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Remittances, Inequality and Poverty: Evidence from Rural Mexico

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Abstract

Economic research has produced conflicting findings on the distributional impacts of migrant remittances, and there has been little research on the effects of changes in remittances on poverty. This paper utilizes new data from the Mexico National Rural Household Survey, together with inequality and poverty decomposition techniques, to explore the impacts of remittances on rural inequality and poverty. Our findings suggest that remittances from international migrants become more equalizing (or less unequalizing), as well as more effective at reducing poverty, as the prevalence of migration increases.

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Remittances, Inequality and Poverty: Evidence from Rural Mexico

Impacts of migrant remittances on income inequality have been a focus of considerable economic research. However, findings often have been contradictory, and a unifying theory of remittances and inequality has been elusive. The same is true for the influence of remittances on poverty, which largely has been ignored in the development economics literature. There has been no effort, to our knowledge, to explain the sometimes striking observed differences in the impacts of internal and international migrant remittances on rural inequality and poverty across regions.

This paper seeks to offer an explanation for the diversity of impacts of remittances on inequality and poverty across regions. Using Gini and poverty decomposition techniques and data from the 2003 Mexico National Rural Household Survey, it offers evidence that the marginal effects of remittances on inequality and poverty vary, in a predictable way, across regions with different levels of migration prevalence. In the case of international migration, which entails significant costs and risks, the impacts of remittances are more equalizing and have a larger effect on alleviating poverty as the share of households with access to remittance income increases.

I

Research on Remittances, Inequality and Poverty

A number of researchers have examined the distributional effects of migrant remittances by comparing income distributions with and without remittances (Barham and Boucher, 1998; Oberai and Singh, 1980; Knowles and Anker, 1981) or by using income-source decompositions of inequality measures (Stark, Taylor and Yitzhaki, 1986, 1988; Adams, 1989, 1991; Adams and Alderman, 1992). These studies offer conflicting findings about the impact of remittances on inequality. Stark, Taylor and Yitzhaki (1986) provide a theoretical explanation for these conflicting findings. They argue that rural out-migration, like the adoption of a new production technology, entails costs and risks. The costs and risks are likely to be especially high in the case of international migration. Given this fact, pioneer migrants tend to come from households at the upper-middle or top of the sending-area's income distribution (e.g., Portes and Rumbaut, 1990; Lipton, 1980), and the income they send home in the form of remittances is therefore likely to widen income inequalities in migrant-source areas.

Over time, access to migrant labor markets becomes diffused across sending-area households through the growth and elaboration of migrant networks (see Massey, Goldring, and Durand, 1994), much as new agricultural technologies become diffused across farms. If households at the middle or bottom of the income distribution gain access to migrant labor markets, an initially unequalizing effect of remittances may be dampened or reversed. Stark, Taylor and Yitzhaki (1988) found that remittances from

international migrants had an unequalizing effect on the income distribution in a Mexican village that recently had begun to send migrants abroad, but an equalizing effect on another village that had a long history of participating in international migration. The present research extends Stark, et al. It uses new, nationally representative data from rural Mexico to estimate the marginal effects of both international and internal migrant remittances on inequality in regions with different levels of migration prevalence. If the migration diffusion hypothesis is correct, one would expect to find a negative correlation between the prevalence of international migration (i.e., the share of households with migrants abroad) and the marginal impact of international-migrant remittances on inequality. For internal migration, which usually entails lower costs and risks, one would expect this correlation to be weaker.

Remittances and Poverty

Interactions between migration and poverty—both at migrant origins and destinations—are among the least researched and understood topics in economics. This is surprising, because the majority of the world’s migration originates in rural areas, where most of the world’s poverty is also concentrated.

The possible impacts of migration on poverty are bracketed by two extremes, which we might call the “optimistic” and “pessimistic” scenarios.

The optimistic scenario is that migration reduces poverty in source areas by shifting population from the low-income rural sector to the relatively high-income urban (or foreign) economy. Income remittances by migrants contribute to incomes of households in migrant-source areas. If remittances are significant and if some migrants originate from poor households, remittances may reduce rural poverty.

