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Abstract

The migration of labor out of rural areas and the flow of remittances from migrants to rural households is an increasingly important feature of less developed countries. This paper explores ways in which migration influences incomes and productivity of land and human capital in rural households over time, using new household survey data from Mexico. Our findings suggest that a massive increase in migration to the United States increased per-capita incomes via remittances and also by raising land productivity in migrant-sending households. They do not support the pessimistic view that migration discourages production in migrant-sending economies, nor the view implicit in separable agricultural household models that migration and remittances influence household incomes but not production.

Key Words: Migration, income, agricultural production, Mexico.

JEL: O15, O13.

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The migration of labor out of rural areas and the flow of remittances from migrants to rural households is an increasingly important feature of less developed countries. This paper explores ways in which migration influences incomes and productivity of land and human capital in rural households over time, using new household survey data from Mexico. Our findings suggest that a massive increase in migration to the United States increased per-capita incomes via remittances and also by raising land productivity in migrant-sending households. They do not support the pessimistic view that migration discourages production in migrant-sending economies, nor the view implicit in separable agricultural household models that migration and remittances influence household incomes but not production.

Theoretical Considerations

In an agricultural household model with perfect markets (viz., the basic model presented in Singh, Squire and Strauss, 1986), the allocation of family time to migration activities and the receipt of income transfers from migrants do not affect production. Under the assumption of perfect labor markets, households may hire substitutes for family members who migrate at a wage that is exogenous to the household. Remittances from migrants represent an income transfer, which shifts the household budget constraint outward. This affects consumption but not production in a separable model. If leisure is a normal good, the existence of a local labor market makes it possible for households to increase leisure demand without decreasing labor in production. Even if remittances are not sufficient to compensate for a higher wage bill, per-capita income may increase (because of a smaller household size due to emigration).

In the past decade, as the emphasis of development economics has shifted towards the study of market imperfections, new perspectives have emerged stressing the complexity of migration as an economic institution, interrelationships between migration's determinants and impacts, and the household's role in migration decision making (Stark, 1991; Taylor and Martin, 2001). Stark hypothesized that migrants play the role of financial intermediaries, enabling rural households to overcome credit and risk constraints on their ability to achieve the transition from familial to commercial production. This argument generally implies a nonseparable household model. (Examples of nonseparable models include Benjamin, 1992; de Janvry, et al., 1991; Jacoby, 1988; and Skoufias, 1994.)

We illustrate this hypothesis in Figure 1.[1] Consider a household with two possible production activities. A household may invest its fixed resources ($\bar{T}$), such as land, in either a low-return or high-return activity. Let Q_i, for i=0,1, denote output from these two activities, respectively. An array of household characteristics, Z_Y, shapes the returns from investing in each activity. PP represents the production possibility frontier

[1] This figure is taken from Taylor, Rozelle and De Brauw (2003).

(PPF). At relative prices p_1/p_0, the household will specialize in the high-return activity, Q_1, its output will be $Q^* = f_1(\overline{T}, Z_Y)$, and its income will be $Y^*=g(Q^*)$.

However, the household may face constraints on investing in the high-return activity, $c(\cdot) = T_1$, where $c(\cdot)$ denotes one or more barriers that limit the household to invest only T_1 of the fixed resource in the high-return activity, implying that T_1 is less than $\overline{T}$. For example, in the case of a credit or liquidity constraint, $c(\cdot)$ denotes some barrier (for example, the lack of a formal credit market) that prevents the household from producing more of a relatively profitable good (e.g., a cash crop), Q_1. In the case of a missing insurance market, it may represent the maximum amount of the fixed resource that the household is willing to invest in the (relatively risky) high-return activity, given its risk aversion. Although the household would like to produce more Q_1, the lack of available credit and/or insurance prevents it from doing so.

Without a credit or insurance market, family migrants could help relax the household's credit or liquidity constraint by sending back remittances, and they could provide income security by promising to remit in the event of a crop failure or other adverse shock, functioning *de facto* as a household insurance policy. This would shift the constraint in Figure 1 upward, and possibly shift the production possibility frontier outward by raising the productivity of the household's fixed assets—for example, land or education.

The effect of migration on production constraints, however, is not always positive. If rural households face a missing or imperfect labor market, migration may further constrain households from investing in a high-return but labor intensive activity by competing for scarce human capital.

Because the relative influences of migration on liquidity, risk and labor constraints are unknown, the overall impact of migration on total household income is ambiguous. However, where capital, risk, and/or human capital constraints bind, the impacts are not likely to be zero, as in the case of a separable model. A finding that migrants or remittances significantly affect non-migration income in migrant-sending households would tend to support the NELM. The sign of activity-specific migration effects, like that of total-income effects, is indeterminate a priori. In terms of Figure 1, migration and remittances could increase output in the high-return activity (Q_1) if they complement income growth in that sector by relaxing the constraints, $c(\cdot)$. However, this also would imply a negative impact of migration on Q_0. By loosening constraints on technology and on access to fixed inputs (e.g., land, machinery, education, etc.), remittances could increase productivity in both sectors by shifting the PPF outward. At given relative prices, the loosening of investment constraints is likely to lead to increased specialization (including, possibly, in migration itself), and a nonparallel shift in the PPF could result in a shift in production between activities.

Few tests of the NELM hypothesis have appeared in the literature. Examples include Lucas (1987), Taylor (1992), and Taylor and Wyatt (1996). Benjamin and Brandt (1998) find evidence that participation in migration loosens risk constraints on household-farm investments. Rozelle, et al. (1999) and Taylor, et al. (2003) find that migration results in both negative lost-labor and positive remittance effects on production in migrant-sending households in rural China. If migrants play the role of financial intermediaries, as these studies suggest, the ex-ante incentive to participate in migration may be large. However, a household's propensity to participate in migration may be mitigated when there are other ways to finance investments or if the loss of labor to migration carries with it significant costs in terms of foregone yields or self-employed income. Moreover, the incentive to invest in production activities, with or without migration, is likely to depend critically on other variables, including access to markets for inputs and production in migrant-sending areas.

In short, the influences of migration and remittances on income and productivity in migrant-sending households are complex and cannot be signed a-priori. An econometric approach is required.

