Network effects and the dynamics of migration and inequality: theory and evidence from Mexico*

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Abstract

International migration is costly and initially only the middle class of the wealth distribution may have both the means and incentives to migrate, increasing inequality in the sending community. However, the migration networks formed lower the costs for future migrants, which can in turn lower inequality. This paper shows both theoretically and empirically that wealth has a nonlinear effect on migration, and then examines the empirical evidence for an inverse U-shaped relationship between emigration and inequality in rural sending communities in Mexico. After instrumenting, we find that the overall impact of migration is to reduce inequality across communities with relatively high levels of past migration. We also find some suggestive evidence for an inverse U-shaped relationship among communities with a wider range of migration experiences.

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1 Introduction

The United States-Mexico border is the longest between a developed and developing country in the world and there is a long history of migration between the two countries. Escobar Latapí et al. (1998) report that the number of Mexicans employed in the United States in a typical year is equivalent to one-eighth of Mexico's labor force.[1] This paper examines the impact of these large emigrant flows on inequality in the rural sending communities in Mexico. Inequality is often of intrinsic interest for a variety of political and equity-based considerations. In addition, income distribution in Mexico displays a high level of inequality by international standards, and there is now a large body of both theoretical and empirical research which suggests that inequality can retard growth.[2] To the extent that emigration is non-neutral with respect to inequality, it can therefore have important political and growth consequences for rural Mexico.

What is the overall impact of international migration on economic inequality at origin? The answer to this question is a priori unclear, depending on where migrants are drawn from in the initial wealth or income distribution, and on the impacts of their migration decisions on other community members. Initial wealth plays two key roles in determining whether a given individual will migrate. Households at the top of a community's income distribution have lower incentives to send members abroad than middle- and low-income households, since their income earning opportunities and social status are higher to begin with. However, while the poorest rural households may stand to benefit the most from emigration, migration is costly and in the presence of liquidity constraints, they may be unable to bear the cost of sending members abroad. The result is that if migration costs are sizeable, migrants are initially primarily drawn from households at the upper-middle of the community wealth distribution, causing inequality to initially increase as these households get richer from income earned abroad. In contrast, if migration costs are low or liquidity constraints do not bind, the lower part of the distribution is also able to migrate, resulting in a more neutral or even

[1] Measurement of the exact number of migrants is notoriously difficult, due in large part to substantial temporary migration of a highly seasonal nature and to most of the migration being undocumented. See USCIR (1998) for discussion and estimates.

[2] See, for example, the recent surveys by Benabou (1996) and Bardhan, Bowles and Gintis (1999).

inequality-reducing effect of migration income.

Most migrants making their first trip from Mexico to the U.S. do so without documents, making the process of migrating an even more risky and costly enterprise. Sociologists have emphasized the role that social networks play in reducing these costs. Espinosa and Massey (1997) report that social networks play an important role in mitigating the hazards of crossing the border, with friends and relatives with previous migrant experience often accompanying new immigrants across the border, showing them preferred routes and techniques of clandestine entry. They can arrange smugglers, or "coyotes", to transport the migrant across the border, and may provide temporary housing and financial assistance in the U.S. Munshi (2003) finds that individuals with larger networks are more likely to be employed and to hold higher paying jobs upon arrival in the U.S. As a result, net migration costs become endogenous to the migration process, as modelled theoretically in Carrington, Detragiache and Vishwanath (1996), and migration is therefore likely to have different effects on inequality at different levels of the migration process, as suggested by Stark, Taylor and Yitzhaki (1986). Indeed, in the presence of liquidity constraints and initially high migration costs, the first households to migrate are likely to be from the upper end of the income distribution, and consequently, their remittances tend to increase inter-household inequality. However, villagers who have successfully migrated can then provide information to other community members, lowering their effective migration costs and allowing migration to diffuse throughout the remainder of the income distribution, reversing any initially unfavorable effects of remittances on income inequality.

We begin by writing down a simple theoretical model of rural migration, show that it leads to an inverse U-shaped relationship between migration and wealth for a given cost of migration, and then examine the consequences of changes in costs and benefits which might arise from the presence of networks. This non-monotone migration-wealth relationship is then confirmed empirically in data from Mexico, and we find that networks still play a strong role in the migration decision, even after controlling for wealth. The main focus of our paper then lies in examining the empirical evidence for an inverse U-shaped relationship between emigration and inequality in the sending communities. We employ two data sets for this purpose. The first consists of data from 57 rural communities in Mexico collected as part of the Mexican Migration Project (MMP), while the second consists of data on 97 rural municipalities from the national demographic dynamics survey (ENADID). Both data sets provide detailed information on migration, but do not collect income or consumption data. To measure inequality, we therefore employ methods recently developed in McKenzie (2003), which allow us to measure inequality at the community level from data on indicators of household infrastructure and asset ownership. This enables us to construct data on inequality and migration for a large number of communities with a range of different migration experiences, in contrast to previous case studies which focus on only a couple of villages, typically in areas of high emigration.

The MMP surveys ask retrospective histories of migration, and enable us to examine the impact of past emigration to the U.S. on current inequality among members of sending communities in Mexico. Since there are likely to be unobserved factors correlated with both the migration decision and current inequality, we employ an instrumental variables strategy to isolate the overall effect of migration on inequality, allowing for nonlinearity in this relationship. The main instruments employed are historic state-level migration rates and U.S. labor market conditions. Using this instrumenting strategy, we find that migration reduces inequality among the MMP communities, with a larger effect on asset inequality than on income or consumption inequality. Many of the MMP communities have high levels of past migration, which may mean they are already past any turning point in the inequality-migration relationship. The ENADID therefore allows us to examine communities with a wider range of migration levels, and since we have data on these communities for both 1992 and 1997, determine whether changes in migration result in changes in inequality over this period. In these communities we do find some suggestive evidence for an inverse U-shaped relation, with the turning point occurring before the migration levels of many MMP communities.

As noted above, previous literature has not examined the overall impact of migration on inequality, focusing instead on examination of the effect of remittances alone on inequality in only a couple of communities.[3] Early efforts treated remittance income as an exogenous transfer, and compared Gini coefficients with and without the inclusion of remittance income. Stark, Taylor and Yitzhaki

[3]See Rapoport and Docquier (2003) for an overview of the economic determinants and consequences of migrants' remittances.

(1986) analyzed the direct effect of remittance income in two villages in Michoacán, Mexico, by comparing the Ginis with and without remittance income, and find that in both cases, remittances reduce inequality, but that the decline is greater in the village with more migration experience. They took this finding to be supportive of their hypothesis that remittances have a more equalizing effect at higher levels of past migration experience. Following a similar approach with national data from Yugoslavia, Milanovic (1987) finds that remittances increase inequality among agricultural households. Noting that migrant workers would otherwise be working and earning income at home, Adams (1989) predicts what income would have been without remittances. Using a sample of three villages in Egypt, he then finds that the inclusion of remittances from abroad worsens inequality. In contrast, following the same approach with households from 4 districts in Pakistan, Adams (1992) concludes that remittances have an essentially neutral impact on the rural income distribution. Taylor (1992) and Taylor and Wyatt (1996) note that in addition to the direct immediate impact on income, remittances can ease credit constraints for liquidity constrained households. Using a sample of 55 households from one part of Michoacán in Mexico, they find evidence that remittances translate into greater increases in income for rural households with illiquid assets. By allowing poorer households access to credit, remittances also finance the accumulation of productive assets, increasing future income. These indirect effects of remittances act to equalize incomes, and they find that remittances reduce inequality, with a greater effect once the indirect effects are included. Barham and Boucher (1998) follow on from Adams, in treating remittances as a substitute to home production. Using data from 3 neighborhoods in Bluefields, Nicaragua, they estimate a double-selection model to allow for the counterfactual of no migration and no remittances to impact on the participation decisions and earning outcomes of other household members. Treating remittances as exogenous would lead them to conclude that remittances reduce income inequality, whereas treating them as a substitute for home earnings results in remittances increasing inequality.

Our methods allow, and indeed force, us to examine the overall impact of migration on inequality. This overall impact includes the direct effect of remittances and the spillover effects of remittances on own production and household labor supply studied in the previous literature. However, it also includes the network effects of migration on the costs and benefits of migration for other community members, multiplier effects of remittances through their spending on products and services produced by other community members (Adelman, Taylor and Vogel (1988)), and other potential spillover and general equilibrium effects. Although we are unable to break down the separate effect of each channel on inequality, we do believe these additional indirect effects are important and need to be included in studying the migration-inequality relationship.

The remainder of this paper is organized as follows. Section 2 presents the theoretical model. Section 3 discusses the data. Section 4 summarizes the method used to construct measures of inequality from data on asset indicators, and Section 5 empirically examines the effect of wealth and networks on the migration decision. Section 6 contains the main results of the paper, examining the effect of migration on inequality, while Section 7 concludes.

2 The model

Initial wealth plays two key roles in determining whether a given individual will migrate: increases in wealth generally raise the returns to domestic production, increasing the opportunity cost of migrating, but also relax credit constraints which restrict the amount of costly migration. We provide a simple static model of an agricultural household's migration decision to illustrate these dual roles of wealth on migration, and derive the resulting relationship between migration, wealth, and migration costs.

Consider a family of size N making its living from agriculture, with initial illiquid household wealth A, such as land holdings. Family members are assumed to live for two periods. Since our prime interest lies in the study of interhousehold inequality, we assume for simplicity that income is income equally shared between members of the same family. In the first period, all members are in Mexico, and each household member inelastically supplies one unit of labor to household production. Total farm production with L workers is $AL - \frac{bL^2}{2}$. The marginal product of farm labor is linearly increasing in wealth and decreasing in the number of workers[4], and there is no outside labor

[4]All the model is written in terms of farm production, it can also be more generally applied to other home

market.[5] A household member can migrate to the U.S. and earn the foreign wage w by incurring a fixed migration cost c, which is initially assumed to be fixed and exogenous.[6] Credit market imperfections prevent borrowing, and so no household member can migrate in the first period. In the second period, households may use savings from the first period to finance migration, after having met the first period subsistence needs of I per member. We assume $w > I$ and that $A - \frac{bN}{2} \geq I$. The household's problem is to chose the proportion of members who migrate, m. We assume no discounting, so the household makes this decision to maximize second period household income net of migration costs, subject to the subsistence constraint. That is, the household's problem is:

$$\max_{\{m\}} AN(1-m) - \frac{bN^2(1-m)^2}{2} + Nm(w-c)$$
$$\text{s.t. } A - \frac{bN}{2} - mc \geq I \tag{1}$$

Let λ be the Lagrange multiplier associated with the subsistence constraint in (1). Then the first-order condition with respect to m is:

$$-AN + bN^2(1-m) + N(w-c) - \lambda c = 0$$

Rearranging, we can solve for the optimal household migration rate, m^*, as:

$$m^* = 1 - \frac{[A-(w-c)]}{bN} - \frac{\lambda c}{bN^2} \tag{2}$$

The Lagrange multiplier $\lambda = 0$ unless (1) binds. When (1) binds, we can solve for the constrained migration rate:

production and family businesses, in which labor is a complement to capital in production.

[5] The assumption of no outside labor market allows us to abstract from general equilibrium effects on wages. Docquier and Rapoport (2003) provide a model of remittances and inequality with a rural labor market, and show, given fixed migration costs, that the domestic wage responses can also give rise to an inverse-U shaped relationship between migration and inequality.

[6] Since the majority of migration in our application is illegal, resulting in low returns to migrant capital, we assume that the foreign wage is independent of A. Our main results continue to hold if w is a function of A provided that the marginal productive (and psychic) returns to wealth at home eventually are greater than those abroad ($w'(A) < 1$), that is, there is some incentive to return to the home village. Otherwise, all who can meet the migration costs will permanently leave, which is not the situation found in our data.

$$\widetilde{m} = \frac{1}{c}\left(A - \frac{bN}{2} - I\right) \tag{3}$$

Equating (2) and (3) allows us to solve for λ when (1) binds:

$$\lambda = \frac{N}{2c^2}\left(2bNc - 2\left[A - w + c\right]c - 2bNA + b^2N^2 + 2bNI\right) \tag{4}$$

From (3) we can solve to find the highest level of assets at which a household is constrained by subsistence needs to not have any migrants:

$$\underline{A} = \frac{bN}{2} + I \tag{5}$$

This level is higher the higher is subsistence income I, and the more household members there are to reduce the marginal productivity of labor. Note that it does not depend on migration costs c, as subsistence concerns make these households unable to save anything in the first period, so that they can not migrate regardless of how low migration costs are.