The pessimistic view is that poor households face liquidity, risk, and perhaps other constraints that limit their access to migrant labor markets. This is particularly likely to be the case for international migration, which usually entails high transportation and entry costs (e.g., smugglers' or recruiters' fees). Households and individuals participating in migration benefit (otherwise, it is not clear why they would participate). However, these beneficiaries of migration may not include the rural poor. If migration is costly and risky, at least initially migrants may come from the middle or upper segments of the source-areas income distribution, not from the poorest households. The poor will not benefit unless obstacles to their participation in migration weaken over time.

The true impacts of migration on poverty are likely to be found not at one extreme or another, but somewhere in between and varying over time. The diffusion hypothesis presented above for inequality may also apply to poverty. Initially, when few households have access to migrant labor markets abroad, international-migrant remittances are likely to flow primarily to middle and upper-income families. If this is the case, then changes in remittances will have little effect on poverty. However, if access to international migration eventually becomes diffused downward through the income distribution,

poverty may become increasingly sensitive to changes in remittances. That is, there may be a negative relationship between the prevalence of international migration and the marginal effect of international-migrant remittances on poverty. A given percentage increase in remittances would reduce poverty by a greater amount in a region where a large share of households have migrants abroad than in a region in which households with international migrants are rare. If internal migration is low cost and entails little risk, even the “pioneer” internal migrants may originate from poor households, and so the relationship between internal migration prevalence and poverty impacts of remittances is likely to be weaker. If remittances from internal migrants are lower than remittances from international migrations, this would further attenuate the impact of a given percentage change in internal remittances on poverty, even if many internal migrants come from poor rural households.

Some insights into migration-poverty interactions may be gleaned, mostly indirectly, from the existing literature. Adams (2004) compared the poverty headcount, poverty gap, and squared poverty gap of Guatemalan households that received remittances from international and/or internal migrants, with those of households that did not receive remittance income. He found that both internal and international remittances reduced poverty. Remittances had a quantitatively larger effect on the severity of poverty (the “poverty gap”) than on the poverty rate (headcount). This study highlights the importance of taking into account both the incidence and severity of poverty when measuring remittance impacts. Adams (1986) found that international remittances had a small but favorable effect on poverty in a sample of households in rural Egypt. The

number of households in poverty declines by 9.8 percent, and the Sen poverty index falls by 12 percent, when per-capita incomes are calculated without including remittances. Adams and Page (2003) performed a cross-country analysis of international migration and poverty. They found that a 10-percent increase in international migration (the share of a country's population living abroad) was associated with a 1.9-percent decrease in the share of people living in poverty. In a study of 2400 municipalities, Lopez Cordova (2004) found that a higher prevalence of remittances (fraction of households receiving remittances) was correlated with lower poverty (using a headcount measure) in 2000.

To our knowledge, no study has attempted to explain variations in poverty effects of international and internal migrant remittances across space. The present research takes a step towards filling this lacuna by using household survey data from rural Mexico to estimate the effects of marginal changes in migrant remittances on poverty in regions with differing levels of migration prevalence. We do this with three variants of the Foster-Greer-Thorbecke poverty index.

II

Migration, Remittances, Inequality and Poverty in Rural Mexico

In the past decade rural Mexico has experienced a massive outflow of rural labor to Mexican urban centers and to the United States. Between 1990 and 2002, the share of Mexico's rural population working in the United States rose from 7% to 14%, and the

share at internal-migrant destinations rose from 11% to 15%; however, the share varies widely across regions (Mora and Taylor, 2004). This makes Mexico an ideal laboratory in which to examine impacts of migration and remittances in rural areas with different levels of integration with migrant labor markets.

To date, empirical research on economic impacts of migration in rural Mexico has been based on detailed surveys of small numbers of communities, at best. This, together with the tremendous heterogeneity that characterizes rural Mexico, has limited the extent to which findings from these studies can be generalized to the rural economy as a whole.

The present research uses new data 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 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.¹ The result is a sample that is representative of more than 80 percent of the population that the Mexican census office considers to be rural.