Empirical Strategy

Imagine a "thought experiment" in which some households are randomly chosen to have migrants at some point in time, say, t-1, and others not. We revisit these households after a sufficient amount of time has elapsed for the impacts of this "migration treatment" to play out, and we conduct a survey that enables us to estimate income functions of the following form:

$$\begin{aligned} Y_{tm}^{i} &= \alpha_{0m} + \alpha_{1m} Z_{t}^{i} + \varepsilon_{tm}^{i} \\ y_{ktm}^{i} &= \beta_{k0m} + \beta_{k1m} Z_{t}^{i} + \varepsilon_{ktm}^{i} \end{aligned} \qquad (1)$$

for "migration treatment groups" $m = 1$ (migration) and $m = 0$ (nonmigration), where Y_{tm}^{i} denotes per-capita total income in household *i* at time *t*, y_{ktm}^{i} denotes income from activity $k=1,...,K$; Z_{t}^{i} is a vector of household factors that explain incomes at time *t*; and ε_{ktm}^{i} and ε_{tm}^{i} are stochastic errors assumed to have zero mean and constant variance. Under the usual classical assumptions, applying ordinary least squares to equation (1) would yield unbiased and efficient estimates of the parameters, α_{1m}^{i} and β_{k1m}.[2]

Such an experiment obviously is not feasible, however. The best that we can do is to observe a household's migration status at one point in time and its income and income composition at a later time. Households are not randomly assigned to migration regimes initially; migration is the result of an endogenous decision that may be correlated with ε_{ktm}^{i} and ε_{tm}^{i}.

[2] Note that a systems approach would not improve efficiency inasmuch as all equations in (1) contain the same right-hand variables.

To address the endogeneity of the migration treatment and possible correlation between the treatment and the error in the income-outcome equations, we use a switching regression strategy with cross-section income and retrospective data on international migration. The advantage of this approach is that, with a good instrument for migration treatment, one can obtain separate, consistent estimates of income-production function parameters at time *t* for households with and without the migration treatment at time *t-1*.[3] The alternative of including migration as an explanatory variable in the income-outcome equations constrains the effects of income-producing assets (the parameters α_{1m}^{i} and β_{k1m}) to be the same for households with and without migrants. If migration affects productivity, these parameters will differ between the two groups. We first describe the data and then present our identification strategy.

Data

Our empirical analysis is based on a unique new data set constructed from the Mexico National Rural Household Survey (*Encuesta Nacional a Hogares Rurales de Mexico*, or ENHRUM). This survey provides detailed data on assets, socio-demographic characteristics, production, income sources, and migration from a nationally representative sample of rural households surveyed in January and February 2003. The sample includes 1,782 households in 14 Mexican states.

INEGI, Mexico's national information and census office, designed the sampling frame to provide a statistically reliable characterization of Mexico's population living in rural areas, or communities with fewer than 2,500 inhabitants. For reasons of cost and tractability, individuals in hamlets or disperse populations with fewer than 500 inhabitants were not included in the survey. The result is a sample that is representative of more than 80 percent of the population that the Mexican government considers as rural.

Complete migration histories were assembled from 1980 through 2002 for (a) the household head, (b) the spouse of the head, (c) all individuals who lived in the household 3 months or more in 2002, and (d) a random sample of all sons and daughters of either the head or his/her spouse who lived outside the household longer than 3 months in 2002. These retrospective data were used to construct international and internal migration variables.

Survey teams visited each community twice, first in summer 2002, to conduct a survey of community characteristics via interviews with local leaders, service providers, and school teachers, and again in January-February 2003, to carry out the household survey. The household survey is the source of all information on household characteristics. Community variables were constructed from the community survey.

[3] This is true regardless of whether the error in the income equations includes unobserved household characteristics correlated with migration as long as the migration instrument is orthogonal to the income errors.

Net activity incomes were calculated for each household as the difference between gross value of output and cash costs of variable inputs. For livestock, the income calculation is gross sales minus cash costs plus the change in the value of herds between the beginning and end of the year.

Rural Mexico is an ideal laboratory for studying the impacts of international migration on the rural economy. Figure 1, constructed from retrospective migration data gathered in the survey, shows that the percentage of Mexico's village population working at international migrant destinations increased sharply at the end of the 20th century, nearly matching the internal-migration share in 2002.[4] Villagers' propensity to migrate to U.S. jobs more than doubled from 1990 to 2002, mirroring an unexpectedly large increase in the number of Mexico-born persons living in the United States as revealed by the 2000 U.S. Population Census.[5] During this period, there was a sharp upward trend in the percentage of villagers working as internal and international migrants in nonfarm jobs, a mildly upward trend in the percentage in U.S. farm jobs, and a declining trend in the percentage in agricultural jobs in Mexico. The decrease in internal migrants employed in farm jobs reflects a decline in Mexico's agricultural employment in the 1990s.[6]

Identifying "Migration Treatment" Effects

Our goal is to compare incomes and the productivity of household factors in 2002 between (a) households that had family members at international migrant destinations in an earlier year (the treatment group) and (b) those that did not (the non-treatment or control group), and also to explore whether the migration treatment altered the

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[4] The ENHRUM survey assembled complete migration histories from 1980 through 2002 for (a) the household head, (b) the spouse of the head, (c) all individuals who lived in the household 3 months or more in 2002, and (d) a random sample of sons and daughters of either the head or his/her spouse who lived outside the household longer than 3 months in 2002. The size of both villager and migrant populations in the synthetic cohorts created using retrospective data is biased downward as one goes back in time, because some individuals are removed from the population due to death and thus are not available to be counted in 2003. Permanent migration does not pose a problem, because information about migrants was provided by other family members in the village. In the relatively rare case where entire families migrated, overall migration estimates may be biased downward; however, it is not clear whether this would produce an upward or downward bias in the *slope* of the migration trend.

[5] The Mexico-born population in the United States increased from 6.7 million to 10.6 million between 1990 and 2000 (United States Census Bureau).

[6] The total nonfarm payroll in Mexico increased by 73% from 1990 through 2001 in real terms, while the farm payroll decreased by 5.2% (Mexico, Instituto Nacional de Estadística, Geografía e Información)

composition of income across agricultural and nonagricultural activities in 2002. Three econometric questions arise in attempting to identify these migration treatment effects: the choice of treatment year, the endogeneity of the treatment, itself, and the potential effect of migration on the accumulation as well as productivity of household assets. We begin the analysis by choosing 1990, 12 years prior to the survey, on the theory that it provides a sufficiently long time horizon for the diverse influences of migration described above to play out. We then test the sensitivity of our findings to the choice of the treatment year.