Let us now see how the rate of migration changes with the level of wealth, A. From (2) we have:

$$\frac{\partial m^*}{\partial A} = -\frac{1}{bN} - \frac{c}{bN^2}\frac{\partial \lambda}{\partial A} \tag{6}$$

and from (4) we have, when $\lambda \neq 0$,:

$$\frac{\partial \lambda}{\partial A} = -\frac{N}{c^2}\left(c + bN\right) \tag{7}$$

Substituting in (6) we have:

$$\frac{\partial m^*}{\partial A} = \begin{cases} -\frac{1}{bN} \text{ when } \lambda = 0 \\ \frac{1}{c} \text{ when } \lambda > 0 \end{cases} \tag{8}$$

Interpreting (8), we see that when subsistence constraints bind, increasing wealth increases migration, the extent to which depends on migration costs c. When subsistence constraints no longer bind, an increase in wealth merely causes the opportunity cost of migrating to increase in terms of lost household production, and so households will reduce migration, the extent to which depends on productivity. Using (2) and (3) to find the level of level of A at which $m^* = \widetilde{m}$, and hence at which $\lambda = 0$, gives a level of assets A_1 above which households are no longer bound by the subsistence constraint:

$$A_1 = \frac{1}{2}\frac{b^2N^2 + 2bNI + 2bNc + 2cw - 2c^2}{c + bN} \tag{9}$$

Finally, we see in (8) that m^* is decreasing in A for $A > A_1$ ($\lambda = 0$). We can then find the lowest asset level at which unconstrained households will optimally choose no migration from (2) with $\lambda = 0$:

$$\overline{A} = bN + (w - c) \tag{10}$$

Note that this is increasing in the net benefit from migration, $(w - c)$. So putting this altogether we have:

$$m^* = \begin{cases} 0 \text{ when } A \leq \underline{A} \\ \frac{1}{c}\left(A - \frac{bN}{2} - I\right) \text{ when } \underline{A} \leq A \leq A_1 \\ 1 - \frac{[A-(w-c)]}{bN} \text{ when } A_1 \leq A \leq \overline{A} \\ 0 \text{ when } A \geq \overline{A} \end{cases} \tag{11}$$

That is, a household's migration rate will be a triangular function of assets, with migration increasing with wealth at low levels, and decreasing with wealth at higher levels. In other words, as wealth increases, the maximal number of migrants a given household can afford increases but the optimal number decreases. Figure 1 shows this relationship.

Migration rates will thus first increase and then decrease with wealth. The model as presented does not incorporate risk. The migration itself along with the income it provides are risky, and so decreasing absolute risk aversion will provide an additional reason for migration rates to increase with wealth. However, Stark and Levhari (1982) note that migration can provide a way for risk-averse

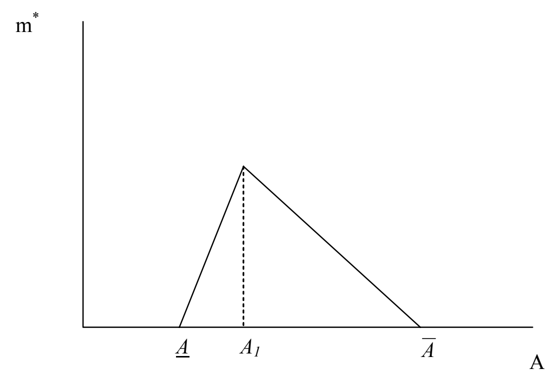

Figure 1: Relationship between Migration Rate (m^*) and Asset Wealth (A).

farm households to diversify their income portfolio, which will be a more important rationale for migration for poorer households. Taken together, these factors should act to reinforce the inverse-U shaped relationship between migration rates and initial wealth. Borjas (1987) offers an additional reason why we might expect to see migration rates declining with wealth in Mexico. He shows that migrants from a country with a more unequal income distribution than the U.S., as is the case with Mexico, will be negatively selected. High inequality in Mexico increases the incentives for remaining in Mexico for people in the top of the distribution. If we introduce borrowing constraints into his model, then we would also see migration rates increasing with wealth at lower levels, as in Figure 1.

Massey, Goldring and Durand (1994) outline a cumulative theory of migration, which fits well with the assumptions of our model. They note that the first migrants usually come from the lower middle ranges of the socioeconomic hierarchy, and are individuals who have enough resources to absorb the costs and risks of the trip, but are not so affluent that foreign labour is unattractive. Family and friends then draw on ties with these migrants to gain access to employment and assistance in migrating, substantially reducing the costs and risks of movement to them. This increases the attractiveness and feasibility of migration for additional members, allowing them to migrate and expanding further the set of people with network connections. Migration networks can then be viewed as reducing the cost of migration c, and perhaps also increasing the benefits w. Reducing the costs of migration has two effects on the desired level of household migration. Firstly, for a given unconstrained level of desired migration, a reduction in migration costs makes it less likely that subsistence concerns will prevent migration from reaching this desired level. This effect tends to reduce A_1, the asset level at which households are no longer constrained. However, a reduction in migration costs also increases the net benefits of migrating, $w - c$, making households want to migrate more, and thereby increasing their likelihood of being constrained. This effect therefore tends to increase A_1. One can show that which effect dominates depends on whether migration costs are high to begin with, in which case the second effect dominates, or low to begin with, in which case the first effect dominates. In terms of our notation,

$$\frac{\partial A_1}{\partial c} \underset{>}{\overset{<}{=}} 0 \Leftrightarrow c \underset{<}{\overset{>}{=}} -bN + \frac{1}{2}\sqrt{\left(6b^2N^2 + 4\left(w - I\right)bN\right)} \tag{12}$$

Figure 2 plots the effect of a reduction in migration costs for initial situations of high and low costs. In both cases we see that networks, by lowering migration costs, increase desired household migration rates at any asset level at which there was initially some migration, and also induce additional individuals to migrate. Interestingly, these additional migrant households are households who were initially too wealthy to bother with migration given its costs, but who now find the net benefits of migration to have increased as a result of the network to a point where it is now worth migrating.

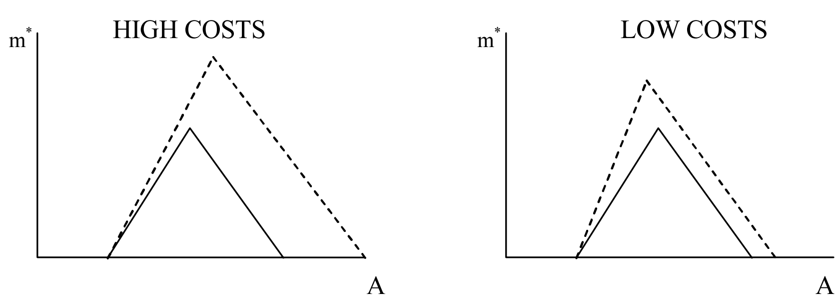

Figure 2: Effect of a Reduction in Migration Costs on Optimal Household Migration Rate According to Initial Level of Costs. Solid Lines are at original costs, Dotted Lines at the new lower costs.

As we are considering only one period for the migration decision, this rules out the possibility of strategic delay, whereby migrants delay migrating in the current period in order to wait for networks to lower the costs of migrating in the next. Even without such a factor, Carrington, Detragiache and Vishwanath (1996) note that once networks make migration costs endogenous, there is the possibility of multiple equilibria, since individual households do not internalize the cost-lowering impact of their own migration on the migration decisions of others. In these circumstances, initial conditions become important, and a village which has high initial levels of migration for some exogenous reason will continue to have higher levels of migration in subsequent periods. We will use this idea to argue that historic migration rates provide instruments for current migration levels in the communities in our study.

In the context of this model, it becomes clear that the relationship between migration and subsequent inequality will depend on the initial distribution of income. In light of the observations of sociologists, such as Massey, Goldring and Durand (1994), it seems likely that initially it will be the middle class of a village who have the highest rates of migration, and so we can interpret the level of wealth A_1, at which the initial turning point occurs, as being middle class. Their migration is then likely to increase village inequality. When migration costs are high to begin with, the first network effects tend to reinforce this, by increasing migration opportunities more for the middle and upper-middle classes, as is seen in the High Cost scenario in Figure 2. Migration will therefore increase inequality at first. However, as migration costs continue to fall through the building of a larger network, we see from the Low Cost scenario that further reductions in migration costs will benefit primarily the lower and lower-middle classes in the village, which will tend to reduce inequality.[7] This gives rise to an inverted U-shaped relation between migration and inequality which is the hypothesis to be tested in this paper.

[7] The migrant network may also provide loans to potential migrants, which information costs prevent other potential lenders from making. The result is that even households with wealth below $\underline{A}$ may eventually be able to migrate, further lowering inequality.

3 Data

Mexico has some of the most comprehensive surveys of migration available for any developing country. In order to examine the effect of migration on inequality in the sending communities, one would ideally like to have individual and community-level panel data on both assets and migration. While no single survey fits this criterion, we use two surveys which approach it: the Mexican Migration Project (MMP) data and the Encuesta Nacional de Dinámica Demográfica (ENADID), along with the national income and expenditure survey (Encuesta Nacional de Ingresos y Gastos de los Hogares - ENIGH).

The majority of our analysis uses data from the Mexican Migration Project, a collaborative research project based at the University of Pennsylvania and the University of Guadalajara.[8] The MMP surveyed five communities in 1982, between two and five communities each year from 1987-97, and fourteen communities in 1998. In general, 200 households were surveyed in each community, with smaller samples taken in communities with less than 500 residents. We use the MMP71 database, which contains data on 71 communities. Since our theoretical model applies best to rural communities and small towns, we restrict most of our analysis to the 57 communities which had a population below 100,000 in 1990. Each community is surveyed only once, but household heads are asked entire life retrospective migration histories, including whether at each point in time they had a parent or sibling with U.S. migrant experience.[9] In addition, the survey asks for each individual in the household whether they have ever been to the United States, and if so, in what year was their first migrant experience. This enables the construction of a time-series of the stock of current residents in a community who had migrant experience in a given year. In addition to questions about migration, households are asked about their current and past land holdings, and about current household infrastructure and durable asset ownership. No information is collected on household income or consumption in Mexico. The dataset also contains community-level variables taken from

[8] Full details of the methodology, the data, and the questionnaires are available at http://www.pop.upenn.edu/mexmig.

[9] Later years of the survey also ask this information for spouses of the head, but since this data is not available for all communities, we do not use it in our analysis.

past years of the Mexican Census. The survey is typically taken in December and January, which is when traditionally most migrants return to their communities, but if initial fieldwork suggests migrants tend to return during other months instead, a portion of the interviews are conducted then.[10]

The MMP surveys have the advantage of containing the most detailed migration data, allowing construction of both community and household head panel data on migration and migration networks. However, since data on assets are collected only for the survey year, we only have cross-sectional data on inequality for each community. Moreover, although migration history itself is not an explicit criteria in selection of communities, the survey contains data from only 13 of Mexico's 32 states, with many of the surveyed communities coming from the traditional migrant-sending states in West-Central Mexico. For these reasons we also carry out some estimation using data from the ENADID[11].

The ENADID is a national demographic survey intended to provide information on fertility, infant and general mortality, national and international migration, births, deaths and contraceptive practices. It was taken in 1992 and again in 1997 by Mexico's national statistical agency, the Instituto Nacional de Estadística, Geografía e Informática (INEGI).[12] The questionnaires and summary tables for 1992 are contained in INEGI (1994). Approximately 2000 households were surveyed in each state, with a total sample size of 57,017 households in 1992 and 73,412 households in 1997. The ENADID asks whether household members have ever been to the U.S. in search of work. This question is asked of all household members who normally live in the household, even if they are temporarily studying or working elsewhere, and an additional question asks whether any household members have gone to live in another country in the past five years. Thus U.S. migrants are recorded as long as they return to Mexico or have family members remaining in the community. Although the same households were not sampled in both years, some of the same municipalities were. Restricting our focus to municipalities with less than 100,000 population, we were able to match 97 municipalities

[10] A small non-random sample of 10-20 households from each community is also conducted in the U.S., however we do not use this data.

[11] See Massey and Zenteno (2000) for a comparison of the MMP with the ENADID 1992 survey.

[12] Unfortunately this survey was not continued after 1997, preventing us from using a longer community panel.

in which 50 or more households were surveyed in both 1992 and 1997, although in only 33 of these were 100 or more households surveyed in both years. As with the MMP data, the ENADID surveys collect some information on household infrastructure, but no data on consumption and only the 1997 survey contains income data. In the next Section we describe the method used to calculate inequality based on such data. For the municipalities which are surveyed in both 1992 and 1997, we then have a short panel on inequality and migration at the community level.