¹ The percentage of the population of Mexico that lives in hamlets of less than 500 people is no more than 20% in 2000, INEGI, Population Census 2000.

To implement the survey, Mexico was divided into five regions, reflecting INEGI's standard regionalization of the country: Center, South-Southeast, West-Center, Northwest, and Northeast. The survey was designed to be representative both nationally and regionally. Data from this survey make it possible to quantify migration and remittances at the household level, as well as to test for influences of these variables on household total income, on income inequality, and on poverty.

Table 1 summarizes migration from households in rural Mexico. Sixteen percent of all households in the sample had a family member living in the United States at the start of 2002, the year of the survey, and 26 percent had a family member living in another part of Mexico. Many households had more than one migrant. The number of U.S. migrants per household ranged from 0 to 9, while the number of internal migrants ranged from 0 to 10. The average household in the sample had 0.35 U.S. migrants and 0.71 internal migrants in 2002—or 1.06 migrants in total.

There are sharp differences in migration experience among the five rural regions of Mexico. The West-Central region traditionally has had the highest propensity to send migrants to the United States. It currently has the highest participation rates in international migration and the most international migration experience. Nearly 28% of all households in this region have at least one family member in the United States, and the average household has .62 U.S. migrants. By contrast, 7.5%% of households in the south-southwest have U.S. migrants, with an average of .10 U.S. migrants per household.

These inter-regional differences are the basis for comparing differences in the distributional and poverty effects of remittances at different levels of household involvement in migration.

Figure 1 illustrates differences in historical trends in international migration, respectively, at the village level across the five regions from 1980 to 2002. It was constructed from retrospective migration histories assembled for all family members in the ENHRUM sample, including sons and daughters who were not part of the household at the time of the survey. Villages with large concentrations of international migrants in 2002 have a history of increasing participation in migration throughout the 1980-2002 period. Only in rare cases did a village with a high concentration of migrants in 2002 begin to participate in migration late in the period. We use 2002 concentrations of migrants as a proxy for migration histories in our analysis of distributional and poverty effects of migrant remittances, presented below.

Remittances and Income in Rural Mexico

Detailed data on household-farm production, wage work, and migration make it possible to estimate total income for each household in the ENHRUM sample. Total income is the sum of income from six sources: family production (crop, livestock, nonagricultural, commerce, service, natural resource extraction); agricultural wage labor; nonagricultural wage labor; internal migrant remittances; international migrant

remittances; and public transfers. This list of incomes is exhaustive; the sum of income from the six sources equals household total net income.

There are various methods to arrive at estimates of net income from rural household production activities. We did not try to impute values of family inputs like labor, land and capital, because it is not obvious what prices should be used to do this. Net income from household production activities was estimated as the gross value of production (using observed local prices) minus purchased inputs. This method yielded net incomes from crop production that were very low or negative in some cases, especially for staples and small animals. Subtracting imputed values of family inputs (e.g., family labor at local wages) from these net income figures would yield mostly negative net staple and livestock incomes. Gross income from livestock production was estimated as the change in value of standing herds between the end and start of the survey year, plus (a) sales of animals and animal products; (b) home consumption of home-produced animals and animal products minus (c) livestock purchases and (d) livestock input costs (feed, medicines, and other costs). Incomes from all other household production activities were estimated in a manner analogous to net crop income (as gross value of production minus purchased input costs). Salary and wage income was summed across all household members and jobs. Migrant remittances were summed across all remitters and, in the case of dollar-denominated remittances from the United States, transformed to pesos using the prevailing average 2002 exchange rate of 10 pesos per U.S. dollar.

Table 2 summarizes rural households' total net income and remittances from internal and international migrants, nationally and by region. Average household total income for the whole sample in 2002 was 53,465 pesos (U.S. \$5,346). This comes out to an average per-capita income of approximately U.S. \$1,372 per year. The composition of incomes reported in the table reveals a significant role for migrant remittances in rural Mexico: 13 percent of household total income and 16 percent of per-capita income comes from migrant remittances (mostly from the United States).