Migration Instruments

Three instruments were used to control for the endogeneity of the "migration treatment." The first, $bracerocom_i$, is a dummy variable equal to 1 if household i's village participated in the Bracero program prior to 1964 and zero otherwise. Data on this variable were obtained from the community survey, described above. Participation in the Bracero program was driven by labor recruiters and likely to be largely random. The second and third, $duscom_i$ and $dmexcom_i$, are dummy variables equal to 1 if *other* households in the village had migrants abroad or at internal destinations, respectively, in 1990, and zero otherwise. The validity of these instruments depends on their correlation with the migration treatment but not with income outcomes measured in 2002. Woodruff and Zenteno (2001), and McKenzie and Rapoport (2004) argue in favor of the use of historic migration as an instrument to identify migration outcomes, based on the argument of Massey et al. (2002) this migration is largely the result of demand-side factors coupled with the arrival of railroads into Mexico. According to Massey, et al., contractors seeking labor to fuel a booming U.S. economy followed the railroads south into Mexico. Thus, the arrival and layout of the railroad system led to differences in migration rates across states. The development of migration networks, in turn, lowered migration costs and risks in subsequent years (Massey, et al., 2005). The bracero 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 program was terminated in 1994. We do not expect these instruments, measured 12 to 43 years prior to the year in which incomes are measured, to be significantly correlated with the errors in the income-outcome regressions.

The Assumption of Factor Fixity

The right-hand side variables in the income equations in (1), i.e., the Z_t^i, include variables that (a) are hypothesized to explain per-capita total and activity incomes in 2002 and (b) are not likely to have been significantly shaped by migration between 1990 and 2002. They include the household head's years of schooling, experience, and experience-squared, as in a standard Mincer (1974) earnings equation; household landholdings (hectares); and two variables measuring village access to outside markets and market risk. The first is an index of frequency of public transportation between the village in which the household is located and the nearest commercial center. The second is a dummy variable taking on a value of 1 if the village loses access to the commercial center periodically in times of weather shocks and 0 otherwise. It might be interpreted as a proxy for market access-risk. We also control for total family (not household) size in the income equations.

Migration may affect the accumulation as well as the productivity of factors. However, there is reason to believe that the two key factors affecting time-t incomes, land and farmer education, did not change significantly between 1990 and 2002. In addition, Household heads' age is clearly exogenous, and family (not household) size is largely predetermined for this period.

According to the ENHRUM, 49% of rural Mexican households had land and 28% had ejido land in 2002. Between 1990 and 2002, land markets were thin, due largely to the high ejido share and long delays in privatization following the reform of Mexico's ejido laws in 1992 (Article 27). There is little difference in income sources, including migrant remittances and government transfers, between households with ejido plots and those with private land. We do not have data on land ownership in 1990. However, when we performed a separate regression of landholdings in 2002 on household migration status in 1990, controlling for region, the correlation between the two was insignificant ($t = 0.39$).

In the long run, schooling is an investment that may be shaped by migration. However, in the majority of cases, household heads in the sample had completed their schooling prior to 1990. To be certain that the findings presented below are not contaminated by endogeneity of farmer schooling, we limit the sample to households whose heads were not in the school-age group in the year of the migration treatment. This eliminates five households from the sample but does not change our findings in any substantive way. We also performed a simple regression like the one for land and found that the correlation between household head schooling and 1990 migration status is negative for U.S. migration ($t = -1.71$) and insignificant for internal migration ($t = -0.35$). The same regression, but replacing household head's schooling with average schooling of household members or number of household members with secondary schooling, produced insignificant results for both migration regimes.

The ancillary education and land regressions do not provide a definitive test of the effect of 1990 migration regime on 2002 household head schooling and landholdings; however, the results are not what one would expect if migration were a significant driver of land accumulation or of household heads' schooling in rural Mexico during this period.

Findings

Table 1 presents summary statistics on per-capita income and its composition as well as on all other variables included in our analysis. The first data column presents means in 2002 for households that did not have at least one family member (household head, spouse, or child) as a labor migrant in the United States in 1990. The second data column does the same for households with U.S. migrants in 1990.

Panel A of the Table shows that 2002 average per-capita total income was approximately 51% higher in households that had a U.S. migrant in 1990 than for those that did not (18,423 versus 12,236 pesos).[7] The 2002 income "portfolio mix" also differed between the two household groups. Not surprisingly, households with at least one international migrant in 1990 had significantly greater remittances from abroad in 2002: 5,933 versus 633 pesos. They also received more public transfers (2,180, compared with 986 pesos). Households that did not have U.S. migrants in 1990 had significantly higher 2002 per-capita income from wages (6,427 versus 4,077 pesos). Differences between the two groups in per-capita income from all other activities are not statistically significant.

Panel B of Table 1 presents summary statistics for each of the variables included in the econometric analysis. Differences in variable means between the two household groups in most cases are statistically significant but quantitatively small. In 2002, households that had U.S. migrants in 1990 were slightly smaller (4.2 versus 4.7 members), had a larger number of members with at least some secondary schooling (1.8 versus 1.4), had heads who were older (46 versus 39 years), and enjoyed slightly greater accessibility to market centers. They also had fewer family members who were internal migrants in 1990. Households with U.S. migrants in 1990 were significantly more likely to be located in the West-Center or Northeast census regions and less likely to be in the South or Northwest regions.

The results of the migration probit are reported in Table 2. The historic community U.S. migration variable is highly significant, as are household head experience and two of the five census region dummies. The bracero and internal migration dummies appear to add little additional information to explain the "migration treatment." This estimated probit regression was used to obtain an inverse-Mills ratio to control for migration selectivity in the 2002 income regressions for each of the two "treatment" groups. The income equations were estimated jointly with the probit, following Lee (1978).

The estimated coefficients on farmer education and land in the selectivity-corrected income equations are presented in Table 3 (full regression results appear in the Appendix). Panel A reports the estimates for total income. Households with at least one international migrant in 1990 had significantly higher marginal returns to land in 2002 than households that did not participate in migration. Other things being equal, an additional hectare of land was associated with an increase in total income of 1,069 pesos (about US$111) in households that had migrants in 1990 compared with 78 pesos (US$8)

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[7] The exchange rate at the time of the survey was approximately 10 pesos per US$.

in those that did not receive the "migration treatment." An additional year of farmer schooling has a significant and positive effect on total income in households without U.S. migrants (678 pesos), but it does not significantly explain total income in the "treatment" group, for which the education effect is negative but insignificant.