The MMP survey collects migration information for all children of the household, whether or not they live at home. In addition, since the surveys are collected during the traditional migrant return period, data are collected on community members who are only present for part of the year in Mexico. Households for which all community members have permanently migrated to the United States are not captured. We therefore study the impact of migration of community members who have returned to the community, or who have parents still in the community, on inequality among households present in the community at the time of the survey. Since Mexican migration is characterized by frequent return, with the median trip duration in the MMP and ENADID being seven months (Massey and Zenteno, 2000), this still enables us to capture much of a community's migration experience.

A large component of the fixed cost of migration in our theoretical model can be viewed as the cost of crossing the border. Most of the recent first-time migrants in the MMP sample crossed illegally: on average 89 percent of first-time migrants between 1970 and 1990 were undocumented, while a further 7 percent entered on tourist visas. Figure 3 shows that this is in sharp contrast to the period before 1965, where less than one-quarter were undocumented, and the majority entered under the bracero program, which allowed for the temporary recruitment of Mexican farmworkers. In 1965 the United States Congress amended the Immigration and Nationality Act, ending the bracero program.[13] From this point onwards, the overwhelming majority of first-time migrants in the MMP sample are undocumented.

More detailed description of the asset variables contained in the MMP and ENADID surveys and

[13] See Chapter 3 of Massey, Durand and Malone (2002) for a summary of the bracero era and description of the causes of its demise.

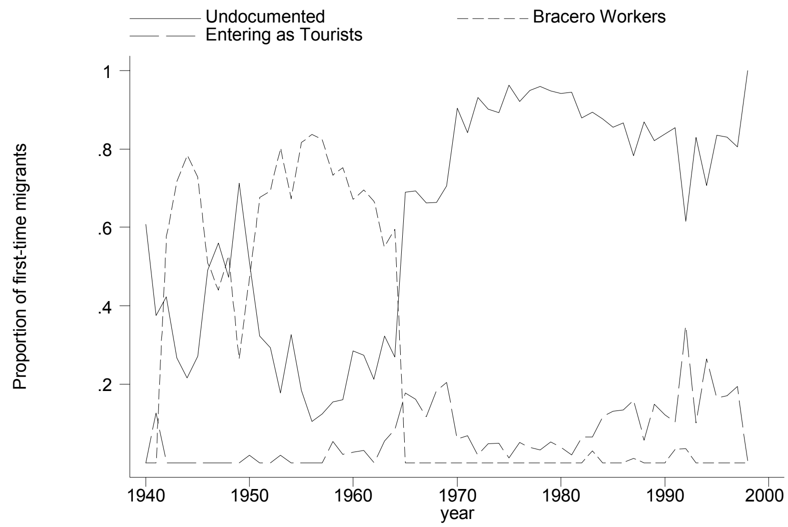

Figure 3: Legal Status of First-time Migrants in the MMP Sample.

the method used to construct inequality measures from them is contained in the next Section and in Appendix 2, while precise definitions of the migration variables are deferred to Section 6. Appendix 1 describes the source and construction of variables not contained directly in these data sets. Table 1 provides summary statistics for both the MMP and ENADID surveys for key variables used in this paper. As expected, the MMP sample consists of communities with higher average levels of migration than the ENADID sample: on average 26 percent of individuals aged 15 and over in the MMP communities had been to the U.S., compared to 9 percent in the ENADID municipalities.

4 Construction of Consumption and Inequality Measures

The MMP data and the ENADID data provide the most comprehensive information about Mexican migration. However, unfortunately neither survey contains information on consumption, while only the ENADID 1997 survey has income data. The surveys do contain a variety of information on household infrastructure, such as whether the house has a dirt or tile floor and whether the household has access to running water, electricity and sewerage facilities. The MMP survey also asks whether households own certain durable assets, such as a car, radio, television, stove and fridge. In a companion paper, McKenzie (2003) uses the ENIGH surveys from Mexico, which contain data on both asset indicators and consumption and income, to show how such asset indicators can be used to also obtain proxies for inequalities in living standards. We briefly summarize this approach here and its use in constructing measures of inequality for the MMP and ENADID surveyed communities.

Given a vector $\mathbf{x} = (x_1, ..., x_P)'$ of asset indicators, most of which are dummy variables for types of infrastructure or ownership of certain durables, the first principal component of the observations, y, is the linear combination

$$y = a_1 \left(\frac{x_1 - \overline{x}_1}{s_1} \right) + a_2 \left(\frac{x_2 - \overline{x}_2}{s_2} \right) + ... + a_p \left(\frac{x_p - \overline{x}_p}{s_p} \right) \tag{13}$$

whose sample variance is greatest amongst all such linear combinations, subject to the restriction $a'a = 1$, where $\overline{x}_k$ and s_k are the sample mean and standard deviation of variable x_k. Assets which vary most across households are given larger weight, which is a useful feature of this approach for measuring inequality. Since the mean of y across all households is zero, inequality measures which divide by the mean are ill-defined. Instead, McKenzie (2003) proposes a relative measure of inequality across communities. Letting σ_c be the standard deviation of y across households in community c, and ϕ be the standard deviation of y over the whole sample, a measure of relative inequality is then:

$$I_c = \frac{\sigma_c}{\phi} \tag{14}$$

I_c can be shown to satisfy many of the commonly accepted desired properties of an inequality measure, and can be thought of as a proxy for relative inequality in wealth.

The ENIGH surveys contain data on income, consumption, and many of the same asset indicators as are in the migration surveys. Using these auxiliary surveys, one can predict income and consumption given the asset indicators found in the MMP and ENADID surveys, and then using the residuals from this prediction in a bootstrapping process, obtain estimates of the Gini coefficients for income and consumption for each migration survey. Appendix 2 details the process used and provides the principal components used in constructing I_c.

5 Determinants of Migration

The theoretical model presented in Section 2 predicts that migration rates will display a non-linear relationship with wealth. Since our analysis of the effect of migration on inequality is predicated on such a relationship between migration and household resources, we first examine the empirical support for such a model. Massey and Espinosa (1997) study a large number of determinants of the migration decision, and find social capital in the form of migrant parents, siblings, and other community members to play the most powerful role. However, they include only dummy variables for land, home, and business ownership, and thus do not examine the role of nonlinearities in wealth.

Using the MMP data for municipalities with less than 100,000 population in 1990, we estimate a probit model for the probability of a household head in Mexico migrating to the United States at some stage in the year of or the year prior to the survey year as a quadratic function of household resources. Four different measures of household resources are used: actual land holdings, the asset index based on the first principal component, and predicted monetary non-durable consumption and predicted income calculated for each household by the method discussed in Section 4.

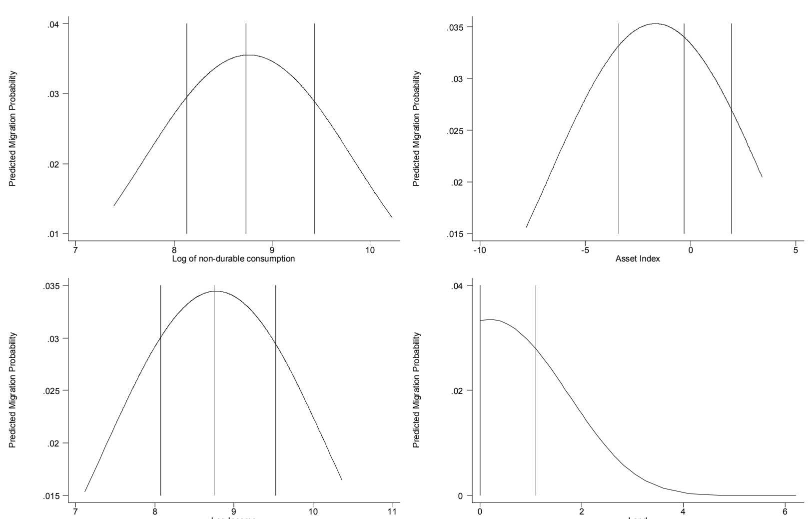

Figure 4: Probability of the household head first migrating to the U.S. within 2 years of the survey year as a function of wealth: Male heads aged 20-39. Vertical lines indicate 10th, 50th, and 90th percentiles of the wealth distribution.

Figure 4 shows that the empirical relationship between migration rates and household resources is indeed first increasing and then decreasing in total resources. The highest migration rate is found at levels of resources at or around the median wealth level for households with heads aged 20-39. This complements the finding of Chiquiar and Hanson (2002) that Mexican immigrants tend to come from the upper-middle of the education distribution in Mexico and provides support for the quadratic relationship between migration and wealth predicted by our theory.

Table 2 examines further the determinants of the migration decision of the household head, and the role of personal and community migration networks in this decision. We use predicted log non-durable consumption (*lndc*) as our preferred measure of household resources. We begin with a cross-sectional analysis, estimating a probit model of the probability that a male household head aged 15-49 years first made a trip to the United States within a year of the survey year. Since only current wealth information is available, which is likely to reflect in part the result of past migration, we focus only on first-time migrants around the time of the survey.

Column 1 replicates the unconditional quadratic relationship between migration rates and *lndc*. Column 2 finds that this relationship continues to hold after controlling for the age, marital and parental status of the household head, and for various community characteristics which might be thought to affect access to credit, access to information about migration opportunities, and the cost of migrating, such as availability of lenders, whether there is a train station in the community, distance to the nearest highway and distance to the principal migrant destination for community in the U.S. None of these community characteristics is found to play a significant role. Column 3 then introduces the U.S. migration rate over 1955-59, the middle of the bracero period, for the state in which each community is located, taken from González Navarro (1974).[14] This historic state-level migration rate is found to have a strongly significant positive effect on an individual head's probability of migration.

Column 4 of Table 3 then adds measures of the migration experience of the immediate family and community of the head. The community network is found to matter, with the proportion of other households with migrant experience two years prior to the survey year having a significant positive

[14] Thanks to Chris Woodruff for generously supplying this data.

effect. Having a father or brother with previous migrant experience also has a significant effect at the 10 percent level of significance. This effect is conditional on wealth, and thus does not simply reflect greater wealth accumulation by migrant family members. However, it may reflect unobserved family factors which influence migration, such as greater English skills or ability to cross borders, rather than network effects. In Column 5 we see that these effects continue to hold when we add a cubic term in *lndc,* whereas the cubic term is not significant. Higher order terms in *lndc* also proved insignificant, with the estimated function appearing quadratic in all instances.

The community characteristics included aim to capture differences amongst communities which could affect migration. However, there may still be unobserved community characteristics which affect the probability that all individuals in a community migrate. The personal and community migrant network variables could then be capturing the influence of these unobservable characteristics, rather than the role of networks. We therefore use the retrospective panel of migration history for the head and in Column 6 of Table 3 include community fixed effects to capture time-invariant community characteristics. Since we only have *lndc* for the end period, we use education as our proxy for wealth, and find a quadratic relationship again. After controlling for community fixed effects, we still find strong positive effects of both the community migrant network and having a migrant brother or father for the probability of migrating.

The migration decision is also affected by the benefits of migrating to the U.S. Prime determinants of these benefits are the wage gap between Mexico and the United States, and the probability of finding employment in the U.S. Hanson and Spilimbergo (1999) find a negative relation between Mexican real wages and border apprehensions, a weaker positive effect of U.S. wages on apprehensions, but no significant effect of U.S. unemployment on border apprehensions. We define the wage gap as the difference between the real U.S. hourly manufacturing wage expressed in terms of pesos and the real hourly Mexican manufacturing wage[15]. We then regress the percentage change in the wage gap between years t and $t+1$ on the real depreciation over the year, using annual data for the period 1969-1998. The R^2 for this regression is 0.959, with a coefficient of 2.10 on the real

[15] Wage data kindly provided by Gordon Hanson.

depreciation. Movements in the Mexico-U.S. real exchange rate therefore appear to be the major source of movements in relative wages between the two countries. Since real exchange rate data are available over a longer period than real wages, we use the real depreciation as our main measure of relative wage changes.

