to control for the effects of changes in time-varying village policy and administrative capacity, ΔVP_{jt}, and regress them on period $t-3$ and $t-4$ log consumption per capita, which are our instruments for change in lag log consumption in our main models, the quartic in years since IDs (ID_{jt-2}) and interactions with village rainfall variance (RV_j), period $t-2$ lagged household and village regressors, village fixed effects and province-year effects:

$$\begin{aligned}\Delta VP_{jt} = {} & \gamma_1 c_{it-3} + \gamma_2 c_{it-4} + \alpha_1 ID_{jt-2} + \alpha_2 ID_{jt-2}^2 + \alpha_3 ID_{jt-2}^3 + \alpha_4 ID_{jt-2}^4 \\ & + \alpha_5 (RV_j \cdot ID_{jt-2}) + \alpha_6 (RV_j \cdot ID_{jt-2}^2) + \alpha_7 (RV_j \cdot ID_{jt-2}^3) + \alpha_8 (RV_j \cdot ID_{jt-2}^4) \\ & + \mathbf{Z}'_{jt-2}\alpha_8 + \mathbf{X}'_{jt-2}\alpha_9 + \mathbf{v}_j + \mathbf{p} \cdot \mathbf{T}_t + e_{ijt}\end{aligned} \tag{10}$$

In Table 4, we report F-tests on the quartic in years-since IDs were issued and interactions in specifications that both exclude household and village characteristics other than lagged consumption per capita (column 1) and the full reduced form which includes vectors of $t-2$ household and village level characteristics (column 2) that are the underlying instruments for changes in pre-determined time-varying household and village controls. We first examine the relationship between our instruments and evidence on changes in implementation of grain policy. Rural farm households faced a grain quota that was effectively a tax in which farm households were forced to provide grain to the government at below market price.[27] When households were required to provide more grain to the government at the quota price, their decisions regarding land use were potentially constrained. When the quota share of grain produced is closer to one, quota policy is more likely

[27] In the surveyed villages, as well as throughout rural China, the quota was phased out between 2001 and 2004.

to be driving the decision to grow grain crops. In row 1, we show that the change in the share of grain sold at the quota price has no systematic relationship with our instruments.

We next test whether changes in important indicators of land tenure security are systematically related to our instruments. While farmers nominally had fifteen and then thirty year leases on their land between 1986 and 2002, the leases were treated as policy, and it was not uncommon for village leaders to reallocate land more frequently for a variety of reasons.[28] The share of land in the village that is rented-in or rented-out by households are significant indicators reflecting perceptions of long-term land tenure security. Transfers of land through rental arrangements will not occur in areas in which a rental transaction is taken as a signal that a household no longer needs its land, and my thus find that its rented land is expropriated, or where villages place excessive administrative procedures and conditions on rental transfers. We do not observe any sign of a significant relationship between changes in land rental behavior of households and instruments based on the timing of ID card distribution. This would suggest to us that our instruments are not systematically related to changes in village policies toward land which may also be affecting local investment decisions, labor supply decisions, and income and consumption growth.

Next, we examine the relationship between changes in the weighted average local tax rate paid by households and instruments based on timing of ID card distribution. During the period under study, villages charged a range of different administrative fees to support investment in local public goods and to cover village administrative costs. The weighted average village tax rate is a useful indicator of village administrative capacity. If village administrative capacity is related to timing of ID distribution, as village leaders lobby higher levels of government for IDs, then this capacity may also affect motives for migration and observed consumption growth. Before we control for the set of village level variables, the instrument set appears to have a significant relationship with the weighted average village tax rate (row 4), but the significance vanishes when we include the set of twice lagged village and household level covariates.

Finally, we examine whether changes in the log value of assets managed by the village collective are associated with timing of ID distribution. Villages operating enterprises or otherwise managing

[28] Local variation in land policy and in land tenure security in rural China has been documented by numerous scholars. A helpful selection of useful papers discussing the land tenure system, its consequences and village level policy include Benjamin and Brandt (2002); Brandt, Rozelle and Turner (2004); Deininger and Jin (2005); Jacoby, Li and Rozelle (2002); and Kung (1995).

village productive assets may differ systematically in their implementation of administrative policy and in the timing of their decision to distribute IDs. A major divestment of assets by the village with bankruptcy of an enterprise, for example, might lead to an increase in village unemployment and decision by a local leader to make it easier to migrate through distribution of IDs. Again, after controlling for other village characteristics, we find no evidence that ID distribution is systematically related to changes in village management within the local economy.

5.3 The Effect of Migration on Household Consumption

In Table 5, we show results from estimating the first-differenced consumption model specified in equation (9). First in column (1), we restrict β_3 to zero, and estimate the average effect of migration on log consumption. As detailed above, we control for household and village unobserved effects through differencing, village specific time trends with village dummy variables, and province-wide shocks with province-year dummy variables. The lagged dependent variable is instrumented with $t-3$ and $t-4$ lagged level and change in migration is instrumented with the full set of years-since-ids instruments and interactions with the county rainfall variance. In the base model, we observe significant persistence in household consumption, a positive effect of increasing out-migration on consumption growth with is significant at the 5 percent lebel. An over-identification test suggests that there is no statistical evidence against the validity of any of our instruments. In this specification, the Cragg-Donald F-Statistic indicates that the bias toward the OLS coefficient estimate is less than 5 percent.[29] In columns (2) and (3), we add village and household controls, treating them first as exogenous and then as predetermined, using $t-2$ levels of the household and village controls as instruments. Whereas the coefficient estimate $\hat{\beta}_2$ remains positive, its magnitude decreases in both columns and it is no longer statistically significant in column (3).

In columns (4) through (6), we relax the constraint that $\beta_3 = 0$, and allow the effect of migration on consumption to to differ with lagged household consumption. The overall effect of an increase in

[29] Stock and Yogo (2005) compute critical values of the Cragg-Donald F-Statistic when there are two and three endogenous regressors. In all of the models presented in this paper, we reject the hypothesis that the bias in IV coefficients is larger than 10 percent of the bias in OLS, and in most models we can reject the hypothesis that the bias is larger than 5 percent of the bias in OLS. To ensure that our estimates do not suffer from weak instrument bias, we re-estimated each model using Nagar's (1959) bias corrected two stage least squares, and found that our coefficient estimates did not differ (results available upon request).

out-migration has a significant positive effect on household consumption growth, and the negative and significant sign on the differenced interaction term suggests that increased access to migrant labor markets benefits poorer households within the village relative to well-off households. In columns (5) and (6), differenced household and village controls are first added (column 5), and then treated as pre-determined (column 6). The potential endogeneity of changes to the village population and contemporaneous shocks is evident as the estimated coefficient on the change in the village labor force size variable switches from negative to positive, though neither coefficient estimate is statistically significant. The effect of contemporaneous shocks from either the local economy or migrant destinations is more apparent when examining changes in household demographic characteristics. When household composition is treated as exogenous, we observe significant negative coefficients on change in number of working age laborers in the household, and changes in working-age male and female shares of total household population. These negative coefficient estimates suggest that adults moving into the household may be associated with shocks experienced by these individuals in the previous period, which leads to apparent declines in household consumption per capita. Once household demographic characteristics are treated as pre-determined and instrumented with the $t-2$ lag level, we observe a positive association between number of adult residents and consumption per capita.

The effect of out-migration on household consumption varies little between the stripped down model shown in column (4), and a full model with household and village controls treated as pre-determined in column (6). Point estimates of effects do not differ a great deal, but they vary more strongly with initial consumption when village and household controls are treated as pre-determined.

One possible concern with interpretation of β_3, the coefficient on the interaction of village migration and lagged consumption per capita, is that the interaction term proxies for nonlinearities in effect of lagged consumption on present consumption. Such nonlinearities might arise, for example, in the presence of important credit constraints. To examine this possibility, we add the differenced lag of the squared dependent variable in models 1 and 2 of Table 6. If nonlinearities in effects of initial consumption are behind the coefficient on our interaction term, then that coefficient should be driven to zero with inclusion of the squared term. In fact, there is virtually no change in the

coefficient in either the basic model, column (1), or the full model in column (2).