Higher productivity of land in the migrant-household group as well as higher returns to farmer schooling in the non-treatment group also result when one excludes migrant remittances from total income (see Panel B of the Table). Other things being equal, an additional year of farmer schooling adds 668 pesos to household non-remittance per-capita income in households that did not have U.S. migrants in 1990. An additional hectare of land increases non-remittance income by 998 pesos in households that began the period with at least one U.S. migrant and by 76 pesos in the non-migrant group. When one considers only agricultural (crop and livestock) income (Panel C), the effect of farmer schooling on per-capita income in both household groups becomes insignificant. This suggests that the returns to schooling overwhelmingly are in non-farm activities. Land continues to have a significant positive effect on income that is more than nine times larger for the U.S. migrant group (775 compared with 83 pesos). The difference in land productivity persists when one considers only crop income (Panel D): the effect of land on crop income is smaller but still significant and far larger for the migration treatment group (579 versus 50 pesos).

The Choice of Migration Treatment Year

The choice of the treatment year is arbitrary, raising the question of whether the estimated effects of migration on land productivity vary over time. The retrospective migration data make it possible to use a variety of years as the treatment year. Figures 3a-d show estimated returns to land and schooling for the migration treatment and nontreatment groups for different choices of the treatment year between 1990 and 2001, together with their associated confidence bands. For all choices of treatment year the 95% confidence interval on the returns to farmer schooling in the treatment group contain zero. The confidence band on the returns to land for the migration treatment group is well above zero, but it is sensitive to the choice of the treatment year, peaking out at approximately 1,600 pesos in 1991-96 and converging sharply towards zero at the end of the time interval. For the non-treatment group, the returns to land are consistently lower than for the treatment group, the returns to schooling are positive, and both are robust to the choice of treatment year.

There is some evidence that market access and market access risk significantly affect non-remittance incomes, but only for some treatment years. 1990 treatment households with greater access to markets have significantly higher non-remittance incomes in 2002 than households with less market access (see Appendix). If 1995 is chosen as the treatment year, other things being equal, households in villages that lose access to markets periodically due to weather shocks have per-capita income that is significantly lower than households in villages with more secure access (significant at the 95% level). However, for a 1990 treatment year, the weather-shock variable's effect is insignificant. Some region fixed effects are significant in some of the activity income equations, suggesting that there are regional variations in rural income and its composition. In all regressions we easily reject the null hypothesis that the coefficients on all variables are jointly zero. The inverse-Mills ratio parameter is insignificant in the migration-treatment group income equations, but it is significant and positive in all of the non-treatment income regressions.

Conclusions

Migration may reshape rural economies in myriad ways, particularly in an imperfect-markets setting. Our goal of this paper has been to explore the potential influences, both direct and indirect, that migration may have on rural incomes and their determinants, using data from the 2003 Mexico National Rural Household Survey.

Our findings indicate that rural households' access to U.S. migrant labor markets significantly increased incomes as well as productivity of land in rural Mexico. The land productivity effect increases over time. A number of studies have posited that migrants alleviate liquidity and/or risk constraints on household investments in production activities. The findings reported here suggest that it takes several years for these positive effects of migration to play out. They also suggest that migration competes primarily with local wage work, altering the composition of rural incomes away from local wages and in favor of migrant remittances, and the income effects of migration depend critically on other household assets, particularly landholdings. In households that do not have migrants in the United States, the returns to land are lower while farmer education plays a more important role in income generation, primarily via off-farm activities. The significance of the inverse-Mills ratio in the income regressions for non-migrant households indicates that non-migrant households are positively selected into a non-migration status. There is no evidence of positive sample selectivity bias for the migration-treatment group, however. This implies that if migrant households were suddenly deprived of migration, their expected incomes would be lower than those of otherwise similar households without migrants.

The analysis of migration impacts is complex and challenging, particularly when one uses cross-sectional data, and further econometric investigation is warranted. A high priority for future research is to seek out possible instruments to control for the non-randomness of the process that allocates households across migration regimes, as well as to identify specific ways by which migration influences productivity in rural households.