Column 7 of Table 3 adds these time-varying aggregate variables, and finds a significant negative effect of the real depreciation rate on the probability of migration. This negative effect of a devaluation is also found by Massey and Espinosa (1997) who note that while a real depreciation increases the wage gap between Mexico and the United States, it also raises the cost of being smuggled into the U.S., which is usually expressed in terms of dollars. The negative effect suggests that the effect of the real depreciation on costs dominates its effect on the benefits, and that credit constraints do matter. From equation 2 we see that since a depreciation will increase $w - c$, it will increase the probability of migration for unconstrained households, whereas the increase in c tends to counteract this for constrained households. To investigate this hypothesis further, in Column 8 we interact the real depreciation with the head's education, our proxy for wealth. We find a significantly positive interaction term, which indicates that households with more resources are less affected by an increase in the cost of migration, in accordance with our theory.

6 Inequality and Migration

6.1 Direct and Indirect effects of migration on inequality

The most direct effect of migration is to increase the welfare of the migrant households, as migrants bring back remittances and savings from abroad. This can either increase or decrease inequality in the community, depending on where the migrant household is located in the overall community wealth distribution. However, in addition to these effects on the migrant's own household, it has been argued that there can be spillover benefits for the community at large. One such effect is through the multiplier role of remittances. Durand, Parrado and Massey (1996) report that the majority of U.S. earnings are spent on current consumption, including family maintenance, health, home construction and the purchase of consumer goods. Such spending increases the demand for goods and services produced by other community members. Adelman, Taylor and Vogel (1988) use a Social Accounting Matrix to estimate that a \$100 drop in remittances results in a \$178 drop in village income, for one village in Michoacán. Remittances also help foster production, with Woodruff and Zenteno (2001) finding a strong effect of remittances on investment in microenterprises. In the context of our theoretical model, these spillover effects may be seen as raising the income or wealth levels of non-migrant members of the community, allowing some households to move above the threshold level $\underline{A}$ at which households are constrained by subsistence to not migrate.

The community can also benefit further from migration through the formation of networks, which lower the costs and increase the potential benefits to other community members from migrating. Table 3 uses data from the Mexican Migration Project to present supportive evidence of this. We divide communities into those above the median migration prevalence rate and to those below. The top panel looks at how the costs of migration vary with the level of community migration prevalence. As was seen in Figure 3, the majority of first-time migrants cross without documents. The proportion of recent first-time migrants crossing without documents does not vary between communities of low and high migration prevalence. Most recent first-time illegal crossings employ a coyote (border-smuggler), and we find some evidence that the mean cost of this coyote is lower in communities with larger migration networks. Moreover, Massey, Durand and Malone (2002) report that with an increase in coyote fees in the 1990s following increased border enforcement, migrants increasingly relied on friends or family already in the United States to arrange and finance the coyote. Clearly a larger migrant network increases this possibility. In terms of other migration costs, Durand et al. (1996) report that migradollars have played a large role in promoting transportation to the border. Table 3 shows most new migrants stay with friends, family, or other community members upon arrival, and about 40 percent cross with friends. Conditional on migrating, these features of the migration do not vary with size of the migrant network, but clearly a larger network increases the number of community members who can provide such assistance.

The bottom panel of Table 3 looks at the role of networks in helping migrants obtain jobs in the

United States. Migrants from communities where more other community members have migrated are significantly more likely to have obtained their last U.S. job through the recommendation of a relative, friend, or fellow community member, rather than through their own search or contracting. Even in communities with lower levels of overall prevalence, household heads who actually migrate still rely heavily on relatives or friends to recommend them for a job, however with low prevalence, less people will know relatives or friends in the U.S. who can help them in this way. Moreover, Munshi (2003) finds that individuals with larger networks are not only more likely to be employed, but are also more likely to hold a higher paying nonagricultural job in the U.S.

Additionally, migration can have general equilibrium effects which affect other community members. Mishra (2003) finds that Mexican migration to the U.S. has a significant positive impact of the wages of other workers in Mexico. However, these effects are estimated to be greatest for higher wage workers, and therefore increase wage inequality in Mexico. However, Hanson, Robertson and Spilimbergo (2002) find a weaker effect of border enforcement on wages in Mexican border cities, with the effect greatest for low-education workers. The overall effect of migration on inequality, which we attempt to measure in the next Section, is therefore the net result of these direct effects, multiplier effects, network effects, and general equilibrium effects.

6.2 OLS Results

The prediction of our theoretical model is that, conditional on other community characteristics, inequality should first increase and then decrease with the level of community migration experience. To avoid issues of simultaneity, we therefore model current inequality for community i in survey year t, $Ineq_{i,t}$, as a quadratic function of previous migration, $mig_{i,t-s}$, and a vector of other current community characteristics, $X_{i,t}$:

$$Ineq_{i,t} = \alpha + \beta_1 mig_{i,t-s} + \beta_2 mig_{i,t-s}^2 + \gamma' X_{i,t} + \varepsilon_{i,t} \quad (15)$$

Our main measure of migration is the community migration prevalence ratio 15 years before the survey period. The migration prevalence ratio is defined as in Massey, Goldring and Durand (1994) to be the number of people in a given community aged 15 years or older with international migratory experience in a given year divided by the total number of people in the community aged 15 or older alive in the reference year. They argue that such an indicator provides a good proxy for the extent of a given community's involvement in the transnational migratory process. Moreover, in the present context, the prevalence ratio serves as a measure of the stock of migration experience in the community, which is expected to impact on inequality through both the direct and indirect channels mentioned above. For robustness, we will later consider a second measure of migration experience, which is the proportion of current households which had a migrant 15 years before. Since we are concerned that there may be factors which contemporaneously affect both migration and inequality, such as temporary shocks at the community level, we look at migration experience 15 years prior to the survey period, although later consider also periods of 5, 10 and 20 years before for robustness purposes. Since the MMP survey asks all individuals the year of their first trip to the U.S., these measures of migration prevalence can be easily calculated at any point in time. In contrast, the ENADID survey only asks as of the survey date whether individuals have ever been to the U.S. and the year of the last trip, which means that one can not calculate historic migration prevalence rates for the ENADID communities.

Three separate measures of inequality are considered: the predicted Gini of non-durable consumption obtained via the method outlined in Section 4, the predicted Gini of income obtained via the same method, and the relative inequality in assets measure, I_c, given in equation 14. The MMP71 dataset then contains information on 57 communities with 1990 populations below 100,000. Given this relatively small sample size, we choose a parsimonious specification of the other community characteristics $X_{i,t}$, including the proportion of household heads aged under 30 in the survey year, the proportion of household heads aged over 60, the proportion of household heads with less than six years of education, and the proportion of household heads with nine or more years of education.

Table 4 then presents the OLS estimates of equation 15. We present specifications which include only a linear term in past migration experience, as well as those which also contain a quadratic term, and specifications both with and without the community characteristics as additional regressors.

With all three measures of inequality, the overall fit is poor when the demographic controls are not included, and one does not find a statistically significant relationship between past migration stock and current inequality. Including the demographic controls improves the fit somewhat, and there is a significant negative relationship between migration prevalence and inequality in assets, and inequality in income. The coefficient on migration prevalence is negative, but insignificant, in the equation for inequality in non-durable consumption.

6.3 IV Results

The OLS regressions contain only limited controls for community characteristics, and so a concern is that there are unobserved community characteristics which are correlated with both past migration prevalence and current inequality. Possible examples would include employment opportunities within the community, access to credit, and land ownership patterns. While we have proxies for some of these characteristics, such as data on the number of banks in the community, such proxies are likely to be imperfect. Furthermore, with only 57 communities, the model would soon become saturated should we attempt to control for all community characteristics which are plausibly related to both migration and inequality. Therefore we instead pursue an instrumental variables strategy to account for a possible omitted variables bias due to correlation between $mig_{i,t-s}$ and $\varepsilon_{i,t}$.

We consider several possible instruments for the migration prevalence in a community. Woodruff and Zenteno (2001) argue that historic state-level migration flows can be used as instruments for current migration in estimating the effect of migration remittances on microenterprise capital. Following them, we use the U.S. migration rate for 1924 for the state in which each community is located, taken from Foerster (1925). These state-level historic migration rates may be argued to be a result of largely historic demand-side factors coupled with the arrival of railroads into Mexico. Massey, Durand, and Malone (2002) outline how restrictions on immigration from Asia coupled with a booming economy in the Southwest of the United States lead US employers to hire "enganchadores" (contractors) to obtain as many workers as possible. These enganchadores followed the railroads south into Mexico, stopping in the first sizeable population centers they encountered to hire workers, which were in the west-central Mexican states. The arrival and lay-out of the railroad system thereby led to some states having different migration rates than others. This historic migration at the state level led to the development of migration networks, which we expect to determine the community-level migration prevalence, $mig_{i,t-s}$, but not otherwise affect inequality within the community. Massey, Goldring and Durand (1994, p 1496) lead credence to this assumption, arguing that "transnational migration tends to become a self-reinforcing process that...over time...becomes increasingly independent of the conditions that originally caused it".[16]

In addition to the 1924 state migration rates, Woodruff and Zenteno also use migration rates over the 1955-59 period by state, taken from González Navarro (1974).[17] These rates are from the peak period of the 1942-64 bracero program. This program allowed for the legal entry of temporary farm workers, providing up to 450,000 work visas annually to Mexicans during the peak years, and allowed for the immigration of around 5 million Mexicans into the United States (Massey, Durand and Malone (2002)). The sharp break in U.S. immigration policy in 1965 ended this program, and as seen in Figure 3, undocumented migration came to greatly outnumber legal migration in the subsequent period. State-level migration rates during this bracero period are expected to contribute to community prevalence rates, both directly through some community members participating in the bracero program, and through the development of migrant networks. However, they are not expected to have an additional impact on current community levels of inequality, especially given the period of thirty to forty years which have passed since the peak years of the bracero period.

A second set of instruments consists of demand-side variables from the United States, which affect the costs and benefits of migrating, but have no other direct impact on rural Mexican communities. For each MMP community, one can identify the most common US city destination for migrants from a given community on their first trip to the U.S. Differences in geographic proximity and historic migration patterns will mean that different communities will tend to cluster at different US destinations. The unemployment rate in the US state in which this destination city is located will

[16] Escobar Latapí et al. (1998, p 164) also conclude that "the origins of Mexico-U.S. migration lie largely inside the United States".

[17] Data kindly supplied by Chris Woodruff.

then affect migration from that community to the US. Since we need to instrument migration stocks rather than flows, we aggregate up unemployment in each of the ten years prior to the year in which migration prevalence is measured, and weight by the proportion of current household heads who were of prime migrant age, 20-30 years, in that year. For example, for community 1 surveyed in 1987, for which the most common U.S. destination is Los Angeles, the weighted unemployment rate is then calculated as the 1971 Californian unemployment rate (cue_{71}) multiplied by the proportion of heads in that community aged 20-30 years in 1971 (f_{71}) + $cue_{70}f_{70} + ... + cue_{62}f_{62}$. This weighted unemployment over 1962-71 is then used to instrument migration prevalence in community 1 in 1972. Similarly, we also use the real depreciation of the peso against the U.S. dollar, weighted by prime age population in each of the fifteen years prior to the year at which migration prevalence is measured as an instrument. Different communities are surveyed in different years, and have different cohort sizes of prime migration age in the years in which large depreciations are realized, resulting in differences in the effective depreciation faced by our different communities. Finally, we also consider the distance from the community to the prime U.S. destination, and this distance squared as possible instruments for migration prevalence.

Table 5 then presents the first-stage instrumental variables regression results when various combinations of these instruments are used to instrument migration prevalence and migration prevalence squared. Results are presented both for the cases with and without community demographic characteristics included as exogenous regressors in the second-stage. Three main instrument sets are used. Set A is arguably the most exogenous, consisting of the 1924 state level migration rate, and the US state unemployment rate and weighted real depreciation. Instrument Set B consists of solely the 1955-59 rate, which has the single greatest predictive power, and is therefore least subject to weak instrument concerns, while Instrument Set C consists of the full set of possible instruments. Both the 1924 and 1955-59 state migration rates are found to be significant, when included separately, with the 1955-59 rate maintaining significance when both sets are included. Weighted state unemployment generally has the expected negative sign, but is insignificant. The weighted real depreciation has a negative coefficient, which is significant in some specifications. As in estimation of the individual household head's migration decision, it therefore appears that a real depreciation reduces migration, possibly through an increase in the cost of migrating. Migration prevalence at first increases and then decreases with distance, which we attribute to picking up the fact that most migration still comes from west-central Mexico. The p-values for the F-statistic of the excluded instruments are all less than 0.01 for the prediction of community migration prevalence, while the F-statistics themselves are around 5 for instrument sets A and C, and over 30 for instrument set B. Migration prevalence squared is predicted somewhat less strongly than the level of migration prevalence, but the F-statistics still show instrument relevance.