Another specification issue arises from descriptive papers about the relationship between migration and poverty in rural China. Du, Park and Wang (2005), for example, examine correlations between household participation in migrant employment and poverty status, and find an inverted-U relationship between migration and household income. They posit that the probability of migration first increases with household income, and then begins to decrease. While we are examining general equilibrium effects of village migration on household consumption levels, one might still wonder whether this quadratic relationship may be observed and identified as a causal relationship with respect to village migration. If so, migration should have less of an effect on household consumption for low consumption levels, then peak, and finally decrease for higher levels of income. We examine this possibility in columns (3) and (4) of Table 6 by including the square of the lagged consumption level interacted with the migration variable, and find come evidence of a quadratic relationship.[30] Initially, the coefficients suggest a concave relationship between migration and consumption, but the coefficient estimates all reverse signs when we add the household and village controls. The Cragg-Donald F statistic also falls dramatically between column 1 and column 3, indicating that the larger instrument set may become weaker when we add the second interaction term. Therefore we discount these results and continue to use only the interaction between migration and lagged consumption in future models.

In order to examine the effects of migration on consumption across villages with different migration levels, and also at different points in the consumption distribution within villages we plot the predicted the effect of a 10 migrant increase on consumption against prior year consumption and show the results in Figure 6. We use the delta method to compute standard errors and show a 95 percent confidence interval around predicted effects. For values of consumption less than median consumption per capita in 1995, we can be confident that migration is significantly associated with consumption growth, and that the effect is stronger for poorer households.

[30] To instrument for the additional interaction term, we interact the $t-3$ and $t-4$ levels of lagged consumption squared with the eight instruments for the number of village migrants.

5.4 Out-Migration and Income Per Capita

One might be concerned that finding a stronger effect of out-migration on the consumption of poorer households could simply reflect a higher marginal propensity to consume out of additional income for poor households, or alternatively, may reflect not an increase in income but a decline in the precautionary saving of poorer households as it becomes feasible to expand labor supplied to the migrant market after experiencing a shock to income.[31] We thus next estimate equation (9) using the first-difference of log income per capita as the dependent variable (Table 7). Again, it is evident that increases in out-migration lead to a significant increase in income per capita, and that we also observe more rapid income growth among poorer households.

Our results thus suggest that out-migration from the village is leading to growth in income and consumption per capita, and that migrant opportunity is contributing to more rapid growth among poorer households within villages. This result is consistent with Benjamin et al's (2005) observation that income from migrant employment was relatively equalizing within villages, and moreover, this finding sheds light on differences in factors affecting participation in local versus migrant labor markets. Earlier research on inequality in rural China emphasized that differential access to local non-agricultural employment was a significant source of increased interpersonal inequality within villages (Morduch and Sicular, 2000; Rozelle, 1994). The fact that access to migrant employment is relatively equalizing suggests that those households without access to local employment opportunities may nonetheless have sufficient ability to increase their incomes more rapidly as opportunities improve in migrant labor markets.

We also show, in Figure 7, predicted effects of increasing village migration on household income per capita across the consumption distribution for 1995. Again, household income per capita rises faster for poorer households within villages, and migration has a statistically significant effect on on income growth for nearly all households in the RCRE villages.

[31] Giles and Yoo (2006) find, for example, that a larger migrant network is associated with a decline in precautionary saving, and that this effect is stronger for households below the poverty line.

5.5 Migrant Networks, Investment and Specialization

Apart from the effects of increased consumption, migrant networks may have indirect, longer term effects on income growth through their impact on investment in productive activities and promotion of specialization within the rural economy as households with migrants make implicit or explicit transfer of land to non-migrant households.

To investigate these mechanisms, we re-estimate equation (9) using the following dependent variables: the change in log value of productive assets, the change in log value of productive assets related to agriculture, the change in log value of productive assets for non-agricultural activities, the change in log value of non-productive assets, and the change in land per capita managed by the household. As with our analysis of consumption per capita changes, we are interested in the distributional impacts of the migrant labor market across these activities. If poorer households engage in more investment in agriculture and have larger farms with out-migration, for example, would suggest that the migrant labor market may assist with raising consumption of poor households not through direct employment, but through general equilibrium effects allowing them to specialize more in agricultural activities.

Results showing the effects of migration on household investments are shown in Table 8, and on land management by the household in Table 9. At first blush, we find no evidence of a significant relationship between migration and household investment in productive assets. When we examine the effects of migration on investment in agricultural and non-agricultural assets separately and allow for effects to differ with with household consumption per capita, we find that migration appears to be associated with increased investment of poorer households within villages. In Table 9, we find that poorer households in villages are also likely to have increased land under cultivation as migration increases, and taken together with the apparent effect of migration on investment in assets related to agricultural production suggests that poorer households may benefit from the ability to specialize in agriculture as other members of the village participate in migrant activities. Households also increase their investment in durable goods and housing with out-migration, and this effect is significant for households at all levels of initial consumption per capita.

6 Conclusions

7 References

Banks, James, Richard Blundell and Agar Brugiavini (2001). "Risk Pooling, Precautionary Saving and Consumption Growth," *Review of Economic Studies* v68, n4 (October 2001): 757-79.

Baum, Christopher F., Mark E. Schaffer, and Steven Stillman (2003). "Instrumental Variables and GMM: Estimation and Testing," *Stata Journal* 3(1): 1-31.

Benjamin, Dwayne and Loren Brandt (2002). "Property Rights, Labour Markets, and Efficiency in a Transition Economy: The Case of Rural China," *Canadian Journal of Economics* 35(4): 689-716.

Benjamin, Dwayne, Loren Brandt and John Giles (2005). "The Evolution of Income Inequality in Rural China," *Economic Development and Cultural Change* 53(4): 769-824.

Bertrand, Marianne, Esther Duflo and Sendhil Mullainathan (2004). "How Much Should We Trust Differences-in-Differences Estimates?" *Quarterly Journal of Economics*, 119, 249-275.

Besley, Timothy and Anne Case (2000). "Unnatural Experiments? Estimating the Incidence of Endogenous Policies," Economic Journal v110, n467 (November 2000): F672-94.

Cai, Fang, Albert Park and Yaohui Zhao (2006). "The Chinese Labor Market," chapter prepared for the second conference on *China's Economic Transition: Origins, Mechanisms and Consequences*, Pittsburgh, November 5-7, 2004.

Carrington, William, Enrica Detragiache and Tara Vishnawath (1996). "Migration with Endogenous Moving Costs," *American Economic Review* 86(4): 909-930.

Chan, Kam Wing and Li Zhang (1999). "The Hukou System and Rural-Urban Migration in China: Processes and Changes," *China Quarterly* v0, n160 (December 1999): 818-55.

Chen, Shaohua and Martin Ravallion (1996). "Data in transition: Assessing Rural Living Standards in Southern China," *China Economic Review*, 7(1) (Spring 1996): 23-56.

de Brauw, Alan, Jikun Huang, Scott Rozelle, Linxiu Zhang and Yigang Zhang (2002). "The Evolution of China's Rural Labor Markets During the Reforms," *Journal of Comparative Economics* 30:329-353.

Dercon, Stefan (2005). "Economic Reform, Growth and the Poor: Evidence from Rural Ethiopia," *Journal of Development Economics* (in press).

Deininger, Klaus and Songqing Jin (2005). The potential of land rental markets in the process of economic development: Evidence from China, *Journal of Development Economics* 78: 241-270.

Donald, Stephen, and Whitney K. Newey (2001). "Choosing the Number of Instruments." *Econometrica* 69(5): 1161-1191.

Du, Yang, Albert Park and Sangui Wang (2005). "Is Migration Helping China's Poor?" *Journal of Comparative Economics* 33(4): 688-709.

Giles, John (2006). "Is Life More Risky in the Open? Household Risk-Coping and the Opening of China's Labor Markets," *Journal of Development Economics* 81(1) (October 2006): 25-60.

Giles, John and Kyeongwon Yoo (2006). "Precautionary Behavior, Migrant Networks and Household Consumption Decisions: An Empirical Analysis Using Household Panel Data from Rural China," *The Review of Economics and Statistics* (in press).

Gustafsson, Björn and Li Shi (2002). "Income inequality within and across counties in rural China 1988 and 1995," *Journal of Development Economics*, 69(1) (October 2002): 179-204.

Hannum, Emily, Jere Behrman, and Meiyan Wang (2004). "Human Capital in China," draft prepared for conference on "China's Economic Transition: Origins, Mechanism, and Consequences," held at University of Pittsburgh, November 2004.

Jalan, Jyotsna and Martin Ravallion (2002). "Geographic Poverty Traps? A Micro Model of Consumption Growth in Rural China," *Journal of Applied Econometrics* 17(4): 329-46.

Kézdi, Gábor (2003). "Robust Standard Error Estimation in Fixed-Effects Panel Models," Central European University, Department of Economics, working paper, (October 13, 2003).

Liang, Zai and Zhongdong Ma (2004). "China's Floating Population: New Evidence from the 2000 Census," *Population and Development Review* 30(3): 467-488.