Figure 1. Potential Migration Effects on Rural Households´ Production

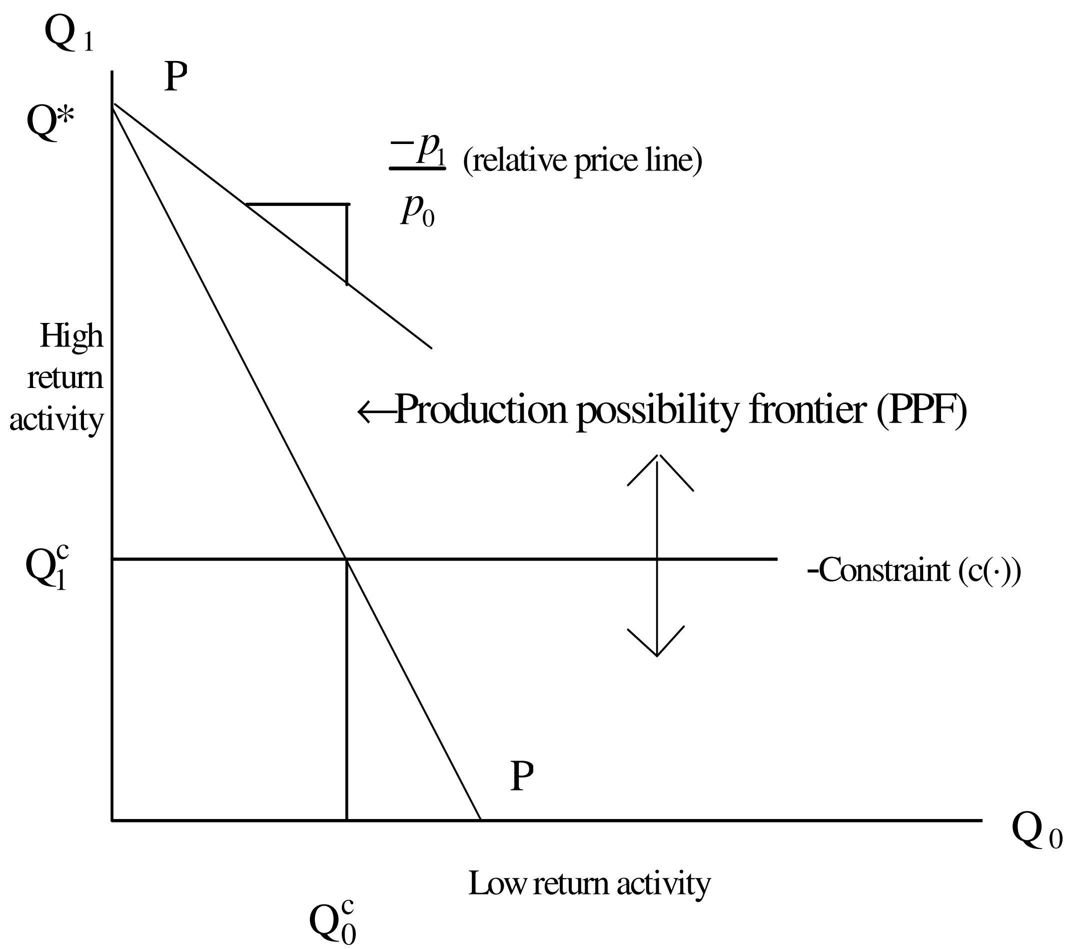
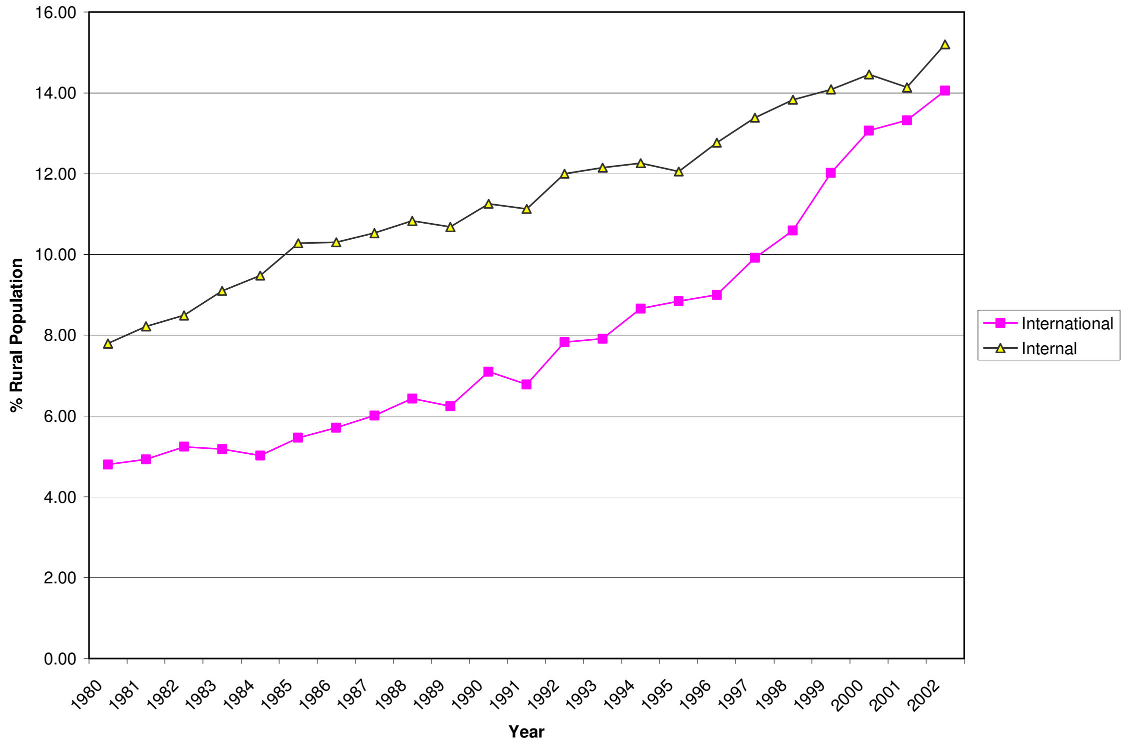


Figure 2. Labor Migrants as Percentage of Mexican Village Populations, by Migrant Destination, 1980-2002



Source: Migration history data from the 2003 ENHRUM.