The second-stage IV results using the Gini of non-durable consumption as our inequality measure are given in Table 6. Table 7 provides results using relative asset inequality, while Table 8 gives the results using the income Gini. In each table, columns (1)-(3) present results for a linear specification in migration prevalence with no additional regressors, columns (4)-(6) add community demographic characteristics, and columns (7)-(12) add a quadratic term in migration prevalence to columns (1)-(6). Comparing the IV estimates to the OLS estimates in Table 4, we find the coefficients in columns (4)-(6) of Tables 6-8 to be more negative, and of greater significance, than the corresponding OLS regressions in columns (3), (7) and (11) of Table 4. After instrumenting and controlling for community characteristics, migration prevalence has a significant negative effect on community inequality. This effect is strongest and most significant for asset inequality, where the coefficients in columns (5) and (6) of Table 7 translate an increase in past migration prevalence of 0.14, representing the interquartile range of migration prevalence, into a -0.17 reduction in the asset inequality index. This represents a 20 percent reduction at the mean relative asset inequality index, and would take a community at the 75th percentile of asset inequality down almost to the 25th percentile. The same magnitude increase in migration prevalence is predicted to reduce the income Gini by 0.022 to 0.025, and the non-durable consumption Gini by 0.015 to 0.018. At the mean this translates into a 4.4 percent fall in the Gini of NDC and a 5.6 percent fall in the income Gini, taking a community at the 75th percentile of inequality down to the median, so these effects of migration are lower for income and consumption inequality than for asset inequality. For both instrument sets A and C, the overidentification test p-values are larger than 0.12 for all the specifications which are linear in migration prevalence, so we cannot reject that our instruments are valid.

Adding a quadratic term in migration prevalence to the instrument variables regression results in insignificant coefficients on most of the quadratic terms, which accords with the OLS results. The signs of the coefficients in columns (7)-(9) of Tables 6 and 7 are in accordance with our theoretical prediction, with inequality first increasing and then decreasing with migration, however the coefficients are not significant. Once we include community characteristics, both the linear and quadratic terms in migration prevalence are negative in the equations for non-durable consumption and income. That is, we find no significant evidence for nonlinearity in the inequality and migration relationship using the MMP data.

The results thusfar indicate a significant negative relationship between migration prevalence ratios 15 years before the survey and current inequality. Table 9 examines the robustness of this relationship to alternative time lags, looking at the instrumented migration prevalence in the current period and 5, 10, and 20 years before the survey period. Since inequality is measured between households, the proportion of households with a migrant member may also be a more appropriate measure of community levels of migration, and so we also consider this proportion in the current period and 5, 10, and 15 years before the survey period. We continue to find a significantly negative relationship between inequality and past migration, for all three measures of inequality and each of these alternative measures of past community migration experience. Our findings are therefore robust to alternative measures of timing.

6.4 Quantile Regression Results

An alternative approach towards examining the distributional effects of migration is to employ quantile regression analysis.[18] Consider the following quantile regression equation for wealth, w_i, measured as log of non-durable consumption or income, or the asset index, as a function of the migration stock in household i's community, mig_i, and other determinants of wealth such as age

[18] See Koenker and Hallock (2001) for a recent overview.

and education, denoted X_i:

$$w_i = \alpha_q + \beta_q mig_i + \gamma_q' X_i + \varepsilon_i \tag{16}$$

Here q denotes the qth conditional quantile of wealth. The parameter β_q measures how wealth responds to migration stock at quantile q. If migration increases inequality, we would expect to see increasing dispersion of wealth with migration status, and so find larger β_q's for the upper quantiles. In contrast, if migration reduces inequality, we should find larger β_q's at lower quantiles. Table 10 presents the results from quantile regression estimation of equation 16. The results show that migration reduces dispersion in consumption, assets, and income, since these wealth measures grow faster with migration for the lower quantiles. This confirms the finding of the IV analysis that migration reduces inequality in the MMP sample.[19]

6.5 ENADID Results : Does a Change in Inequality result from a Change in Migration?

Using the MMP data we find that an increase in migration prevalence is followed by a reduction in inequality, but no evidence for increases in inequality at lower levels of migration prevalence. As mentioned previously, the MMP communities are mostly from states with historically high levels of migration, and it may be that most of the MMP communities are therefore past the level of migration at which a turning point occurs. For this reason, we use the ENADID surveys, which are nationally representative and cover a wider range of migration experiences. We are able to match some of the same municipalities in the 1992 and 1997 ENADID surveys, and then examine changes in inequality over a period in the 1990s in which substantial migration to the U.S. from Mexico was occurring. We consider two specifications which allow for a nonlinear effect of migration changes on inequality. The first is to run the following regression across municipalities k:

[19] A quadratic term in migration did not prove significant for any of the three measures of wealth status. There was therefore no evidence of a region of increasing inequality at lower levels of migration.

$$\Delta Ineq_k = \delta_0 + \delta_1 \Delta mig_k + \delta_2 \Delta mig_k * mig_{k,1992} + u_k \tag{17}$$

where $\Delta Ineq_k$ denotes the change in inequality in municipality k between 1992 and 1997, Δmig_k is the change in migration prevalence over this same period, and $mig_{k,1992}$ is the 1992 level of migration prevalence. If an increase in migration always results in a reduction in inequality, then we would expect $\delta_1 < 0$. The interaction term allows for the effect of the change in migration to vary according to the initial level. If the theory is correct and there is in fact an inverse U-shape, then one would expect to find $\delta_1 > 0$ and $\delta_2 < 0$, that is, an increase in migration would increase inequality at low initial levels of migration stock, and would reduce inequality at higher levels. The constant term captures any aggregate change in within-municipality inequality occurring in Mexico between 1992 and 1997.

The second specification directly takes differences of equation (15):

$$\Delta Ineq_k = \beta_0 + \beta_1 \Delta mig_k + \beta_2 \Delta \left(mig_k^2 \right) + \eta_k \tag{18}$$

The theory then predicts $\beta_1 > 0$ and $\beta_2 < 0$. Since these equations are expressed in terms of differences, municipality fixed characteristics which are correlated with both inequality and migration levels are differenced out. This greatly reduces the need for instrumenting, and we estimate equations 17 and 18 using OLS. We are unable to employ the instrumental variables approach used for the MMP data, since distances to the border and historic migration rates are fixed over time, while changes in U.S. labour market conditions prove to be weak instruments for explaining variation across communities in migration rates over this period.

One concern is that since we observe a different sample of individuals from a given municipality in 1997 than we did in 1992, some of the changes in inequality and migration prevalence found in the data may just be the result of small-sample measurement-error bias. With sufficient individuals sampled from a municipality, this is less of a concern. Verbeek and Nijman (1992) find that with sample sizes of 100-200 households, pseudo-panel data provides a good approximation to genuine panel data. We therefore carry out our analysis using the 33 municipalities which had a sample size of 100 or more households in both ENADID surveys.

Table 11 presents the results from the ENADID data. Under equation 17, column 1 shows no significant relationship when the interaction term is not included, and column 2 shows a significant inverse-U relationship once the interaction term is included. The Gini of non-durable consumption increases with an increase in migration up to an initial migration prevalence ratio of 0.17, after which it decreases. The turning point lies within the observed sample range, at around the 85th percentile of 1992 migration prevalence in the ENADID survey, but only at the 34th percentile of current migration prevalence in the MMP surveys. In columns 3 we see this inverse U-shape relationship is robust to the use of an alternative measure of migration stock. Using the specification in equation 18, column 4 finds coefficients of the signs predicted by an inverse-U theory, and a turning point similar to that in column 2. However, the coefficients are only significant at the 14% level. When we use the I_c measure of relative inequality, we find no significant effect using the migration prevalence ratio, and a very weak effect using the proportion of households with a migrant. This may be a result of the clumping and truncation in the principal component index (see Figure 5 in Appendix 2), which means that asset inequality is likely to be measured less well than consumption inequality in the ENADID data. Columns 8-10 find some evidence of an inverse U-shaped relationship for income, but not as strong as for non-durable consumption.

The evidence for an inverse U-shape should be viewed as suggestive only, since the relationship is not significant in all specifications, and is stronger for non-durable consumption than for asset or income inequality. However, the signs in all regressions in columns 2-10 of Table 11 all point towards an inverse-U shape, and we obtain similar turning points under the specifications in both equations 17 and 18. Given that 5 years is a relatively short time to observe changes in inequality, and that we only have data for 33 municipalities, we view this evidence as providing reasonably strong support for our theory.

The nature of the data means that we can not employ instrumental variables here, and so only claim an association between changes in migration and changes in inequality. Although there may be unobserved time-varying community characteristics which effect both changes in migration and changes in inequality, it is difficult to think of a priori reasons why they should result in the inverse U-shaped inequality-migration relationship found here. The results can be squared with the findings of the MMP data, in which migration resulted in a decrease in inequality, by noting that the majority of the MMP communities have migration prevalence higher than the turning point predicted in the ENADID data, so that one observes only the second part of the inverse-U in the MMP data.[20]

7 Conclusions

Migrants to the United States from Mexico are found to come from the middle of the asset wealth distribution, with the probability of migration displaying an inverse-U shaped relationship with wealth. The presence of migration networks, both at the family and at the community level, are found to increase the likelihood of migration, which accords with their ability to raise the expected benefits and lower the costs of migration. At high levels of migration prevalence, such as occur in many of the MMP communities, we find that this migration leads to a reduction in inequality. Large networks spread the benefits of migration to members at the lower end of the income and wealth distributions of the community, reducing inequality. Asset inequality is found to decline more than consumption or income inequality. We find suggestive evidence for a Kuznet's relationship using data from the ENADID, with migration increasing inequality at lower levels of migration stock, and then reducing inequality as one approaches the migration levels prevailing in the MMP communities. Panel data on inequality over longer time periods, and for more communities, is needed to confirm this evidence.

[20] Note that the differences in migration prevalence across the two surveys are not due to differences in measurement, since Massey and Zenteno (2000) find the MMP and ENADID match well along a number of dimensions, including migration prevalence, when compared over similar communities.

Appendix 1: Data Sources

U.S. State Level Unemployment Rates: The official State-level unemployment rates available from the U.S. Bureau of Labor Statistics begin in 1970. Unemployment data from 1962-1974 was obtained from "Area Trends in Employment and Unemployment", U.S. Department of Labor, Manpower Administration, Bureau of Employment Security, monthly reports. Data on the insured unemployment rate as a percentage of covered employment was obtained for 1954-69 from "Unemployment Insurance Claims", Department of Labor, Bureau of Employment Security, weekly reports, and was taken at the end of the first week in September each year. This data was used to extrapolate back the state-level unemployment rate using the formula predicted state unemployment in year t equals insured unemployment rate in year t multiplied by the 1962 actual state unemployment rate divided by the 1962 insured unemployment rate. For California, historic unemployment data obtained from the California Employment Development Department matched closely with the spliced series created here.

Real Exchange Rate: Exchange rate data from 1940-73 and the Mexican CPI were obtained from "Estadísticas Históricas de México", Third Edition, INEGI (1994):Aguascalientes. Annual average Exchange rate and CPI data for Mexico from 1970 onwards were obtained from the Bank of Mexico website www.banxico.gob.mx. U.S. CPI data were obtained for the entire period from the Bureau of Labor Statistics.

Distance to Major U.S. destination(s) for MMP communities: For each MMP community, the personal data information file was used to extract the most popular two locations in the U.S. for the first migrant trip. Then driving distance in miles from the MMP municipality to each of the two U.S. locations was then calculated from mapblast.com. Distance to the most popular location and popularity-weighted average distance to the top two locations were both constructed for each community.

Appendix 2: Measuring Wealth and Inequality

The wealth and inequality measures in this paper are based on asset indicators, since income and consumption data are not directly available in the migration surveys. Table A1 provides a summary of the principal component scoring factors a in equation (13), and the different asset indicators available for use in the MMP and ENADID surveys, for which data also exists in the ENIGH surveys. The MMP survey contains a much broader range of indicators than the ENADID, with yes/no questions on ownership of household durables such as a car, radio, and fridge, as well as data on household infrastructure and building materials. The first principal component appears to be measuring wealth, and is internally consistent in the sense that mean ownership of each asset is increasing across terciles, while poor materials such as dirt floors and water piped outside of the house, are decreasing with the overall asset index. The key requirement for the index I_c to be a good proxy for wealth inequality across communities is that there is a sufficiently broad class of asset indicators collected so as to allow for differentiation in living standards across households. Graphing the probability density function of the asset index enables one to see if the distribution is clumped into a small number of groups or truncated at one end.