Mallee, Hein (1995). "China's Household Registration System under Reform," *Development and Change*, 26(1):1-29.

McKenzie, David and Christopher Woodruff (2006). "Do Entry Costs Provide an Empirical Basis for Poverty Traps? Evidence from Mexican Microenterprises," 55(1) (October 2006): 3-42.

Meng, Xin (2000). "Regional wage gap, information flow, and rural-urban migration" in Yaohui Zhao and Loraine West (eds) **Rural Labor Flows in China**, Berkeley: University of California Press, 251-277.

Montgomery, James D. (1991). "Social Networks and Labor-Market Outcomes: Toward an Economic Analysis," *American Economic Review* v81, n5: 1407-18.

Morduch, Jonathan and Terry Sicular (2000). "Politics, growth, and inequality in rural China: does it pay to join the Party?" *Journal of Public Economics*, 77(3) (September 2000): 331-356.

Munshi, Kaivan (2003). "Networks in the Modern Economy: Mexican Migrants in the U.S. Labor Market," *Quarterly Journal of Economics*, v118, n2 (May 2003): 549-99.

Nagar, A.L. (1959). "The Bias and Moment Matrix of the General k-Class Estimators of the Parameters in Simultaneous Equations," *Econometrica* 27: 575-595.

Ravallion, Martin and Shaohua Chen (2007). "China's (Uneven) Progress Against Poverty," *Journal of Development Economics*, 82(1) (January 2007): 1-42 .

Rosenzweig, Mark R. (2003). "Openness and Poverty Reduction in the Long and Short Run," paper presented at the conference on *The Future of Globalization*, Yale University, October 10-11, 2003.

Rozelle, Scott (1994). "Rural Industrialization and Increasing Inequality: Emerging Patterns in China's Reforming Economy," *Journal of Comparative Economics* 19(3) (December 1994): 362-391.

Rozelle, Scott, Li Guo, Minggao Shen, Amelia Hughart and John Giles (1999). "Leaving China's Farms: Survey Results of New Paths and Remaining Hurdles to Rural Migration," *The China Quarterly* 158: 367-393.

Solinger, Dorothy (1999). **Contesting Citizenship in Urban China : Peasant Migrants, the State, and the Logic of the Market**, University of California Press (Berkeley), 1999.

Stock, James H., Jonathan H. Wright, and Motohiro Yogo (2002). "A Survey of Weak Instruments and Weak Identification in Generalized Method of Moments." *Journal of the American Statistical Association* 20(4): 518-529.

Stock, James H. and Motohiro Yogo (2005). "Testing for Weak Instruments in Linear IV Regression" in D.W.K. Andrews and J.H. Stock, eds. *Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothenberg.* Cambridge: Cambridge University Press: 80-108.

Taylor, J. Edward, Scott Rozelle, and Alan de Brauw (2003). "Migration and Incomes in Source Communities: A New Economics of Migration Perspective from China," *Economic Development and Cultural Change*, 52(1), 75-101.

Woodruff, Christopher and Rene Zenteno (2007). "Migration Networks and Microenterprises in Mexico," *Journal of Development Economics*, 82(2) (March 2007): 509-528.

Wooldridge, Jeffrey M. (2002). **Econometric Analysis of Cross Section and Panel Data**. MIT Press, Cambridge, 2002.

Yang, Dean (forthcoming). "International Migration, Remittances and Household Investment: Evidence from Philippine Migrants' Exchange Rate Shocks," *Economic Journal* (forthcoming).

Yang, Dennis Tao (2004). "Education and Allocative Efficiency: Household Income Growth during Rural Reforms in China," *Journal of Development Economics* 74(1) (Special Issue June 2004): 137-62.

Zhao, Yaohui (2002). "Causes and Consequences of Return Migration: Recent Evidence from China," *Journal of Comparative Economics* v30, n2 (June 2002): 376-94.

Zhao, Yaohui (2003). "The Role of Migrant Networks in Labor Migration: The Case of China," *Contemporary Economic Policy* v21, n4 (October 2003): 500-511.

Figure 1
Share of Village Labor Force Employed as Migrants By Year

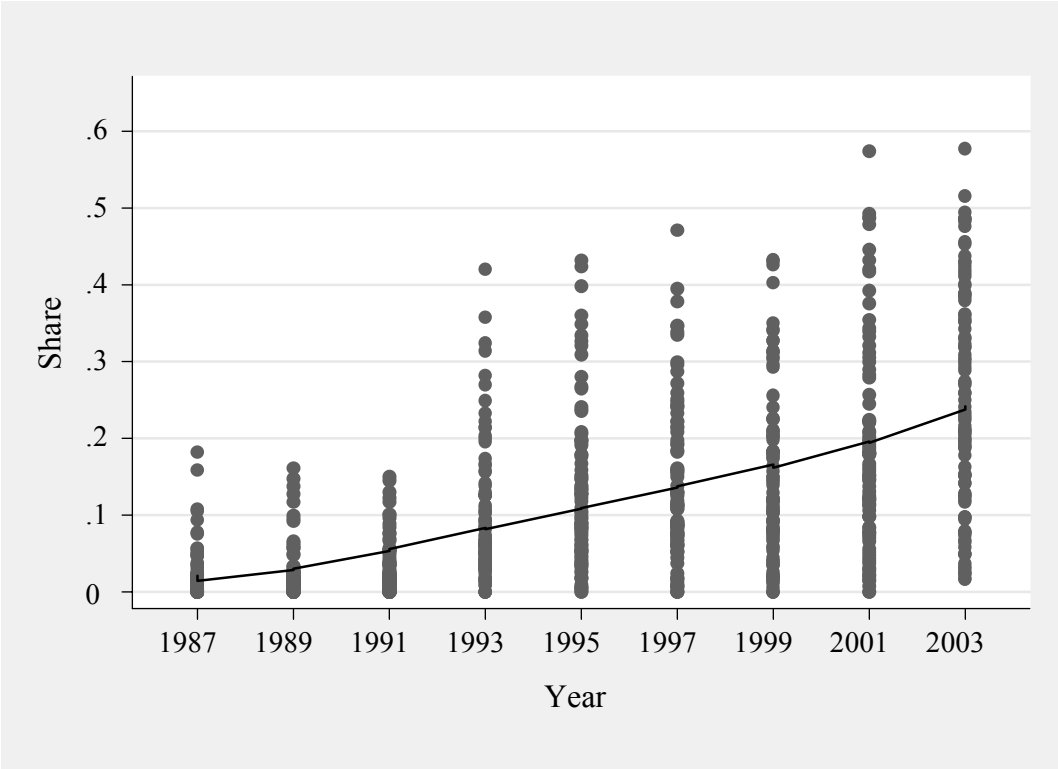

Figure 2
Village Consumption Growth as a Function of the Change in Number of Migrants

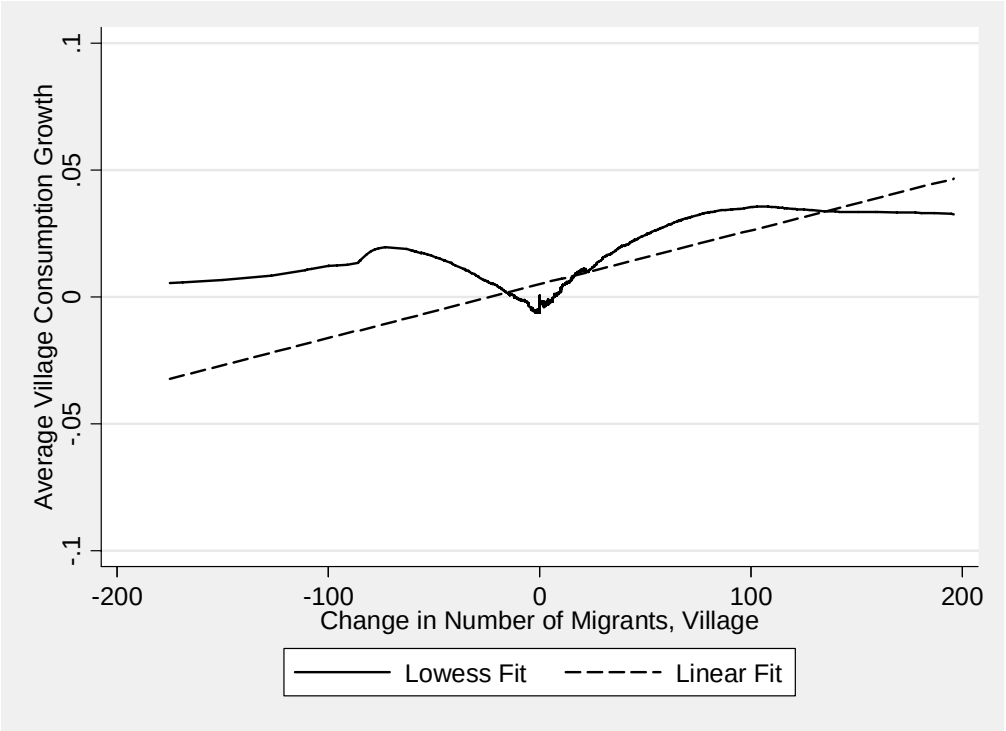

Figure 3
Change in Poverty Headcount as a Function of the Change in Number of Migrants