Figure 3a

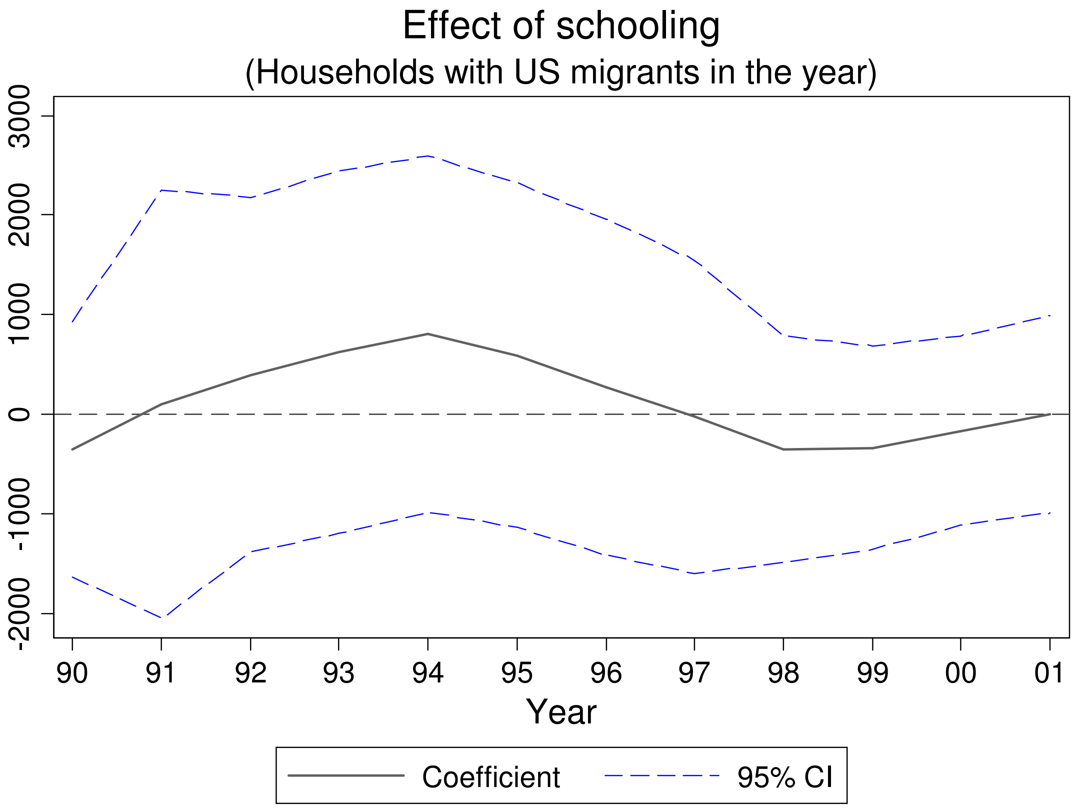
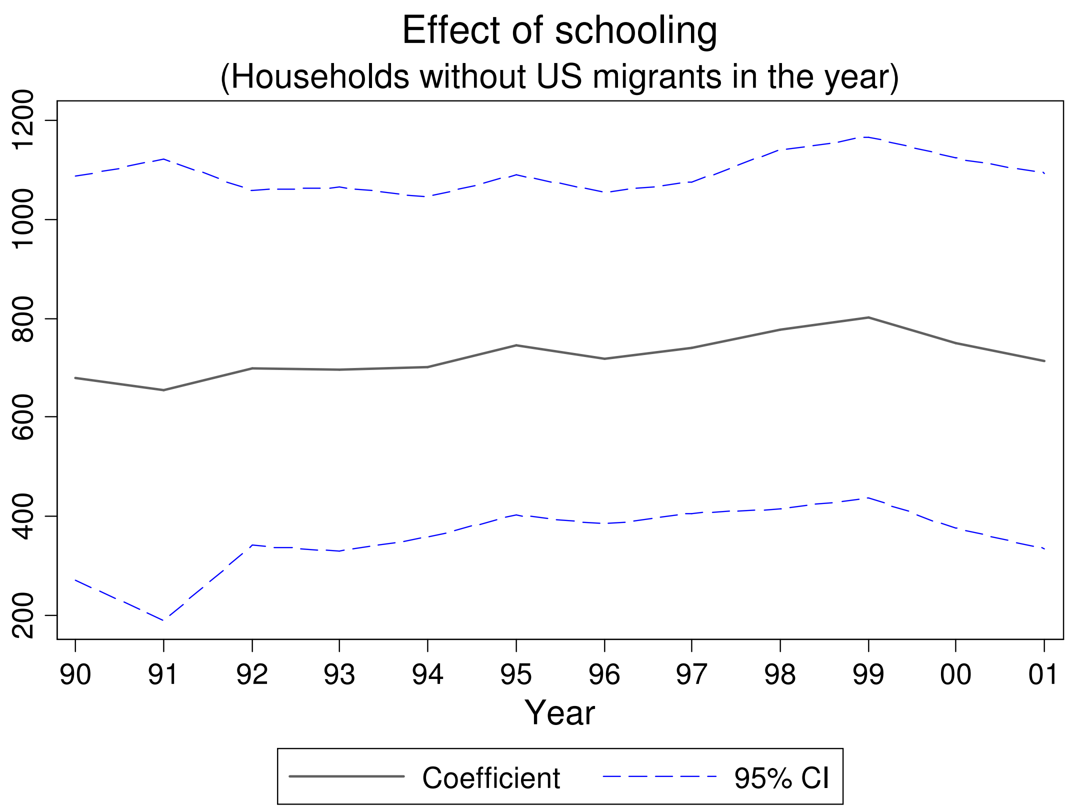
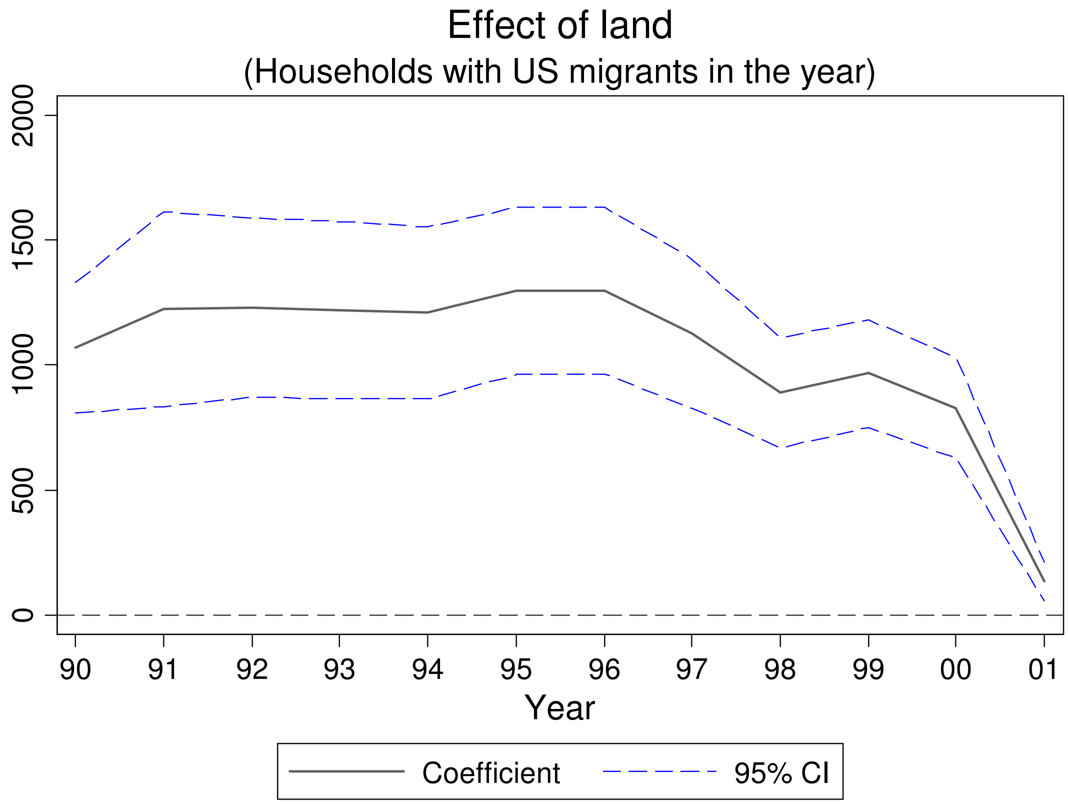

Effect of schooling
(Households with US migrants in the year)
3000
2000
1000
0
-1000
-2000
90
91
92
93
94
95
96
97
98
99
00
01
Year
Coefficient
95% CI