Figure 5 plots the probability density function of the asset index for each of the two surveys. The MMP density is smooth, with no signs of clumping, and does not have truncated tails, suggesting that the relative inequality measure based on this index will perform well. In contrast, the smaller number of indicators available for the ENADID survey results in some clumping of the asset index values. In addition, there do not seem to be sufficient indicators to fully distinguish among the top households, leading to truncation of the top tail. The relative inequality measure, I_c, is therefore less likely to be a satisfactory measure of inequality for the ENADID.

While I_c can be used to obtain a measure of inequality in wealth using the MMP or ENADID survey alone, we would also like to consider the effect of migration on inequalities in income and consumption. The ENIGH surveys contain data on income, consumption, and many of the same asset indicators as are in the migration surveys. These surveys were taken in 1984, 1989, 1992, 1994, 1996 and 1998. For the MMP surveys, we use the closest ENIGH survey to the survey year to predict

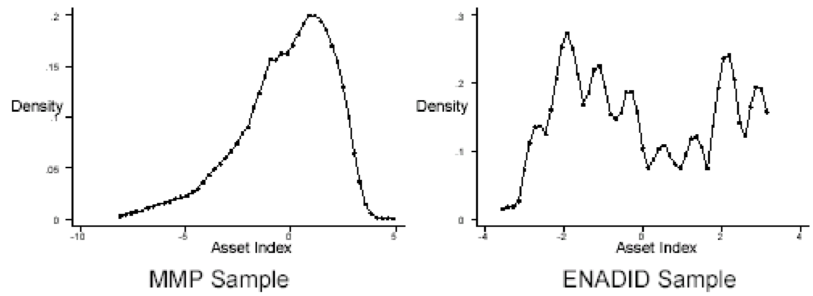

Figure 5: Density Function of Asset Index constructed from MMP and ENADID samples

inequality, while the 1992 and 1998 ENIGH surveys are used to predict inequality for the 1992 and 1997 ENADID surveys respectively. Consumption and Income were converted into real 1998 pesos using the consumer price index provided by the Bank of Mexico. With these auxiliary surveys we use the bootstrap prediction method of McKenzie (2003) to obtain predicted inequality in consumption and income. We outline the method for the MMP data, noting where differences arise when using the ENADID. The first step is to use the ENIGH survey to regress log of non-durable consumption ($lndc$) on the vector of asset indicators x and a vector of household demographic controls w:

$$\ln ndc_i = \beta' x_i + \gamma' w_i + \varepsilon_i \tag{19}$$

This equation is carried out only for households in the same states as are in the MMP data (and using all states for the ENADID), and only for households in communities of less than 100,000 population. The residuals from this regression $\widehat{\varepsilon}_i$,are then divided into two groups, according to whether they correspond to a principal component above or below the median. Then using the MMP data, for household j in group g, we draw (with replacement) an $\widetilde{\varepsilon}_j$ from the empirical distribution of residuals for households in group g, and use this to obtain the predicted non-durable consumption for household j :

$$\widetilde{ndc}_j = \exp\left(\widehat{\beta}' x_j + \widehat{\gamma}' w_j + \widetilde{\varepsilon}_j\right) \tag{20}$$

The Gini coefficient of predicted non-durable consumption is then calculated for each MMP or ENADID community. This procedure is repeated 20 times and we take the mean Gini over all replications. Likewise, one can replace non-durable consumption with household income and repeat the process.

Using this procedure, McKenzie (2003) finds a rank-order correlation of 0.85 between actual and predicted state-level Ginis of non-durable consumption in Mexico, suggesting that this method provides an appropriate measure of inequality. Since the bootstrapping process samples from the residuals of actual consumption, the clumping and truncation problems which affect measurement of relative asset inequality for the ENADID will not be such a concern for the predicted gini of NDC.

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TABLE 1: SUMMARY STATISTICS OF KEY VARIABLES BY COMMUNITY

Variable	Mean	Std. Dev.	Percentiles 25th	50th	75th
MMP SURVEY COMMUNITIES					
Migration measures for male heads aged 15-49					
Proportion making trip within three years of survey	0.230	0.299	0.048	0.126	0.293
Proportion of heads with migrant father	0.190	0.172	0.019	0.150	0.312
Proportion of heads with migrant mother	0.042	0.057	0.000	0.022	0.059
Proportion of heads with migrant brother	0.430	0.231	0.293	0.440	0.589
Proportion of heads with migrant sister	0.155	0.110	0.086	0.140	0.196
Community Migration measures					
Current migration prevalence	0.259	0.142	0.158	0.243	0.344
Migration Prevalence 15 years before	0.149	0.113	0.071	0.118	0.209
Proportion of Households with a migrant 15 years before	0.326	0.209	0.198	0.292	0.462
State migration rate in 1924	0.013	0.008	0.007	0.013	0.020
State migration rate in 1955-59	0.025	0.016	0.013	0.025	0.032
Demographics					
Proportion of heads aged under 30	0.115	0.046	0.080	0.110	0.150
Proportion of heads aged over 60	0.241	0.067	0.198	0.240	0.285
Proportion of heads with education <6 years	0.630	0.191	0.500	0.602	0.750
Proportion of heads with education ≥ 9 years	0.161	0.112	0.065	0.140	0.245
Wealth and Inequality					
Community mean of Asset Index	-0.506	1.345	-1.130	-0.179	0.511
Community mean of Predicted Ln Non-durable Consumption	8.754	0.270	8.588	8.776	8.945
Community mean of Predicted Non-durable Consumption	8349	2226	6649	8447	10099
Community mean of Predicted Income	7297	2291	5798	6878	8599
Relative Asset Inequality (I_c)	0.871	0.171	0.763	0.882	0.954
Gini of Non-durable consumption	0.406	0.025	0.389	0.404	0.420
Gini of Income	0.443	0.026	0.429	0.442	0.461
Other community variables					
Number of bank branches	3.8	7.0	1.0	2.0	4.0
Mean real coyote payment 1970-98 (1998 US$)	549.9	167.8	445.5	533.7	626.7
Minutes to Federal Highway	14.2	21.6	0.0	5.0	20.0
Distance in miles to principal US destination	1715.2	473.4	1646.7	1721.6	1855.3
ENADID MATCHED MUNICIPALITIES					
Gini of non-durable consumption 1997	0.403	0.017	0.390	0.404	0.413
Gini of non-durable consumption 1992	0.406	0.017	0.395	0.406	0.416
Gini NDC 1997 - Gini NDC 1992	-0.003	0.021	-0.015	-0.002	0.009
Gini of income 1997	0.452	0.020	0.441	0.453	0.462
Gini of income 1992	0.448	0.014	0.438	0.448	0.456
Relative Asset Inequality (I_c) 1997	0.868	0.186	0.770	0.914	0.976
Relative Asset Inequality (I_c) 1992	0.792	0.212	0.644	0.831	0.968
Migration Prevalence 1997	0.093	0.091	0.011	0.053	0.157
Migration Prevalence 1992	0.080	0.077	0.009	0.055	0.139
Change in Migration Prevalence 1992-97	0.013	0.048	-0.009	0.003	0.040
Proportion of Households with a Migrant 1997	0.211	0.192	0.034	0.160	0.368
Proportion of Households with a Migrant 1992	0.169	0.152	0.023	0.130	0.309

Notes: MMP summary statistics are for the 57 communities in MMP71 with 1990 population below 100,000
ENADID summary statistics are for the 97 municipalities with populations less than 100,000 that can be matched

TABLE 2: PROBIT ESTIMATION OF THE DETERMINANTS OF THE HOUSEHOLD HEAD'S FIRST MIGRATION TRIP

	Probability of First Migrant Trip Occurring in Survey Year or Year before Survey year					Probability of First Migrant Trip Occurring in Year t		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Proxies for Wealth								
Log of Non-durable Consumption	0.2871	0.3193	0.2677	0.2339	-0.1174			
	(2.29)*	(2.35)*	(2.28)*	(2.17)*	(0.06)			
Log NDC Squared	-0.0166	-0.0179	-0.0152	-0.0134	0.0266			
	(2.33)*	(2.33)*	(2.29)*	(2.19)*	(0.11)			
Log NDC Cubed					-0.0015			
					(0.17)			
Own Education (years)						0.0008	0.0008	0.0008
						(4.04)**	(4.01)**	(3.99)**
Own Education Squared						-0.0001	-0.0001	-0.0001
						(4.94)**	(4.85)**	(4.79)**
Household Head's Characteristics								
Married		0.0152	0.0199	0.0184	0.0184	0.0006	0.0004	0.0004
		(1.20)	(1.90)	(2.01)*	(2.02)*	(0.71)	(0.54)	(0.54)
Number of Children Aged under 18		0.0017	0.0019	0.0018	0.0018	0.0000	0.0000	0.0000
		(1.11)	(1.36)	(1.38)	(1.38)	(0.06)	(0.14)	(0.15)
Community Characteristics								
Number of Bank Branches		0.0004	-0.0001	-0.0001	-0.0001			
		(1.49)	(0.35)	(0.40)	(0.39)			
Mean Real Coyote Payment 1970-98		-0.0057						
		(1.38)						
Any Money Lenders in Community		-0.0002	-0.0005	-0.0025	-0.0025			
		(0.01)	(0.06)	(0.32)	(0.32)			
Train Station in Community		-0.0023	0.0047	0.0011	0.0011			
		(0.41)	(0.64)	(0.20)	(0.19)			
Proportion with less than Minimum Wage in 1970		0.0093						
		(0.46)						
Proportion in Agriculture in 1970		0.0195						
		(0.78)						
Minutes to Federal Highway		-0.0000	0.0001	-0.0000	-0.0000			
		(0.23)	(0.64)	(0.35)	(0.36)			
Distance in Miles to Principal US Destination		-0.0000	-0.0000	-0.0000	-0.0000			
		(1.24)	(0.86)	(1.14)	(1.14)			
Community and Personal Network								
State Migration rate in 1955-59			0.3618					
			(1.97)*					
Proportion of Other Heads in Community with				0.0362	0.0362	0.0198	0.0198	0.0199
migrant experience in period t-1				(2.34)*	(2.34)*	(4.88)**	(4.47)**	(4.51)**
Father is a migrant				0.0132	0.0132	0.0017	0.0017	0.0017
				(1.80)	(1.80)	(2.66)**	(2.57)*	(2.57)*
Brother is a migrant				0.0098	0.0098	0.0071	0.0071	0.0071
				(1.62)	(1.62)	(10.30)**	(10.10)**	(10.06)**
Aggregate Time-varying variables								
Average real depreciation over current and last year (*100)							-.0047	-0.1026
							(1.65)	(2.81)**
Average US unemployment rate over current and last year							0.0001	0.0001
							(0.53)	(0.51)
Average real depreciation * Education of the head (*100)								.0088
								(1.84)
community fixed effects	no	no	no	no	no	yes	yes	yes
Observations	3116	2590	2730	2729	2729	100529	95639	95639
Number of Communities in Sample	57	45	49	49	49	54	54	54
Pseudo-R2	0.007	0.067	0.068	0.089	0.089	0.065	0.068	0.068

Notes:
Coefficients reported are marginal effects representing the change in probability of migration for a discrete change in the dummy variables and for an infinitesimal change in the continuous variables at the mean.
T-statistics in parentheses, with robust standard errors clustered at the community level.
* significant at 5%; ** significant at 1%
All probits except column 1 also include dummy variables for 5 year age group of the household head and are for male household heads currently in Mexico and aged 15-49.
Migrant status of the father and brother is for three years before the survey year for columns (4) and (5), and for year t-1 in columns (6)-(8).

TABLE 3: EFFECTS OF NETWORK ON MIGRATION COSTS AND BENEFITS

3A: Illegality and Migration Costs by level of Migration Prevalence

Characteristics of first migrant trip	Migration Prevalence Ratio <0.24	0.24 +	Welch test of equality of means t-stat	p-value
	Proportion of Communities			
Proportion Undocumented	0.90	0.90	-0.21	0.830
Proportion of Illegal crossings which use a coyote	0.82	0.86	-1.94	0.052
Mean cost of coyote if coyote is used (1998 US$)	476	401	3.42	0.001
Proportion staying with community member, friend or relative upon arrival	0.86	0.88	-0.79	0.430
Proportion of illegal crossings which are accompanied by friends	0.40	0.41	-0.32	0.750

3B: Method by which migrants obtained their last job in the U.S.