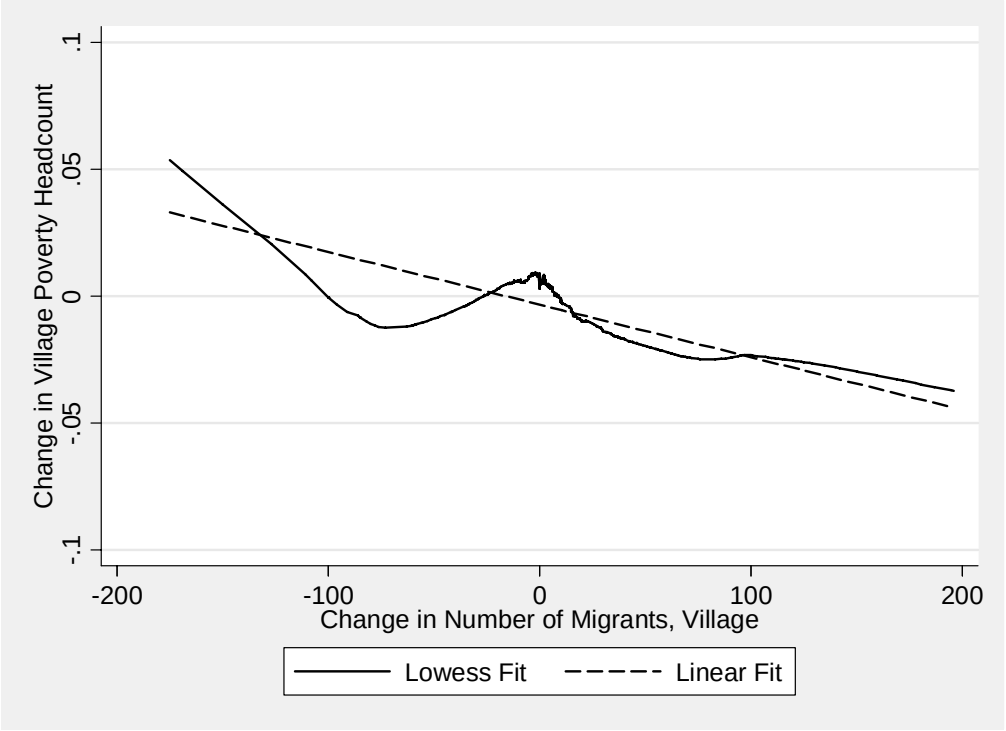

Figure 4
Change in Out-Migrants in Village Labor Force
Versus Years-Since-IDs were Distributed

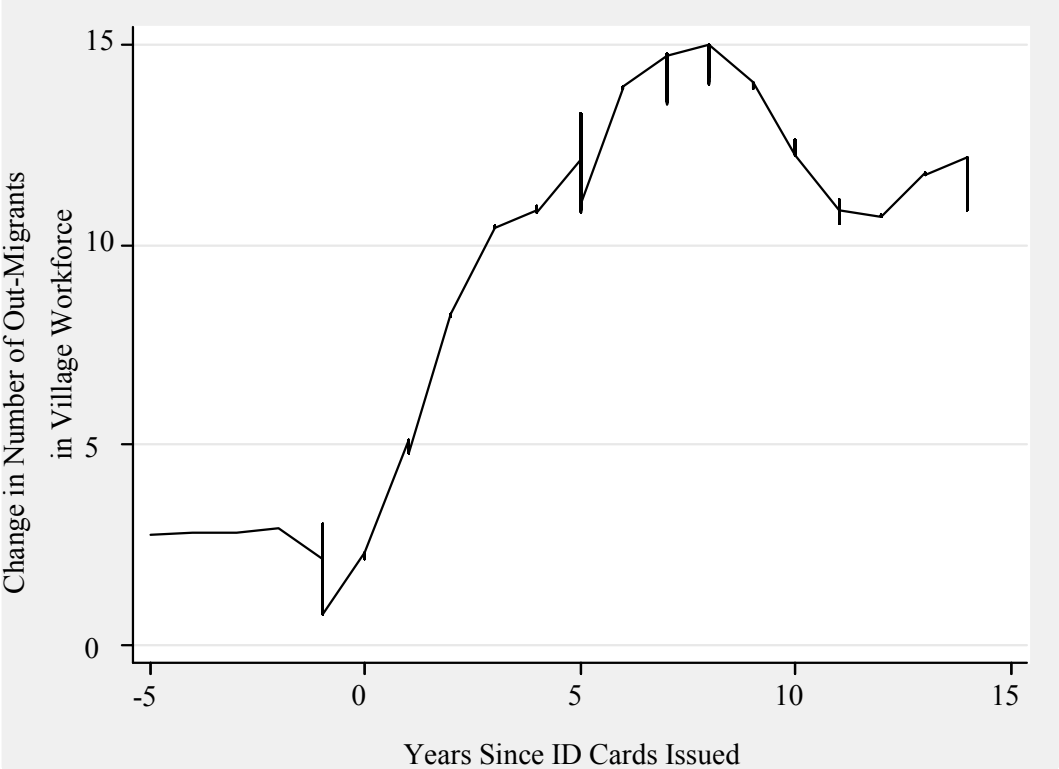

Figure 5
Change in Number of Village Migrants by Years Since IDs Issued
By Variance of Village Rainfall

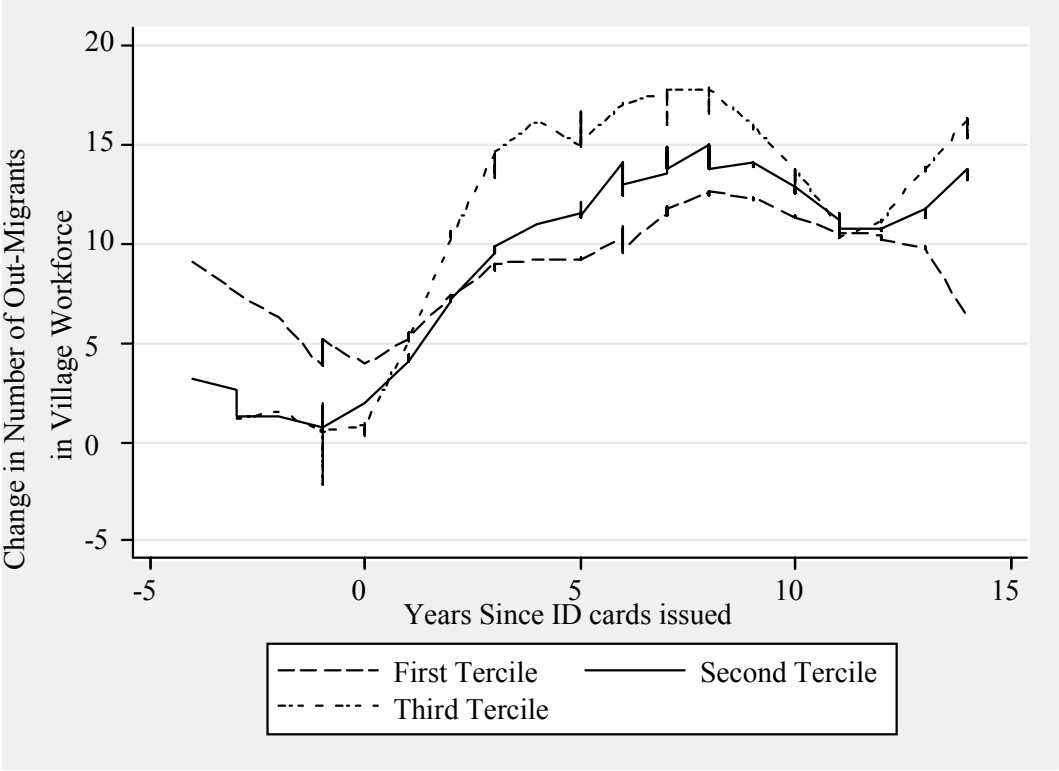

Figure 6
Effects of Increasing Migration by 10 on Consumption at Different Levels of Initial Consumption
(Using 1995 Levels of Consumption)