Figure 3b



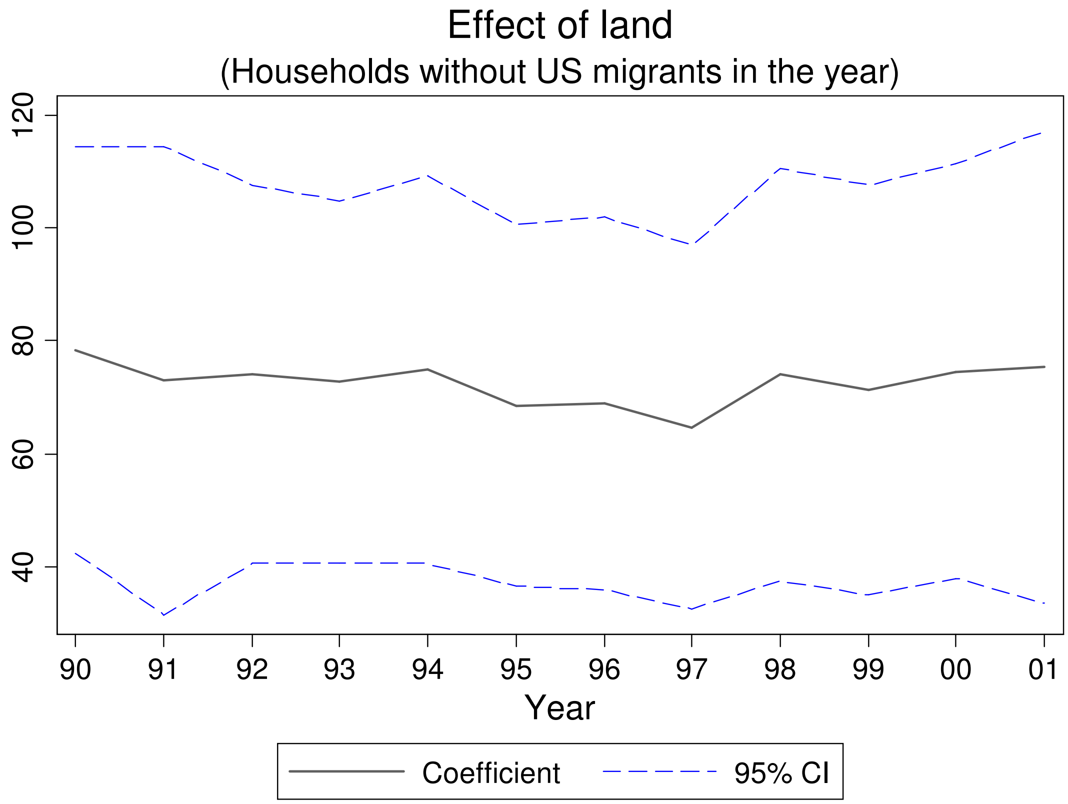
Effect of schooling
(Households without US migrants in the year)
200
400
600
800
1000
1200
90
91
92
93
94
95
96
97
98
99
00
01
Year
Coefficient
95% CI

Figure 3c



Effect of land
(Households with US migrants in the year)
2000
1500
1000
500
0
90
91
92
93
94
95
96
97
98
99
00
01
Year
Coefficient
95% CI

Figure 3d



Effect of land
(Households without US migrants in the year)
120
100
80
60
40
90
91
92
93
94
95
96
97
98
99
00
01
Year
Coefficient
95% CI

Table 1. Summary Statistics, by Household U.S. "Migration Treatment" Status in 1990

Variable Name	Description	Household "Migration Treatment": Without U.S. Migrant	With U.S. Migrant
	Panel A ***Per-Capita Income***		
Pcy	Per-capita total income	12,236.17	18,422.72***
Pcag	Per-capita crop income	2,302.15	2,445.16
Pcliv	Per-capita livestock income	228.93	905.57
Pctra	Per-capita public transfers	985.60	2,179.95***
Pcus	Per-capita remittances, U.S.	632.92	5,932.95***
pcmex	Per-capita remittances, internal	313.34	224.79
pcwage	Per-capita wage income	6,426.73	4,077.12***
pcnonag	Per-capita nonagricultural income	1,346.49	2,657.18*
	Panel B ***Variables in the Regression Analysis***		
Human Capital and Household Characteristics			
hhsize	Household size (to calculate per-capita incomes)	4.66	4.20**
Sec	No. of family members with secondary schooling	1.42	1.85**
edhead	Years of schooling of household head	4.48	3.97
exphead	Years experience of household head	38.94	46.13***
exp2	Exphead-squared	1833.93	2452.01***
Land	Landholdings (hectares)	4.78	5.13
Community and Plot Characteristics			
transport	Frequency of public transport to market center	8.10	8.96*
weather	Village is inaccessible during weather shocks (dummy)	0.14	0.06***
Migration Characteristics			
Us1990	No. of family migrants in U.S. in 1990	-	1.26
mex1990	No. of family migrants in Mexico in 1990	0.21	0.15*
Region Dummies			
r2	Southeast	21.31	7.60***
r3	West-Center	17.5	41.14***
r4	Northwest	19.94	11.39***
r5	Northeast	18.63	36.71***
N		1600	158

Table 2. Probit for Household 1990 U.S. Migration Regime

Variable	Estimated Coefficient	T-Statistic
Edhead	0.109	0.60
Exphead	**0.019**	**1.71**
exp2	-0.0001	-0.76
duscom1990	**0.799**	**5.64**
dmexcom1990	0.086	0.58
Bracerocom	0.212	0.174
r2	0.254	1.07
r3	**0.841**	**3.29**
r4	0.229	0.86
r5	**0.690**	**2.48**
Constant	**-3.111**	**-9.03**

Sample Size 1669 (N with US migrants: 153)
Pseudo R2 0.181
Area under ROC curve 0.810
P & V normality test $P>Chi^2=0.187$
P normality test
Skewness P>F=0.893
Kurtosis P>F=0.828

Table 3. Selectivity Corrected Per-Capita Income for 2002

Income Source	Household Migration Status in 1990	
	us1990=1	**us1990=0**
Total Income		
Farmer Education	*-353.84* *(-0.54)*	***678.22*** ***(3.26)***
Land	***1068.67*** ***(8.01)***	***78.47*** ***(4.28)***
Inverse-Mills Ratio (t-statistic)	(0.24)	***(3.37)***
Non-Remittance		
Farmer Education	*-240.34* *(-0.55)*	***667.88*** ***(3.31)***
Land	***997.74*** ***(11.18)***	***75.78*** ***(4.13)***
Inverse-Mills Ratio (t-statistic)	(0.12)	***(3.01)***
Agriculture and Livestock		
Farmer Education	106.78 (0.47)	71.60 (0.57)
Land	***775.09*** ***(16.93)***	***83.26*** ***(6.97)***
Inverse-Mills Ratio (t-statistic)	(0.57)	**(2.37)**
Agricultural		
Farmer Education	8.03 (0.06)	92.09 (0.78)
Land	**579.17** **(19.45)**	***50.08*** ***(4.52)***
Inverse-Mills Ratio (t-statistic)	(0.26)	**(2.65)**