Last U.S. job obtained by:	Migration Prevalence Ratio <0.24	0.24 +	Welch test of equality of means t-stat	p-value
	percent of migrants			
searching oneself	24.4	19.6	16.42	0.000
recommendation from relative	21.2	22.4	-4.34	0.000
recommendation from friend	18.0	21.4	-12.37	0.000
recommendation from fellow community member	4.0	5.3	-8.92	0.000
contracted	23.5	21.1	8.06	0.000

Notes: all heads aged 15 or over in survey period with migrant experience
Panel 3A is for first-time migrants migrating within 15 years of the survey year.
For MMP71 communities with less than 100,000 population in 1990.

TABLE 4: OLS ESTIMATES OF THE EFFECT OF PAST MIGRATION ON CURRENT INEQUALITY

	Gini of Non-durable Consumption				Relative Inequality in Assets				Gini of Income			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Migration Prevalence 15 years before	0.008	-0.024	-0.057	-0.109	-0.289	-0.983	-0.799	-1.729	-0.019	-0.185	-0.076	-0.229
	(0.22)	(0.23)	(1.28)	(1.06)	(1.76)	(1.55)	(3.30)**	(2.89)**	(0.56)	(1.89)	(1.75)	(2.37)*
Migration Prevalence Squared		0.075		0.125		1.677		2.210		0.401		0.364
		(0.30)		(0.54)		(1.21)		(1.76)		(1.78)		(1.65)
Proportion of heads aged under 30			0.114	0.118			-0.065	0.014			0.046	0.059
			(1.08)	(1.09)			(0.12)	(0.03)			(0.45)	(0.54)
Proportion of heads aged over 60			0.142	0.143			0.766	0.779			0.190	0.192
			(2.06)*	(2.04)*			(1.65)	(1.69)			(2.84)**	(2.73)**
Proportion of heads with education <6 years			0.009	0.013			0.364	0.443			-0.039	-0.026
			(0.24)	(0.33)			(1.46)	(1.67)			(1.13)	(0.69)
Proportion of heads with education ≥9 years			-0.046	-0.040			0.009	0.116			-0.054	-0.036
			(0.82)	(0.67)			(0.02)	(0.30)			(0.91)	(0.58)
Constant	0.405	0.407	0.369	0.368	0.914	0.960	0.583	0.566	0.446	0.457	0.437	0.434
	(73.82)**	(53.24)**	(8.92)**	(8.74)**	(25.99)**	(18.81)**	(2.43)*	(2.32)*	(73.80)**	(53.07)**	(12.27)**	(11.80)**
F-test that quadratic terms both zero (p-value)		0.948		0.363		0.144		0.002		0.176		0.041
Observations	57	57	57	57	57	57	57	57	57	57	57	57
R-squared	0.001	0.003	0.135	0.141	0.037	0.059	0.231	0.268	0.007	0.064	0.156	0.200

Robust t statistics in parentheses, * significant at 5%; ** significant at 1%
Source: Own calculations from MMP71 communities with less than 100,000 population in 1990.

TABLE 5: FIRST-STAGE IV RESULTS FOR MIGRATION PREVALENCE

	Migration Prevalence 15 years before							Migration Prevalence Squared				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Instruments												
State Migration rate in 1924	5.708		0.008	5.283		0.792	2.250		-4.675	2.075		-3.050
	(3.25)**		(0.00)	(3.53)**		(0.45)	(2.69)**		(1.33)	(2.90)**		(0.88)
State Migration rate in 1924 Squared									262.7			203.5
									(1.71)			(1.49)
Weighted past State-level unemployment in US 16-25 years before	-0.051		-0.033	-0.005		0.033	-0.006		-0.012	0.015		0.013
	(1.70)		(1.08)	(0.15)		(1.10)	(0.52)		(0.94)	(1.13)		(0.81)
Weighted Real Depreciation over 16-30 years before survey	-0.068		-0.014	-0.071		-0.026	-0.031		-0.030	-0.034		-0.032
	(1.42)		(0.29)	(1.84)		(0.68)	(1.58)		(1.51)	(2.05)*		(1.87)
State Migration rate in 1955-59		4.394	3.692		3.583	3.263		-0.536			-1.125	
		(5.97)**	(3.41)**		(7.21)**	(4.49)**		(0.46)			(1.24)	
State Migration rate in 1955-59 Squared								38.402			41.740	
								(1.84)			(2.67)*	
Distance in Miles to Principal US destination (*1000)			0.188			.015			0.069			-0.010
			(1.96)			(0.16)			(1.86)			(0.24)
Distance in Miles Squared (*10^6)			-0.057			-.009			-0.024			-0.001
			(2.17)*			(0.37)			(2.24)*			(0.07)
Included Exogenous Variables												
Proportion of heads aged under 30				0.188	0.351	0.435				0.118	0.100	0.072
				(0.62)	(1.37)	(1.45)				(0.84)	(0.81)	(0.44)
Proportion of heads aged over 60				1.026	0.940	1.017				0.469	0.361	0.431
				(4.50)**	(4.84)**	(4.49)**				(3.89)**	(3.26)**	(3.24)**
Proportion of heads with education <6 years				0.057	0.156	0.134				-0.007	0.055	0.019
				(0.56)	(1.73)	(1.42)				(0.13)	(1.45)	(0.41)
Proportion of heads with education ≥9 years				0.010	0.135	0.123				-0.044	0.015	-0.030
				(0.06)	(0.90)	(0.84)				(0.53)	(0.23)	(0.39)
Constant	0.159	0.038	-0.036	-0.213	-0.328	-0.389	0.017	0.015	0.013	-0.129	-0.109	-0.090
	(2.77)**	(2.07)*	(0.40)	(1.61)	(3.66)**	(2.93)**	(0.75)	(1.45)	(0.37)	(1.95)	(2.31)*	(1.23)
Observations	57	57	57	57	57	57	57	57	57	57	57	57
R-squared	0.24	0.36	0.40	0.57	0.66	0.67	0.17	0.37	0.23	0.50	0.63	0.54
F-stat excluded instruments	5.68	31.44	5.62	4.96	32.12	5.33	3.52	15.79	2.48	3.84	16.03	2.48
p-value	0.002	0.000	0.000	0.004	0.000	0.000	0.021	0.000	0.035	0.015	0.000	0.037
Shea Partial R^2 for excluded instruments	0.243	0.364	0.403	0.233	0.386	0.410	0.100	0.152	0.213	0.154	0.139	0.265
Instrument Set	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*D*	*E*	*A*	*D*	*E*

Robust t statistics in parentheses, * significant at 5%; ** significant at 1%
Source: Own calculations from MMP71 communities with less than 100,000 population in 1990.

TABLE 6: IV ESTIMATES OF THE EFFECT OF PAST MIGRATION ON INEQUALITY IN NONDURABLE CONSUMPTIOI

	Dependent Variable: Community Gini of Nondurable Consumption											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Instrumented Endogenous Variables												
Migration Prevalence 15 years before	-0.007	-0.064	0.017	-0.106	-0.132	-0.112	0.232	0.159	0.245	-0.092	-0.052	0.076
	(0.10)	(1.28)	(0.45)	(1.23)	(2.28)*	(2.01)*	-0.99	-0.69	-1.54	(0.46)	(0.24)	(0.63)
Migration Prevalence Squared							-0.664	-0.545	-0.624	-0.036	-0.196	-0.520
							-1.05	-0.93	-1.3	(0.08)	(0.40)	(1.52)
Exogenous Regressors												
Proportion of heads aged under 30				0.132	0.141	0.203				0.131	0.134	0.169
				(1.15)	(1.31)	(2.08)*				(1.14)	(1.23)	(1.55)
Proportion of heads aged over 60				0.193	0.220	0.213				0.194	0.221	0.232
				(1.65)	(2.42)*	(2.46)*				(1.65)	(2.34)*	(2.20)*
Proportion of heads with education <6 years				0.016	0.019	0.025				0.014	0.013	0.003
				(0.47)	(0.57)	(0.77)				(0.39)	(0.32)	(0.07)
Proportion of heads with education ≥9 years				-0.047	-0.048	-0.036				-0.049	-0.057	-0.077
				(0.97)	(1.01)	(0.80)				(0.86)	(1.05)	(1.40)
Constant	0.407	0.416	0.403	0.358	0.353	0.338	0.395	0.402	0.390	0.358	0.353	0.349
	(39.67)**	(51.18)**	(66.09)**	(8.30)**	(8.52)**	(8.40)**	(26.11)**	(27.00)**	(40.61)**	(8.25)**	(8.28)**	(7.90)**
F-test that quadratic terms both zero (p-value)							.579	.409	.282	.470	.077	.163
Observations	57	57	57	57	57	57	57	57	57	57	57	57
Instrument Set	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*D*	*E*	*A*	*D*	*E*
Overidentification J-statistic	1.048	n.a.	7.808	0.008	n.a.	5.261	0.012	n.a.	3.719	0.002	n.a.	2.939
p-value for overidentification test	0.592		0.167	0.996		0.385	0.912		0.445	0.966		0.568

Notes:
Robust t-statistics calculated from two-step efficient GMM estimation in parentheses, * significant at 5%; ** significant at 1%
n.a. not applicable as equation is exactly identified
Instrument Sets:
A: State migration rate in 1924, weighted state-level unemployment 16-25 years earlier (UE), Weighted Real Depreciation 16-30 years before survey (Real Depn.);
B: State migration rate in 1955-59
C: A+B+ Distance in miles to principal destination in U.S. and distance squared.
D: State migration rate in 1955-59, State migration rate in 1955-59 squared
E: A and state migration rate in 1924 squared.

TABLE 7: IV ESTIMATES OF THE EFFECT OF PAST MIGRATION ON INEQUALITY IN ASSET INDEX

	Dependent Variable: Relative Inequality in Principal Component of Asset Indicators											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Instrumented Endogenous Variables												
Migration Prevalence 15 years before	-0.762	-0.696	-0.385	-2.185	-1.200	-1.263	2.42	1.194	1.801	-0.299	-0.859	-0.925
	(1.81)	(2.25)*	(1.62)	(3.60)**	(3.31)**	(3.84)**	-1.25	-0.66	-1.59	(0.17)	(0.48)	(0.93)
Migration Prevalence Squared							-9.855	-4.62	-7.17	-5.088	-0.839	-2.360
							-1.63	-1.03	-1.78	(1.12)	(0.21)	(0.85)
Exogenous Regressors												
Proportion of heads aged under 30				0.523	0.078	0.091				0.360	0.052	0.489
				(0.75)	(0.15)	(0.17)				(0.46)	(0.09)	(0.76)
Proportion of heads aged over 60				2.339	1.180	1.396				2.461	1.187	2.397
				(3.38)**	(2.13)*	(2.69)**				(3.22)**	(2.14)*	(3.58)**
Proportion of heads with education <6 years				0.586	0.420	0.334				0.333	0.392	0.435
				(2.09)*	(1.81)	(1.54)				(0.86)	(1.40)	(1.50)
Proportion of heads with education ≥9 years				0.016	-0.002	-0.178				-0.363	-0.043	-0.198
				(0.04)	(0.01)	(0.54)				(0.62)	(0.11)	(0.45)
Constant	0.974	0.975	0.923	0.205	0.494	0.538	0.855	0.854	0.855	0.312	0.498	0.225
	(15.99)**	(18.46)**	(23.76)**	(0.73)	(2.21)*	(2.51)*	(8.14)**	(7.12)**	(18.20)**	(0.95)	(2.16)*	(0.82)
F-test that quadratic terms both zero (p-value)							.188	.156	.194	.006	.001	.003
Observations	57	57	57	57	57	57	57	57	57	57	57	57
Instrument Set	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*D*	*E*	*A*	*D*	*E*
Overidentification J-statistic	3.914	n.a.	6.869	2.393	n.a.	8.943	0.411	n.a.	2.958	0.885	n.a.	9.968
p-value for overidentification test	0.141		0.231	0.302		0.111	0.522		0.565	0.347		0.041

Notes:
Robust t-statistics calculated from two-step efficient GMM estimation in parentheses, * significant at 5%; ** significant at 1%
n.a. not applicable as equation is exactly identified
Instrument Sets:
A: State migration rate in 1924, weighted state-level unemployment 16-25 years earlier (UE), Weighted Real Depreciation 16-30 years before survey (Real Depn.);
B: State migration rate in 1955-59
C: A+B+ Distance in miles to principal destination in U.S. and distance squared.
D: State migration rate in 1955-59, State migration rate in 1955-59 squared
E: A and state migration rate in 1924 squared.