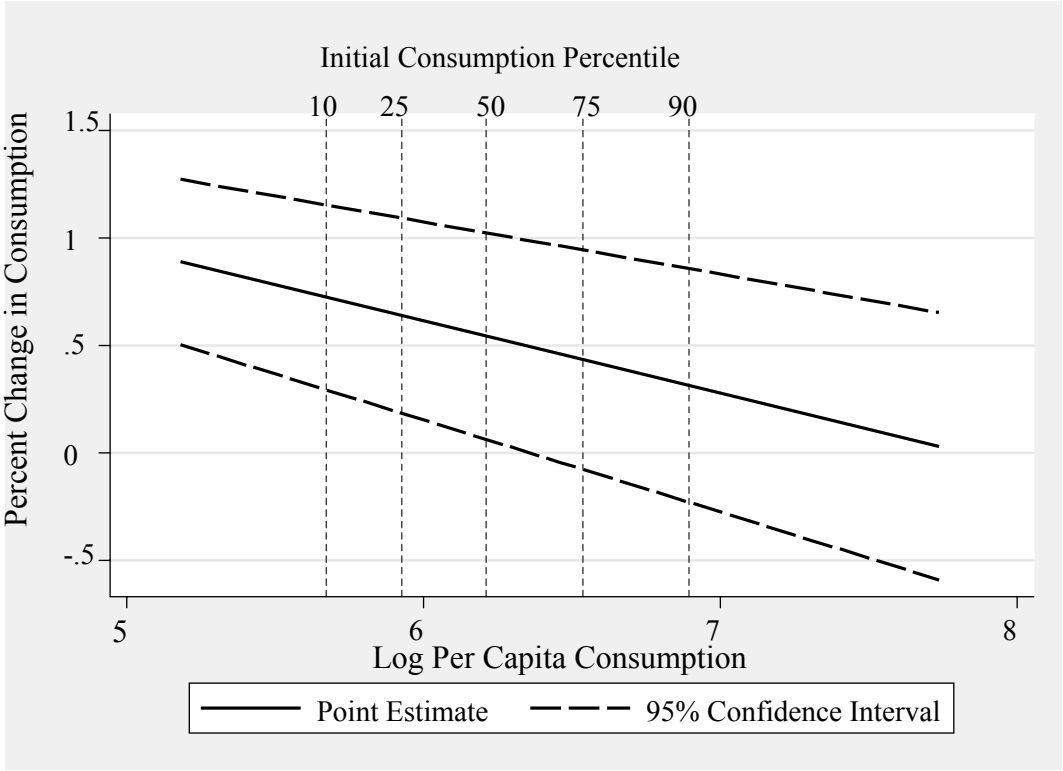

Figure 7
Effects of a 10 Migrant Increase on Income Per Capita at Different Points in the Lagged Distribution of Consumption
(Using 1995 Levels of Consumption)

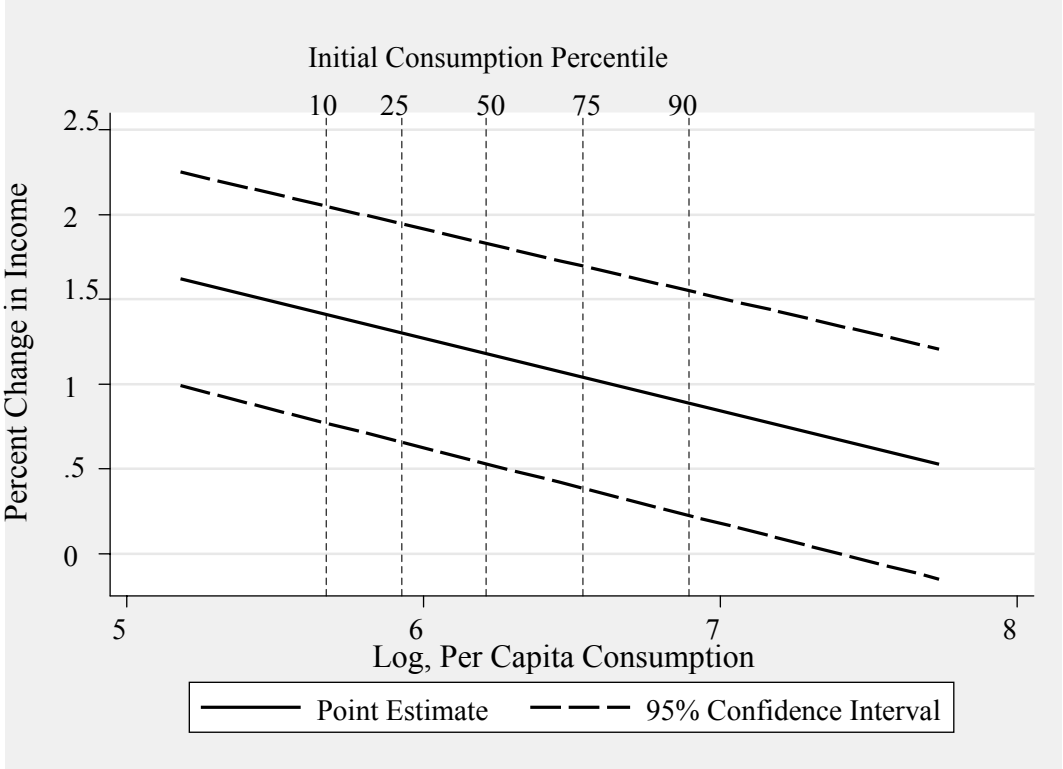

Figure 8
Effects of a 10 Migrant Increase on Income Per Capita at Different Points in the Lagged Distribution of Consumption
(Using 1995 Levels of Consumption)

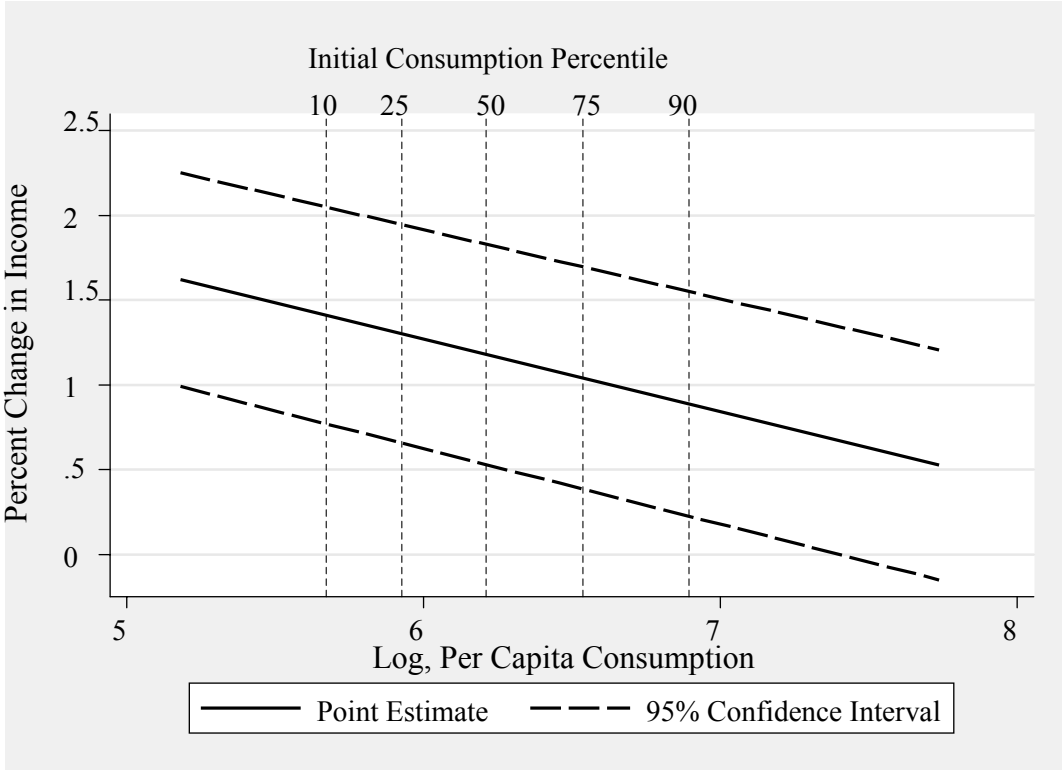

Table 1
Local Networks of Rural-Urban Migrants at Time of Migration
Five-City CULS Migrant Survey*