Migrant remittances are not equally distributed across regions (Table 2). The percentage of household income from international migrant remittances ranged from 3.6 in the Northwest to 20.1 in the Northeast. The percentage from internal migrant remittances ranged from 0.54 to 3.7 percent.

The numbers in Tables 1 and 2 reveal that migrant remittances potentially have significant impacts on rural income inequality and poverty, but these impacts are not likely to be uniform across regions with vastly different prevalence and histories of migration.

Income Source Gini Decomposition

To explore the impacts of remittances on rural income inequality, it is first necessary to select an inequality index. Various indices exist. Following Ray (1998), an inequality index should have 5 basic properties: (1) adherence to the Pigou-Dalton

transfer principle; (2) symmetry; (3) independence of scale; (4) homogeneity with respect to population; and (5) decomposability.

The Pigou-Dalton principle maintains that inequality, as measured by the index, should increase when income is transferred from a low-income household to a high-income household. An index displays symmetry if the measured level of inequality does not change when individuals trade positions in the income distribution—that is, the identity of individuals or households is irrelevant.

Independence of income scale means that a proportional change in all incomes does not alter inequality. Homogeneity means that a change in the size of the population will not affect measured inequality. Finally, in order to explore influences of specific income sources on inequality, the index needs to be decomposable with respect to income sources. (Ray also refers to decomposability by population subgroup; however, this is not our interest in this study.)

The inequality measures that satisfy these 5 requirements include the coefficient of variation, Theil's entropy index (T), Theil's second measure of inequality (L), and the Gini coefficient (G). The two Theil measures can be disaggregated by population subgroup but not by income source. The Gini coefficient is probably the most intuitive measure of inequality, with its neat correspondence to the Lorenz curve and easy-to-interpret decompositions of remittance effects. This is the measure we use in the present study.

Following Lerman and Yitzhaki (1985), the Gini coefficient for total income inequality, G , can be represented as:

$$G = \sum_{k=1}^K R_k G_k S_k \quad (1)$$

where S_k represents the share of component k in total income, G_k is the source Gini, corresponding to the distribution of income from source k , and R_k is the Gini correlation of income from source k with the distribution of total income.²

Equation (1) permits us to decompose the influence of any income component, in our case remittances, upon total income inequality, as the product of three easily interpreted terms:

- a) how important the income source is with respect to total income (S_k)
- b) how equally or unequally distributed the income source is (G_k)
- c) whether or not the income source is correlated with total income (R_k).

For example, if remittances represent a large share of total income, they may potentially have a large impact on inequality. (If their share in total income is nil, so must be their contribution to inequality.) However, if they are perfectly equally distributed ($G_k = 0$),

² The properties of R_k are the following:

- a) $-1 \leq R_k \leq 1$. R_k equals zero if y_k and Y are independent, and it equals 1(-1) if y_k is an increasing (decreasing) function of total income.
- b) If y_k and Y are normally distributed, then R_k is equal to the Pearson correlation coefficient.

they cannot influence inequality even if their magnitude is large. If remittances are large and unequally distributed (S_k and G_k are large), they may either increase or decrease inequality, depending upon which households, at which points in the income distribution, receive them. If remittances are unequally distributed and flow disproportionately towards households at the top of the income distribution (R_k is positive and large), their contribution to inequality will be positive. However, if they are unequally distributed but target poor households, remittances may have an equalizing effect on the rural income distribution, and the Gini index may be lower with than without remittances.

Using the Gini decomposition, we can estimate the effect of small changes in remittances on inequality, holding income from all other sources constant (Stark, Taylor and Yitzhaki, 1986). Consider a small percentage change in income from source j (remittances) equal to π , such that $y_j(\pi) = (1 + \pi)y_j$. Then

$$\frac{\partial G / \partial \pi}{G} = \frac{S_j R_j G_j}{G} - S_j \quad (2)$$

where S_j , G_j and R_j denote the source- j income share, source Gini, and Gini correlation, and G denotes the Gini index of total income inequality prior to the remittance change. The percentage change in inequality resulting from a small percentage change in remittances equals the initial share of remittances in inequality minus the share of remittances in total income. One can easily see that, as long as remittances are an important component of rural incomes,

- 1) If the Gini correlation of remittances and total income, R_j , is negative or zero, an increase in remittances necessarily reduces inequality, but

- 2) If the Gini correlation is positive, the distributional impact of remittances depends on the sign of $R_j G_j - G$. A necessary condition for inequality to increase with remittances is that the source Gini for remittances exceed the Gini for household total income, that is, $G_j > G$. This follows from the property that $R_j \leq 1$.