TABLE 8: IV ESTIMATES OF THE EFFECT OF PAST MIGRATION ON INEQUALITY IN INCOME

	Dependent Variable: Community Gini of Income											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Instrumented Endogenous Variables												
Migration Prevalence 15 years before	-0.130	-0.120	-0.093	-0.178	-0.174	-0.157	-0.225	-0.308	-0.091	-0.292	-0.332	-0.208
	(1.57)	(2.45)*	(2.45)*	(1.80)	(3.05)**	(3.18)**	(0.79)	(1.39)	(0.62)	(1.45)	(1.74)	(2.06)*
Migration Prevalence Squared							0.268	0.460	0.011	0.371	0.389	0.190
							(0.36)	(0.91)	(0.02)	(0.82)	(0.92)	(0.69)
Exogenous Regressors												
Proportion of heads aged under 30				0.057	0.081	0.030				0.057	0.093	0.032
				(0.48)	(0.76)	(0.31)				(0.45)	(0.83)	(0.30)
Proportion of heads aged over 60				0.325	0.292	0.299				0.249	0.289	0.262
				(2.32)*	(3.07)**	(3.66)**				(1.78)	(3.19)**	(2.68)**
Proportion of heads with education <6 years				-0.027	-0.025	-0.029				-0.007	-0.012	-0.017
				(0.92)	(0.83)	(1.07)				(0.18)	(0.33)	(0.50)
Proportion of heads with education ≥9 years				-0.060	-0.057	-0.054				-0.020	-0.038	-0.033
				(1.26)	(1.15)	(1.27)				(0.30)	(0.68)	(0.59)
Constant	0.463	0.461	0.456	0.412	0.415	0.418	0.468	0.473	0.456	0.414	0.413	0.416
	(34.54)**	(54.69)**	(77.12)**	(10.16)**	(11.50)**	(12.52)**	(23.63)**	(27.84)**	(56.88)**	(9.80)**	(11.44)**	(11.64)**
F-test that quadratic terms both zero (p-value)							.314	.039	.138	.233	.007	.028
Observations	57	57	57	57	57	57	57	57	57	57	57	57
Instrument Set	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*D*	*E*	*A*	*D*	*E*
Overidentification J-statistic	3.420	n.a.	3.673	4.208	n.a.	4.520	2.934	n.a.	3.464	4.290	n.a.	4.603
p-value for overidentification test	0.181		0.597	0.122		0.477	0.087		0.483	0.038		0.331

Notes:
Robust t-statistics calculated from two-step efficient GMM estimation in parentheses, * significant at 5%; ** significant at 1%
n.a. not applicable as equation is exactly identified
Instrument Sets:
A: State migration rate in 1924, weighted state-level unemployment 16-25 years earlier (UE), Weighted Real Depreciation 16-30 years before survey (Real Depn.);
B: State migration rate in 1955-59
C: A+B+ Distance in miles to principal destination in U.S. and distance squared.
D: State migration rate in 1955-59, State migration rate in 1955-59 squared
E: A and state migration rate in 1924 squared.

TABLE 9: ROBUSTNESS TO ALTERNATIVE MEASURES OF MIGRATION
Coefficient on alternative measures of instrumented past migration

	Measure of Inequality										
	Gini of Nondurable Consumption		Relative Asset Inequality		Gini of Income		First-stage F-stat (p-value)		Overidentification test p-value		
									NDC	Assets	Income
Instrument Set	*B*	*C*	*B*	*C*	*B*	*C*	*B*	*C*	*C*	*C*	*C*
Original Specification											
Migration Prevalence 15 years before	-0.132	-0.112	-1.200	-1.263	-0.174	-0.157	32.12	5.33	0.385	0.111	0.477
	(2.28)*	(2.01)*	(3.31)**	(3.84)**	(3.05)**	(3.18)**	(0.000)	(0.000)			
Alternative Measure of Migration Used:											
Migration Prevalence in survey year	-0.143	-0.080	-1.304	-1.352	-0.189	-0.173	13.18	2.79	0.291	0.134	0.538
	(2.35)*	(1.64)	(2.79)**	(3.50)**	(3.01)**	(3.01)**	(0.000)	(0.021)			
Migration Prevalence 5 years before	-0.147	-0.105	-1.339	-1.499	-0.194	-0.174	15.91	2.64	0.338	0.171	0.477
	(2.32)*	(1.85)	(2.92)**	(3.59)**	(2.94)**	(2.92)**	(0.000)	(0.028)			
Migration Prevalence 10 years before	-0.137	-0.108	-1.249	-1.438	-0.181	-0.165	21.19	3.70	0.372	0.177	0.473
	(2.29)*	(1.91)	(3.14)**	(3.85)**	(3.01)**	(3.01)**	(0.000)	(0.004)			
Migration Prevalence 20 years before	-0.150	-0.133	-1.366	-1.378	-0.198	-0.178	36.50	5.99	0.415	0.112	0.484
	(2.27)*	(2.12)*	(3.50)**	(4.22)**	(3.02)**	(3.34)**	(0.000)	(0.000)			
Proportion of households with a	-0.075	-0.060	-0.682	-0.688	-0.099	-0.085	31.59	5.09	0.259	0.050	0.431
migrant 15 years before	(2.42)*	(1.97)*	(3.59)**	(3.99)**	(3.19)**	(3.30)**	(0.000)	(0.000)			
Proportion of households with a	-0.079	-0.062	-0.722	-0.826	-0.105	-0.093	21.94	3.60	0.261	0.087	0.438
migrant 10 years before	(2.42)*	(1.91)	(3.50)**	(4.45)**	(3.11)**	(3.14)**	(0.000)	(0.005)			
Proportion of households with a	-0.087	-0.079	-0.791	-0.961	-0.115	-0.123	15.36	2.87	0.347	0.088	0.655
migrant 5 years before	(2.44)*	(2.28)*	(3.27)**	(4.22)**	(2.83)**	(3.16)**	(0.000)	(0.019)			
Proportion of households currently	-0.092	-0.059	-0.836	-0.831	-0.121	-0.131	13.15	2.74	0.261	0.020	0.864
with a migrant	(2.33)*	(1.80)	(3.11)**	(3.81)**	(2.71)**	(3.39)**	(0.000)	(0.023)			

Notes:
Coefficients shown are for the migration measure in an IV regression of the inequality measure on the migration measure, the proportion of heads aged under 30 and over 60, the proportion of heads with education <6 years and ≥9 years and a constant
Robust t-statistics after two-stage efficient GMM estimation in parentheses.
* denotes significant at 5%, ** at 1%
Instrument Sets:
A: State migration rate in 1924, weighted state-level unemployment 16-25 years earlier (UE), Weighted Real Depreciation 16-30 years before survey (Real Depn.);
B: State migration rate in 1955-59
C: A+B+ Distance in miles to principal destination in U.S. and distance squared.

Table 10: Quantile Regression Estimates of Regression of Wealth on 1955-59 Migration Stock

	Log Non-durable Consumption		Asset Index		Log Income	
Quantile	Intercept	Migration	Intercept	Migration	Intercept	Migration
0.1	7.369	6.552	-7.127	48.125	7.289	7.809
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
0.25	7.834	3.770	-4.040	28.095	7.756	4.674
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
0.5	8.241	2.521	-1.998	12.966	8.245	3.031
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
0.75	8.628	0.883	-0.459	8.279	8.610	1.478
	(0.000)	(0.097)	(0.011)	(0.000)	(0.000)	(0.015)
0.9	8.882	0.674	0.876	3.607	9.013	1.207
	(0.000)	(0.305)	(0.000)	(0.107)	(0.000)	(0.082)

Notes:
p-values in parentheses obtained via bootstrap estimation using STATA's qreg command.
All regressions also contain controls for 5 year age group dummies, marital status, education, and education squared and are for male heads aged 15-49 years old.
For individuals in MMP71 communities with less than 100,000 population in 1990.

Table 11: Is a change in migration associated with a change in inequality? Results from 1992 and 1997 ENADID data

	Change in Gini of NDC				Change in IC			Change in Gini of Income		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Change in Migration Stock 1992-97	0.007	0.213		0.208	2.290		2.476	0.208		0.201
	(0.13)	(1.83)*		(1.53)	(1.41)		(1.34)	(1.77)*		(1.49)
Change in Migration Stock * 1992 Stock		-1.247			-10.284			-0.984		
		(2.01)*			(1.20)			(1.58)		
Change in Squared Migration Stock 1992-97				-0.525			-4.933			-0.407
				(1.63)			(1.12)			(1.27)
Change in Proportion of Hhs with Migrant			0.105			1.494			0.138	
			(1.72)*			(1.83)*			(2.38)**	
Change in Propn of Hhs with Migrant * 1992 Propn,			-0.354			-4.461			-0.422	
			(1.73)*			(1.62)			(2.15)**	
Constant	-0.002	-0.003	-0.003	-0.002	0.038	0.036	0.044	0.005	0.005	0.006
	(0.87)	(1.34)	(1.11)	(1.01)	(1.15)	(1.05)	(1.36)	(2.21)**	(2.11)**	(2.49)*
Observations	33	33	33	33	33	33	33	33	33	33
R-squared	0.00	0.12	0.10	0.08	0.06	0.10	0.06	0.09	0.16	0.07
Predicted Turning Point in Migration Stock		0.17		0.19	0.22		0.25	0.21		0.24
Predicted Turning Point in Propn of Hhs			0.30			0.33			0.33	

Absolute value of t statistics in parentheses
* significant at 10%; ** significant at 5%

TABLE A1: PRINCIPAL COMPONENT AND ASSET INDICATOR SUMMARY STATISTICS

MMP Principal Components Index

	Scoring Factors	Mean	S.D.	Means by Tercile of Asset Index lowest	middle	upper
Housing Characteristics						
Number of rooms/member	0.154	1.082	0.962	0.737	1.028	1.477
Brick and cement or tile roof	0.167	0.758	0.428	0.590	0.856	0.840
Dirt floor	-0.282	0.113	0.317	0.316	0.014	0.000
Wood or tile floor	0.266	0.434	0.496	0.104	0.374	0.821
Utilities						
Running water	0.198	0.941	0.236	0.841	0.983	0.999
Sewerage	0.277	0.768	0.422	0.478	0.870	0.986
Electricity	0.199	0.971	0.168	0.917	0.999	1.000
Telephone	0.258	0.251	0.434	0.007	0.109	0.649
Durable Assets						
Car	0.193	0.187	0.390	0.024	0.106	0.439
Van	0.147	0.183	0.387	0.044	0.168	0.344
Radio	0.162	0.906	0.292	0.797	0.934	0.988
Television	0.264	0.893	0.309	0.703	0.986	0.999
Sewing Machine	0.225	0.475	0.499	0.195	0.473	0.751
Stove	0.276	0.922	0.269	0.769	0.999	1.000
Fridge	0.343	0.670	0.470	0.169	0.855	0.996
Washing Machine	0.310	0.506	0.500	0.079	0.528	0.920
Stereo	0.284	0.454	0.498	0.093	0.398	0.875
Overall Asset Index		0.000	2.154	-2.472	0.363	2.109

Eigenvalue for 1st component	4.639
Share of variance	0.273

Notes: for all 71 communities in MMP71

ENADID 1992 and 1997 Principal Components Index

	Scoring Factors	Mean	S.D.	Means by Tercile of Asset Index lowest	middle	upper
Asset Indicators						
House has a dirt floor	-0.278	0.208	0.406	0.469	0.115	0.013
House has a wood/tile floor	0.313	0.154	0.361	0.001	0.064	0.411
Water piped into house	0.455	0.363	0.481	0.002	0.147	0.971
Water from pipe outside house	-0.286	0.426	0.494	0.621	0.620	0.021
House has a toilet	0.390	0.628	0.483	0.092	0.855	0.998
Toilet connected to running water	0.450	0.341	0.474	0.001	0.192	0.863
Water drains to pipe	0.360	0.315	0.465	0.005	0.296	0.676
Water drains to septic tank	0.087	0.190	0.392	0.054	0.255	0.276
House has electric lighting	0.211	0.899	0.301	0.754	0.963	0.998
Overall Asset Index		0.000	1.843	-1.895	-0.246	2.324

Eigenvalue for 1st component	3.397
Share of Variance	0.377

Notes: For 97 municipalities with population 100,000 or less which can be matched in the 1992 and 1997 surveys.

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