	Source Community Location	
	All Provinces	4 RCRE Provinces
Share of Migrants with:		
Job Arranged Before *First* Migration Experience	0.52	0.57
Job Arranged Before *Current* Migration Experience	0.53	0.56
Some Acquaintance from Home Village in City Before Migrating	0.91	0.94
**Close Family Member in City Before Migration	0.35	0.35
**Extended Family Member in City Before Migration	0.52	0.58
**Hometown Acquaintances	0.65	0.67
Five or Fewer Hometown Acquaintances	0.39	0.44
More than Five Hometown Acquaintances	0.27	0.24
At Least One Local Acquaintance	0.09	0.08
Number of Migrants	2,463	481

*Respondents are holders of rural registration (*hukou*). The survey was conducted in Fuzhou, Shanghai, Shenyang, Wuhan and Xian during late 2001. Sample frames were assembled using information on distribution of migrants within cities from the 2000 Population Census. After selecting neighborhoods through a proportional population sampling procedure, sample frames were assembled using residents' committee records of migrant households and registers of migrants living on construction sites and held by local by police stations. Very short-term migrants, who lack a residence that falls under the jurisdiction of either of these authorities, are unlikely to have made it into the sample frame.
**A *close family member* is adult sibling or member of nuclear family (e.g., spouse, child, parent). An *extended family member* refers to cousins or other relatives. *Hometown acquaintances* are unrelated, but known by the respondent. Note that migrants may have acquaintances in several categories, so that subcategories of acquaintances will add to more than 100.

Table 2
Average Village Characteristics in 1988
by Timing of ID Card Distribution

		Year ID Cards Were Issued		
		prior to 1988	in 1988	after 1988
Share of Productive Assets Owned by the Village Collective	mean	0.38	0.30	0.27
	std. dev	0.29	0.26	0.26
	p-value	0.150	0.681	0.291
	p-value, loc	0.205	0.930	0.211
Mean Consumption Per Capita	mean	511.4	418.6	414.2
	std. dev	203.4	166.8	132.4
	p-value	0.018	0.228	0.340
	p-value, loc	0.157	0.578	0.496
Mean Income Per Capita	mean	716.3	557.4	593.2
	std. dev	323.5	253.0	383.8
	p-value	0.042	0.150	0.726
	p-value, loc	0.766	0.723	0.715
Cultivable Share of Total Land Area	mean	0.64	0.521	0.526
	std. dev	0.315	0.279	0.278
	p-value	0.081	0.090	0.556
	p-value, loc	0.125	0.597	0.315
Share in Mountains	mean	0.148	0.195	0.318
	std. dev	0.362	0.401	0.477
	p-value	0.344	0.737	0.160
Share Near a City	mean	0.148	0.024	0.045
	std. dev	0.362	0.156	0.213
	p-value	0.043	0.145	0.651
	p-value, loc	0.049	0.206	0.541
Average Household Size	mean	3.763	4.067	4.201
	std. dev	0.482	0.493	0.602
	p-value	0.004	0.351	0.054
	p-value, loc	0.256	0.802	0.132
Total Village Land	mean	4014	5019	6589
	std. dev	4386	5228	7830
	p-value	0.244	0.901	0.165
	p-value, loc	0.906	0.399	0.269

Note: We report p-values for t-tests of the hypothesis that the mean is the same as the joint mean of the other two categories. *P-value, loc* reports the p-value of the t-test after partialing out province and terrain (location in mountains and hills) fixed effects.

Table 2 Continued On The Next Page

Table 2 (Continued)

		Year ID Cards Were Issued		
		prior to 1988	in 1988	after 1988
Village Cadres Share of Village Population	mean	0.007	0.005	0.006
	std. dev	0.006	0.003	0.006
	p-value	0.004	0.396	0.054
	p-value, loc	0.256	0.524	0.132
Share of Households Primarily in Agriculture	mean	0.679	0.847	0.823
	std. dev	0.324	0.236	0.300
	p-value	0.015	0.277	0.543
	p-value, loc	0.559	0.590	0.991
Village Population	mean	1389	1324	1511
	std. dev	869	600	918
	p-value	0.7968	0.621	0.3962
	p-value, loc	0.4802	0.461	0.9193
Village Consumption Per Capita Gini	mean	0.178	0.160	0.162
	std. dev	0.028	0.020	0.032
	p-value	0.026	0.150	0.494
	p-value, loc	0.267	0.381	0.868
Village Income Per Capita Gini	mean	0.229	0.225	0.220
	std. dev	0.072	0.053	0.068
	p-value	0.653	0.841	0.806
	p-value, loc	0.229	0.384	0.771
Village Cultivable Land Per Capita Gini	mean	0.230	0.160	0.200
	std. dev	0.110	0.060	0.090
	p-value	0.013	0.010	0.736
	p-value, loc	0.357	0.078	0.294
Village Poverty Headcount, Using Official poverty line	mean	0.07	0.08	0.04
	std. dev	0.20	0.15	0.08
	p-value	0.986	0.376	0.313
	p-value, loc	0.931	0.757	0.652
Village Poverty Headcount, Using Chen/Ravallion line	mean	0.174	0.305	0.235
	std. dev	0.279	0.329	0.255
	p-value	0.116	0.093	0.788
	p-value, loc	0.225	0.141	0.687
Share of Households in Largest Patrilineal Clan	mean	0.391	0.322	0.381
	std. dev	0.248	0.283	0.269
	p-value	0.961	0.584	0.925
	p-value, loc	0.794	0.384	0.801
Observations		27	41	22

Note: P-values test the hypothesis that the mean is the same as the joint mean of the other categories; P-Value Loc: Tests the same hypothesis after partialing out provincial and terrain (mountain or hill effects) fixed effects.

Table 3
Developing the First-Stage: Timing of ID Card Distribution and Change in Migration from Village

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$(\text{Years Since IDs Issued})_{t-2}$	-0.258	0.070	1.539	-0.244	0.243	-0.105	-0.094	-0.083
	(0.024)	(0.052)	(0.090)	(0.025)	(0.051)	(0.138)	(0.139)	(0.141)
$[(\text{Years Since IDs Issued})_{t-2}]^2/10$	0.121	-0.475	-5.410	0.116	-0.768	0.162	0.124	0.036
	(0.017)	(0.086)	(0.263)	(0.018)	(0.083)	(0.438)	(0.439)	(0.447)
$[(\text{Years Since IDs Issued})_{t-2}]^3/100$		0.283	5.659		0.419	0.316	0.388	0.520
		(0.040)	(0.274)		(0.038)	(0.470)	(0.470)	(0.478)
$[(\text{Years Since IDs Issued})_{t-2}]^4/1000$			-1.841			-0.277	-0.315	-0.367
			(0.093)			(0.162)	(0.162)	(0.164)
(Variance of Rainfall) * $(\text{Years Since IDs Issued})_{t-2}$				-0.003	0.028	0.799	0.804	0.813
				(0.002)	(0.003)	(0.043)	(0.044)	(0.044)
(Variance of Rainfall) * $[(\text{Years Since IDs Issued})_{t-2}]^2/10$				-0.004	-0.063	-2.557	-2.577	-2.591
				(0.001)	(0.005)	(0.152)	(0.153)	(0.155)
(Variance of Rainfall) * $[(\text{Years Since IDs Issued})_{t-2}]^3/100$					0.030	2.396	2.405	2.404
					(0.003)	(0.174)	(0.174)	(0.176)
(Variance of Rainfall) * $[(\text{Years Since IDs Issued})_{t-2}]^4/1000$						-0.691	-0.685	-0.680
						(0.063)	(0.063)	(0.064)
Two Period Lag Village Contols Included?	No	No	No	No	No	No	Yes	Yes
Two Period Lag Household Controls Included?	No	No	No	No	No	No	No	Yes
Number of Obs.	53904	53904	53904	53904	53904	53904	53817	52955
R^2	0.006	0.008	0.016	0.013	0.02	0.039	0.045	0.046
F statistic	41.501	40.059	61.141	49.609	57.102	83.684	81.389	71.306
partial $R^{2,}$, instruments	0.0038	0.0046	0.0119	0.0048	0.0079	0.0124	0.0130	0.0137

Notes: (1) All models include jointly significant controls for village and province*year effects, as well as other included instruments. (2) Dependent variable is change in number of the migrants from the village between year t-1 and t divided by 100. (3) Robust standard errors are cluster corrected at the village, and there are 90 village clusters. (4) Two-period lag village controls include: total number of working age laborers in registered village labor force, total village land, share of land in village in orchards, share of total assets owned by the village collective. (5) Two-period lag household controls include: number of working age laborers in the household, male working age laborer share of household population, female working age laborer share of household population, household land per capita, value of household productive assets, average years of education of working age laborers.