N=1617

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Appendix
Full Regression Results

Per-capita total income US Migrant Households				
Variable	Coef.	se	z	p
Famsize	243.09	616.37	0.39	0.69
Edhead	-353.84	653.67	-0.54	0.59
Exphead	-405.84	613.08	-0.66	0.51
Exp2	4.80	5.97	0.80	0.42
Land	1068.67	133.37	8.01	0.00
Transport	330.74	414.87	0.80	0.43
Weather	-10831.04	7460.82	-1.45	0.15
r2	8894.33	11810.49	0.75	0.45
r3	2111.61	13146.76	0.16	0.87
r4	13766.38	12159.68	1.13	0.26
r5	10788.34	13492.36	0.80	0.42
_cons	6964.94	33309.11	0.21	0.83
lambda	2194.71	9154.44	0.24	0.81
Non-US Migrant Households				
Famsize	53.38	185.92	0.29	0.77
Edhead	678.22	207.85	3.26	0.00
Exphead	129.55	174.85	0.74	0.46
Exp2	0.05	1.82	0.03	0.98
Land	78.47	18.35	4.28	0.00
Transport	58.55	97.05	0.60	0.55
Weather	-2658.83	1555.16	-1.71	0.09
r2	3326.16	1758.09	1.89	0.06
r3	-104.45	2668.87	-0.04	0.97
r4	11919.51	1864.24	6.39	0.00
r5	2261.31	2546.68	0.89	0.37
_cons	-3846.73	4471.16	-0.86	0.39
lambda	22059.78	6537.98	3.37	0.00

Per-capita non-remittance income

US Migrant Households

Variable	Coef.	se	z	p
Famsize	290.07	412.50	0.70	0.48
Edhead	-240.33	437.12	-0.55	0.58
Exphead	-206.96	410.03	-0.50	0.61
Exp2	2.02	3.99	0.50	0.61
Land	997.74	89.25	11.18	0.00
Transport	652.32	277.64	2.35	0.02
Weather	-4880.64	4993.62	-0.98	0.33
r2	9753.51	7902.39	1.23	0.22
r3	-236.79	8795.86	-0.03	0.98
r4	14105.80	8135.95	1.73	0.08
r5	6934.66	9027.57	0.77	0.44
_cons	-844.51	22285.26	-0.04	0.97
lambda	752.27	6125.23	0.12	0.90
Non-US Migrant Households				
Famsize	-31.72	184.10	-0.17	0.86
Edhead	667.88	201.74	3.31	0.00
Exphead	137.10	169.77	0.81	0.42
Exp2	-0.14	1.77	-0.08	0.94
Land	75.78	18.37	4.13	0.00
Transport	39.91	95.34	0.42	0.68
Weather	-2467.13	1530.77	-1.61	0.11
r2	2508.09	1701.56	1.47	0.14
r3	70.67	2593.05	0.03	0.98
r4	12035.87	1805.75	6.67	0.00
r5	1990.94	2475.92	0.80	0.42
_cons	-3423.54	4337.56	-0.79	0.43
lambda	19177.60	6370.50	3.01	0.00

Per-capita agricultural and livestock income				
US Migrant Households				
Variable	Coef.	se	z	p
Famsize	52.38	211.61	0.25	0.80
Edhead	106.78	225.52	0.47	0.64
Exphead	-103.74	211.32	-0.49	0.62
Exp2	1.68	2.06	0.81	0.42
Land	775.10	45.79	16.93	0.00
Transport	34.17	142.43	0.24	0.81
Weather	-2052.25	2559.59	-0.80	0.42
r2	-1360.75	4059.97	-0.34	0.74
r3	1108.42	4521.33	0.25	0.81
r4	-2232.72	4180.26	-0.53	0.59
r5	-182.55	4638.60	-0.04	0.97
_cons	-3640.61	11456.18	-0.32	0.75
lambda	1789.16	3146.90	0.57	0.57
Non-US Migrant Households				
Famsize	-15.26	117.99	-0.13	0.90
Edhead	71.60	125.61	0.57	0.57
Exphead	-25.47	105.76	-0.24	0.81
Exp2	0.75	1.10	0.68	0.50
Land	83.26	11.94	6.97	0.00
Transport	55.33	60.43	0.92	0.36
Weather	-308.12	972.87	-0.32	0.75
r2	1304.86	1054.88	1.24	0.22
r3	-853.32	1617.03	-0.53	0.60
r4	3351.59	1120.86	2.99	0.00
r5	583.47	1545.48	0.38	0.71
_cons	-1270.59	2698.71	-0.47	0.64
lambda	9455.01	3989.72	2.37	0.02

Per-capita agricultural income

US Migrant Households

Variable	Coef.	se	z	p
Famsize	-92.27	137.61	-0.67	0.50
Edhead	8.03	145.96	0.06	0.96
Exphead	-161.85	136.89	-1.18	0.24
Exp2	2.06	1.33	1.54	0.12
Land	579.17	29.78	19.45	0.00
Transport	-7.52	92.62	-0.08	0.94
Weather	-628.23	1665.69	-0.38	0.71
r2	-1848.66	2636.96	-0.70	0.48
r3	-213.30	2935.35	-0.07	0.94
r4	-2160.12	2714.93	-0.80	0.43
r5	-2462.30	3012.48	-0.82	0.41
_cons	3271.56	7437.13	0.44	0.66
lambda	523.94	2043.94	0.26	0.80
Non-US Migrant Households				
Famsize	11.69	110.10	0.11	0.92
Edhead	92.09	118.57	0.78	0.44
Exphead	-40.04	99.81	-0.40	0.69
Exp2	0.93	1.04	0.89	0.37
Land	50.08	11.08	4.52	0.00
Transport	34.01	56.64	0.60	0.55
Weather	-261.68	910.83	-0.29	0.77
r2	1086.21	997.55	1.09	0.28
r3	-1015.81	1525.49	-0.67	0.51
r4	2872.78	1059.41	2.71	0.01
r5	-920.43	1457.42	-0.63	0.53
_cons	-833.89	2548.32	-0.33	0.74
lambda	9947.43	3757.34	2.65	0.01

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