Poverty Decomposition

A modification of the Foster-Greer-Thorbecke (1984) poverty index was used to analyze the poverty implications of remittances. We have found no such poverty decomposition in the literature for Mexico. Huppi and Ravallion (1991) perform an income-source poverty decomposition for Indonesia. More commonly one finds in recent literature that sectoral decompositions of poverty are proxied by undertaking a standard poverty decomposition for groups defined by primary sectoral source of income, or other characteristics such as household size, group or location.³ This proxy method is difficult to justify where a typical farm household's income is diversified across a variety of activities, as is clearly the case in rural Mexico.

³ For example, Baliaskan (1993) did such a study for the Philippines; Gusstafsson and Makonnen (1993) explored principal income sources' effects on poverty incidence in Lesotho; Boateng et al. (1992) decomposed by location and group for Ghana; Kanbur (1990) decomposed poverty incidence by degree of income diversification, region and group and Kakwani (1993) by region and household characteristics in Cote d'Ivoire.

Following the notation of Foster, Greer, and Thorbecke (FGT) (1984), let $Y_d = (Y_{d1}, Y_{d2}, \dots, Y_{dn})$ represent household incomes in increasing order and let $z > 0$ denote the predetermined poverty line. The FGT poverty measure is defined by:

$$P(Y_d; z) = \frac{1}{nz^\alpha} \sum_{i=1}^q g_i^\alpha \quad (3)$$

where n is the total number of households, $q = q(Y_d; z)$ is the number of poor households, and $g_i = z - Y_{di}$ is the income shortfall (the gap between the household's income and the poverty line) of the i th (poor) household, and α is a parameter. This index satisfies the two axioms formulated by Sen (1976, 1979) for poverty measures to satisfy: (1) that a reduction in the income of a poor household, *ceteris paribus*, increases the poverty measure (monotonicity); and (2) that a pure transfer of income away from a poor household increases the poverty measure (the transfer axiom).

FGT present a decomposition of this poverty measure by population subgroup, and Reardon and Taylor (1996) decompose the FGT poverty coefficient by income source. To decompose $P(Y_d; z)$ by determinants of income, we substitute the sum of income across sources for Y_{di} in the FGT poverty index. This yields

$$P(Y_d; z) = \frac{1}{nz^\alpha} \sum_{i=1}^q \left(z - \sum_{k=1}^K y_k \right)^\alpha$$

The impact of a small percentage change in remittances, e , on poverty, $dP(Y_d; z)/de$, is given by

$$\frac{dP(Y_d, e; z)}{de} = \frac{1}{nz^\alpha} \left[\sum_{i=1}^{q_0} -\alpha g_i(e) - \sum_{q^-} g_i(e)^\alpha + \sum_{q^+} g_i(e)^\alpha \right]$$

where q^* denotes the number of households in poverty both before and after the change in remittances, and q^- (q^+) denotes the number of households that leave (enter) poverty as a result of the remittance change. Assuming remittances have a positive effect on income (that is, there are not household-to-migrant remittances that outweigh migrant-to-household transfers), the third term, $\sum_{q^+} g_i(e)^\alpha$, drops out, and the poverty effect is negative (i.e., poverty decreases), or at least not positive. The extent of this poverty effect must be determined empirically. It hinges on whether or not poor households have access to remittance income.