Table 4
Are the "Years-Since IDs" Instruments Correlated with Changes in Time-Varying Village Policies?
F-Statistics on Instruments (F-Probabilities)

	Explanatory Variables Included	
Policy Variable	Instruments (Quartic in Years Since ID Cards Issued and Interactions)	Instruments + Household and Village Controls
Change in Share of Grain Sold at Quota Price (Calculated by Value)	1.29 (0.259)	1.50 (0.170)
Change in Share of Households Renting-In Land	1.40 (0.209)	1.34 (0.233)
Change in Share of Households Renting-Out Land	1.74 (0.099)	1.49 (0.171)
Change in Average Village per Capita Tax Rates Paid by Households	2.49 (0.018)	1.51 (0.167)
Change in Logarithm, Value of Assets Managed by the Village Collective	1.50 (0.170)	1.17 (0.328)

Notes: Each policy variable listed is the dependent variable in regression models and we report the F-Statistic for the hypothesis that the coefficients on the instruments are equal to zero. (The instruments are the quartic in years since ID cards were issued, and interactions of the quartic with the distance of the village from the nearest road in 1993). The number shown in parentheses is the p-value for the F-Statistic. All models include village and province-year dummy variables and standard errors that are robust to within village correlation of residuals. Models that include additional household and village controls (shown in the second column), include all two-period lagged regressors included in column 8 of Table 2. Two period lag village controls include: total number of working age laborers in registered village labor force, total village land, share of land in village in orchards, share of total assets owned by the village collective. Two period lag household controls include: number of working age laborers in the household, male working age laborer share of household population, female working age laborer share of household population, household land per capita, value of household productive assets, average years of education of working age laborers.

Table 5
Migrant Opportunity and HouseholdConsumption
(All Models in First Differences)

	Dependent Variable: ln(Household Consumption Per Capita)					
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Household Consumption Per Capita)$_{t-1}$	0.572	0.534	0.535	0.597	0.544	0.553
	(0.035)	(0.027)	(0.043)	(0.028)	(0.029)	(0.034)
ln(HH Consumption Per Capita)$_{t-1}$ * (Number of Migrants/100)				-0.046	-0.034	-0.083
				(0.028)	(0.027)	(0.028)
Number of Migrants/100	0.128	0.046	0.053	0.331	0.241	0.530
	(0.064)	(0.021)	(0.074)	(0.165)	(0.159)	(0.165)
Village Level Control Variables						
Village Labor Force		-0.0002	0.037		-0.0002	0.024
		(0.003)	(0.022)		(0.003)	(0.014)
Cultivable Share of Village Land		0.106	0.378		0.085	-0.187
		(0.072)	(0.530)		(0.074)	(0.268)
Total Village Land		0.004	0.025		0.004	0.003
		(0.006)	(0.047)		(0.006)	(0.027)
Share of Assets Owned by Village Collective		-0.040	-0.435		-0.045	-0.223
		(0.026)	(0.211)		(0.027)	(0.101)
Share of Village Land in Orchards		0.260	-0.415		0.269	0.205
		(0.102)	(0.840)		(0.100)	(0.493)
Household Level Control Variables						
Working-Age Male Share of Household Population		-0.135	0.164		-0.134	0.116
		(0.036)	(0.168)		(0.036)	(0.148)
Working-Age Female Share of Household Population		-0.123	-0.049		-0.122	-0.067
		(0.035)	(0.164)		(0.035)	(0.146)
Number of Working Age Laborers in the Household		-0.054	0.012		-0.054	0.01
		(0.005)	(0.009)		(0.005)	(0.008)
Cultivable Land Per Capita		0.094	0.015		0.094	0.017
		(0.008)	(0.019)		(0.008)	(0.014)
Household Average Years of Education		0.003	-0.013		0.003	-0.016
		(0.002)	(0.006)		(0.002)	(0.006)
Village, HH Controls Predetermined?		No	Yes		No	Yes
Regression Statistics						
Hansen J Statistic	7.21	23.59	12.13	23.05	24.83	25.73
P-value, J statistic	0.51	0.49	0.15	0.46	0.36	0.31
Shea partial R^2, migration	0.010	0.038	0.007	0.022	0.021	0.019
Cragg-Donald F-Statistic	49.19	35.23	11.23	24.48	23.87	12.13
Number of Clusters	90	90	90	90	90	90
Number of Observations	53676	52373	52147	53676	52373	52147

Notes: All models are run in first-differences and include jointly significant village fixed effects to control for village specific trends, and province-year effects to control for province-wide macroeconomic shocks. Standard errors clustered at the village level. Lagged consumption, the interaction between consumption and migration, and migration are treated as endogenous.

Table 6
Migrant Opportunity and Household Consumption, Alternative Relationships
(All Models in First Differences)

	Dependent Variable: ln(Household Consumption Per Capita)			
	(1)	(2)	(3)	(4)
$\ln(\text{Household Consumption Per Capita})_{t-1}$	0.309	0.079	-0.055	0.626
	(0.324)	(0.303)	(0.339)	(0.355)
$(\ln(\text{HH Consumption Per Capita})_{t-1})^2$	0.024	0.040	0.053	-0.005
	(0.027)	(0.025)	(0.028)	(0.029)
$\ln(\text{HH Consumption Per Capita})_{t-1}$ * (Number of Migrants, Village/100)]	-0.049	-0.090	0.533	-0.722
	(0.029)	(0.028)	(0.318)	(0.403)
$(\ln(\text{HH Consumption Per Capita})_{t-1})^2$* (Number of Migrants, Village/100)]			-0.047	0.050
			(0.025)	(0.031)
Number of Migrants/100	0.352	0.579	-1.432	2.525
	(0.169)	(0.166)	(0.998)	(1.273)
Village Level Control Variables				
Village Labor Force		0.024		0.028
		(0.014)		(0.013)
Cultivable Share of Village Land		-0.161		-0.372
		(0.260)		(0.255)
Total Village Land		0.005		-0.010
		(0.026)		(0.022)
Share of Assets Owned by Village Collective		-0.215		-0.304
		(0.093)		(0.084)
Share of Village Land in Orchards		0.230		0.704
		(0.449)		(0.364)
Household Level Control Variables				
Working-Age Male Share of Household Population		0.133		0.169
		(0.145)		(0.121)
Working-Age Female Share of Household Population		-0.056		-0.048
		(0.143)		(0.123)
Number of Working Age Laborers in the Household		0.011		0.016
		(0.008)		(0.007)
Cultivable Land Per Capita		0.016		0.009
		(0.014)		(0.012)
Household Average Years of Education		-0.016		-0.016
		(0.006)		(0.005)
Village, HH Controls Predetermined?		yes		yes
Regression Statistics				
Hansen J Statistic	20.01	26.36	25.25	36.52
P-value, J statistic	0.696	0.335	0.957	0.584
Shea partial R^2, migration	0.022	0.019	0.010	0.007
Cragg-Donald F-Statistic	21.35	10.85	8.58	4.37
Number of Clusters	90	90	90	90
Number of Observations	53904	52365	53904	52365

Notes: All models are run in first-differences and include jointly significant village fixed effects to control for village specific trends, and province-year effects to control for province-wide macroeconomic shocks. Standard errors clustered at the village level. Lagged consumption, the interaction between consumption and migration, and migration are treated as endogenous.

Table 7
The Impact of Village Migration on Household Income Per Capita
(All Models in First Differences and Estimated Using IV-GMM)

	Dependent Variable: ln(Household Consumption Per Capita)					
	(1)	(2)	(3)	(4)	(5)	(6)
$\ln(\text{Household Consumption Per Capita})_{t-1}$	0.327	0.254	0.291	0.315	0.277	0.318
	(0.056)	(0.047)	(0.067)	(0.047)	(0.047)	(0.050)
$\ln(\text{HH Consumption Per Capita})_{t-1}$ * (Number of Migrants/100)				-0.059	-0.054	-0.107
				(0.029)	(0.029)	(0.035)
Number of Migrants/100	0.169	0.112	0.129	0.47	0.417	0.724
	(0.088)	(0.033)	(0.102)	(0.179)	(0.178)	(0.213)
Village Level Control Variables						
Village Labor Force		0.009	0.014		0.009	0.006
		(0.004)	(0.017)		(0.004)	(0.011)
Cultivable Share of Village Land		0.015	1.07		0.015	0.546
		(0.116)	(0.860)		(0.119)	(0.392)
Total Village Land		-0.024	-0.044		-0.024	0.01
		(0.011)	(0.056)		(0.011)	(0.031)
Share of Assets Owned by Village Collective		0.015	-0.335		0.003	-0.077
		(0.030)	(0.237)		(0.029)	(0.116)
Share of Village Land in Orchards		-0.244	-2.069		-0.219	-0.325
		(0.107)	(1.119)		(0.105)	(0.574)
Household Level Control Variables						
Working-Age Male Share of Household Population		-0.117	0.509		-0.123	0.411
		(0.030)	(0.274)		(0.031)	(0.221)
Working-Age Female Share of Household Population		-0.138	0.249		-0.146	0.153
		(0.027)	(0.259)		(0.029)	(0.205)
Number of Working Age Laborers in the Household		0.016	0.04		0.017	0.041
		(0.005)	(0.012)		(0.005)	(0.010)
Cultivable Land Per Capita		0.125	0.037		0.123	0.038
		(0.010)	(0.030)		(0.009)	(0.026)
Household Average Years of Education		0.014	-0.012		0.015	-0.015
		(0.002)	(0.008)		(0.002)	(0.007)
Village, HH Controls Predetermined?		No	Yes		No	Yes
Regression Statistics						
Hansen J Statistic	7.21	23.59	12.13	23.05	24.83	25.73
P-value, J statistic	0.514	0.485	0.145	0.458	0.359	0.314
Shea partial R^2, migration	0.010	0.038	0.007	0.022	0.021	0.019
Cragg-Donald F-Statistic	49.19	35.23	11.23	24.48	23.87	12.13
Number of Clusters	90	90	90	90	90	90
Number of Observations	53676	52373	52147	53676	52373	52147

Notes: All models are run in first-differences and include jointly significant village fixed effects to control for village specific trends, and province-year effects to control for province-wide macroeconomic shocks. Standard errors clustered at the village level. Lagged consumption, the interaction between consumption and migration, and migration are treated as endogenous.

Table 8
Migrant Opportunity and Household Investment Behavior
(All Models Estimated in First Differences Using IV-GMM)

Panel A

Dependent Variable:	ln(Productive Assets Per Capita)				ln(Agricultural Assets Per Capita)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\ln(\text{Household Consumption Per Capita})_{t-1}$	0.290	0.243	0.301	0.250	0.326	0.236	0.404	0.398
	(0.070)	(0.079)	(0.057)	(0.062)	(0.082)	(0.097)	(0.068)	(0.082)
$\ln(\text{HH Consumption Per Capita})_{t-1}$ * (Number of Migrants, Village/100)			0.008	-0.056			-0.108	-0.178
			(0.042)	(0.052)			(0.065)	(0.079)
Number of Migrants/100	-0.002	0.048	-0.015	0.287	-0.062	0.042	0.634	1.010
	(0.137)	(0.171)	(0.261)	(0.305)	(0.116)	(0.156)	(0.391)	(0.457)
Household, Village Controls?	no	yes	no	yes	no	yes	no	yes
Cragg Donald F Statistic	45.41	11.36	24.58	12.37	48.97	13.78	18.39	10.60
P-value, Hansen J-Statistic	0.090	0.203	0.128	0.225	0.016	0.120	0.079	0.162
Number of Observations	51809	50581	51809	50581	48321	47263	48321	47263

Panel B

	ln(Non-Ag Assets Per Capita)				ln(Durables+Housing Per Capita)			
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
$\ln(\text{Household Consumption Per Capita})_{t-1}$	0.110	0.074	0.127	0.064	0.515	0.559	0.548	0.590
	(0.078)	(0.084)	(0.074)	(0.074)	(0.054)	(0.057)	(0.046)	(0.046)
$\ln(\text{HH Consumption Per Capita})_{t-1}$ * (Number of Migrants, Village/100)			0.153	0.098			-0.099	-0.140
			(0.069)	(0.069)			(0.027)	(0.031)
Number of Migrants/100	0.273	0.229	-0.904	-0.644	0.265	0.168	0.684	0.867
	(0.140)	(0.190)	(0.401)	(0.407)	(0.087)	(0.116)	(0.174)	(0.197)
Household, Village Controls?	no	yes	no	yes	no	yes	no	yes
Cragg Donald F Statistic	40.02	8.39	22.50	12.38	49.26	11.24	24.60	12.22
P-value, Hansen J-Statistic	0.271	0.154	0.199	0.322	0.015	0.009	0.005	0.022
Number of Observations	45581	44700	45581	44700	53871	52352	53871	52352

Notes: Each model is estimated in first-differences. Models including household and village level controls treat them as predetermined and they are instrumented with t-2 lag levels. We show cluster corrected standard errors for 90 village clusters. Models are estimated using IV-GMM.

Table 9
Migrant Opportunity and Land Per Capita
(all models in first differences)

	Dependent Variable: Land per Capita			
	(1)	(2)	(3)	(4)
ln(Household Consumption Per Capita)$_{t-1}$	0.306	0.316	0.224	0.226
	(0.058)	(0.069)	(0.047)	(0.053)
ln(HH Consumption Per Capita)$_{t-1}$ * (Number of Migrants/100)			-0.098	-0.097
			(0.041)	(0.050)
Number of Migrants/100	0.019	0.098	0.593	0.600
	(0.052)	(0.081)	(0.238)	(0.287)
Village Level Control Variables				
Village Labor Force		-0.016		-0.017
		(0.017)		(0.010)
Cultivable Share of Village Land		0.602		0.392
		(0.604)		(0.332)
Total Village Land		0.006		0.023
		(0.046)		(0.033)
Share of Assets Owned by Village Collective		0.246		0.179
		(0.161)		(0.114)
Share of Village Land in Orchards		-1.006		-0.356
		(0.695)		(0.399)
Household Level Control Variables				
Working-Age Male Share of Household Population		0.645		0.847
		(0.211)		(0.185)
Working-Age Female Share of Household Population		0.213		0.524
		(0.209)		(0.172)
Number of Working Age Laborers in the Household		-0.055		-0.038
		(0.018)		(0.014)
Household Average Years of Education		-0.015		-0.024
		(0.008)		(0.007)
Village and Household Controls Predetermined?		yes		yes
Regression Statistics				
Hansen J Statistic	7.81	7.97	22.87	18.69
P-value, J statistic	0.45	0.44	0.47	0.72
Shea partial R^2, migration	0.010	0.007	0.022	0.021
Cragg-Donald F-Statistic	49.22	11.81	24.58	13.15
Number of Clusters	90	90	90	90
Number of Observations	53904	52365	53904	52365

Notes: All models are run in first-differences and include jointly significant village fixed effects to control for village specific trends, and province-year effects to control for province-wide macroeconomic shocks. Standard errors clustered at the village level. Lagged consumption, the interaction between consumption and migration, and migration are treated as endogenous.

Appendix Table A1
Alternative Specifications, Household Consumption and Village Migration

	Dependent Variable: Log Household Consumption Per Capita			
	OLS, Levels	OLS, Differences	IV-GMM	IV-GMM
Regressors	(1)	(2)	(3)	(4)
$\ln(\text{Household Consumption Per Capita})_{t-1}$	0.598	-0.314	0.589	0.168
	(0.014)	(0.009)	(0.025)	(0.291)
$(\ln(\text{HH Consumption Per Capita})_{t-1})^2$				0.035
				(0.024)
$\ln(\text{HH Consumption Per Capita})_{t-1}$ * (Number of Migrants, Village/100)]	0.008	-0.025	-0.045	-0.042
	(0.010)	(0.007)	(0.017)	(0.018)
Number of Migrants/100	-0.052	0.151	0.337	0.331
	(0.066)	(0.045)	(0.109)	(0.118)
Regression Statistics				
Over-Identification: Hansen J Statistic			18.40	17.79
P-value, J statistic			0.74	0.81
Significance of 1st Stage Instruments				
Shea Partial R-Squared, Δ Number of Migrants			0.0145	0.0143
Cragg-Donald F-Statistic			19.07	17.89
Number of Clusters	90	90	90	90
Number of Observations	53904	53904	53904	53904

Notes: All control for village and province-year effects. Standard errors clustered at the village level. Lagged consumption, the interaction between consumption and migration, and migration are treated as endogenous in columns (3)-(4). Regressions in columns (2)-(4) are differenced to remove household level fixed effects, which are not accounted for in column (1). Column (3) corresponds exactly to column (1) in Table 5 and is repeated here for comparison purposes.