Three variants of the FGT poverty index are used to estimate the impacts of changes in remittances on rural poverty:

- The headcount measure ($\alpha=0$, $P_H(Y_d; z) = \frac{q}{n}$) measures the incidence of poverty, i.e., the share of the population living below the poverty line.
- The poverty gap ($\alpha=1$, $P_G(Y_d; z) = \frac{1}{nz} \sum_{i=1}^q (z - Y_{di})$) measures the depth of poverty, that is, how far below the poverty line the average poor household's income falls.
- The squared poverty gap ($\alpha=2$, $P_{SG}(Y_d; z) = \frac{1}{nz^2} \sum_{i=1}^q (z - Y_{di})^2$), measures the severity of poverty and is sensitive to changes in the distribution of income among the poor (Adams, 2003).

All Gini and poverty index decompositions presented below are for per-capita household income, in order to take into account differences in household size across regions and among households with access to different income sources.

III

Empirical Results

Income-Source Inequality Decompositions

Table 3 summarizes the contributions of income sources to per capita total income and income inequality in rural Mexico in 2002. Column 1 presents income-source shares. Migrant remittances represented 16 percent of average per-capita rural income in 2002. The vast majority of this remittance income (87 percent) came from migrants in the United States. Wages were the largest income source, accounting for more than 50 percent. Of this, most (80 percent) was from non-agricultural employment. Family production activities accounted for just under 29 percent of rural per-capita income, and government transfers represented 4.5 percent.

Migrant remittances are unequally distributed across rural households (Column 2). The source Ginis for international and internal remittances are similar: 0.95 and 0.96, respectively.⁴

As indicated earlier, a high source Gini (G_k) does not imply that an income source has an unequalizing effect on total-income inequality. An income source may be unequally distributed yet favor the poor. This is the case for internal migrant remittances. The Gini correlation between internal remittances and the distribution of total per-capita

⁴ These source Ginis are high in part because they include zero remittances for some households.

income (R_k) is only 0.36, comparable to that of agricultural wages. Because of the low Gini correlation between internal-migrant remittances and total-income rankings, the percentage contribution of internal remittances to inequality (1.1 percent) is smaller than the percentage contribution to income (2.0 percent). Thus, internal remittances have a slight equalizing effect on the distribution of total rural income. A 10% increase in internal remittances, other things being equal, reduces the Gini coefficient of total income by 0.1 percent.

The Gini correlation between international migrant remittances and total income rankings is much higher ($R=0.78$). Because of this, international remittances have an unequalizing effect on rural incomes; a 10-percent increase in remittances from migrants abroad increases the Gini coefficient by 0.3 percent.

Government transfers are unequally distributed ($G_k = 0.79$). However, the Gini correlation between transfers and total income is low ($R_k = 0.29$), indicating that transfers favor the poor more than any other income source. Other things being equal, a 10-percent increase in government transfers is associated with a 0.3-percent decrease in the Gini coefficient of total income. In rural Mexico, these transfers include decoupled income payments to basic grain producers, under the PROCAMPO program, as well as needs-based transfers under PROGRESA.⁵ Agricultural wages are the largest income

⁵ PROCAMPO was instituted in the context of a phase-out of price guarantees to basic grain producers. It represented a shift from price based support measures to direct income payments. PROGRESA provides payments to poor rural households, linked to enrollment of children in schools and local clinics.

equalizers in rural Mexico, while income from family production activities has the largest positive effect on inequality.

Both the importance and the distributional impact of migrant remittances and other income sources differ across regions. In West-Central Mexico (Table 4a), which has the highest prevalence of international migration, remittances from international migrants have an *equalizing* effect on rural incomes, equivalent to that of government transfers. There, a 10-percent increase in foreign remittances decreases the total-income Gini by 0.3 percent. In this region, international migrant remittances represent nearly 16 percent of per-capita total income. The source Gini for international migrant remittances (0.87) is lower and the Gini correlation (0.50) is much lower in the west-central region than in rural Mexico as a whole. By contrast, in the lowest migration region of southeastern Mexico, international migrant remittances constitute 6 percent of per-capita total income, and both the source Gini and the Gini correlation for this income source are high (0.98 and 0.87, respectively). Marginal changes in international remittances increase inequality in this region. In both regions, family production and non-agricultural wages have the most unequalizing effects on the rural income distribution, and agricultural wages are income equalizers.

Table 5 summarizes the estimated effects of 10-percent increases in international and internal migrant remittances and the percentages of households with migrants in each of the 5 census regions. Figures 2a-b illustrate the relationship between these two variables. Figure 2a is suggestive of an inverted-U-shaped relationship between

migration and the distributional effect of remittances, in the case of international migration. The Gini elasticity of foreign remittances is positive and highest in the region in which just over 14 percent of households have family migrants abroad (the Center), it is lower in the region in which 20 percent of households have international migrants (the Northeast), and it is negative in the region in which 28 percent of households participate in international migration (West-Center). Bootstrapping was used to construct 95% confidence intervals around these elasticity estimates using the ‘percentile method’.⁶

The elasticity of internal migrant remittances is close to zero in all five regions (Figure 2b), despite shares of households with internal migrants that range from 12 to 35 percent. Rural income inequality is much less sensitive to given percentage changes in internal remittances than to changes in international remittances. This is due both to the low (Gini) correlation between internal remittances and the distribution of total income and the small share of internal remittances in total income of rural households.⁷

⁶ See Chernick (1999) for a discussion of the percentile method and other methods to obtain confidence intervals using the bootstrap.

⁷ In two cases presented in Tables 3 and 4a income-source Gini coefficients are equal to 1.0 (both of these are for family production). This does not imply perfect income inequality, but rather, reflects the presence of some negative income values. Income-source Gini coefficients greater than 1.0 have been reported elsewhere in the literature (e.g., see Lerman and Yitzhaki, 1985). The Gini coefficient is a measure of dispersion, similar to a coefficient of variation. It is equal to the expected difference between two randomly drawn observations divided by the mean. One can view the mean as the expected difference between each observation and zero. If all observations are positive, zero is outside the range of observations, so the ratio is lower than one. However, if some observations are negative, zero is not outside the range of the group, and the ratio depends on the location of zero in the range. Wodon and Yitzhaki (2002, p. 79) argue that the ability to handle negative incomes is an advantage of the Gini coefficient over Atkinson's index.

Effects of Migrant Remittances on Poverty

A poverty line, z , is required in order to estimate the effects of changes in migrant remittances on poverty. The poverty line we use is the per-capita income required to purchase a basic basket of food and nonfood items in rural areas. It was estimated by the Mexican government (SEDESOL) at 28.1 pesos per day, including 15.4 pesos for food, 3.5 for basic health and education, and 9.8 for clothing, shelter, utilities, and transportation.⁸ Impoverished individuals are those who were living in households in which the per-capita income per day was less than 28.1 pesos. Table 6 reports the share of the population living below the poverty line in each region and in all of rural Mexico in 2002. Overall, 58 percent of rural Mexicans live in households with per-capita incomes below the poverty line. The incidence of poverty ranges from 35 percent in the Northwest region to 81 percent in the South-Southwest.

To estimate the effect of migrant remittances on poverty, we first calculated the three variants of the FGT poverty measure, using Equation 3 with $\alpha = 0, 1$ and 2 . We then decreased each of the two types of remittances, in turn, by 10 percent. Households that did not receive remittances were unaffected. The poverty effects of changes in remittances depend upon the extent to which remittances flow to poor (and, depending on the measure, very poor) households.

⁸ See http://www.sedesol.gob.mx/subsecretarias/prospectiva/medicion_pobreza

Results of the poverty experiments are reported in Table 7. Overall, poverty decreases when migrant remittances go up. Nationally, the rural poverty effect is substantially greater for international remittances than for remittances from internal migrants using all three poverty measures. For example, the FGT index with $\alpha=2$ decreases by 0.53 percent as a result of a 10-percent increase in international remittances, compared with 0.30 percent for internal remittances. The headcount measure decreases by .39 percentage points when internal remittances increase, but by 0.77 percent in response to a rise in remittances from abroad.

Poverty elasticities of remittances from migrants abroad vary sharply across regions. The sensitivity of poverty to international remittances is greatest in the high migration, West-Center region, and it is smallest in the low migration, South-Southwest region. Other things being equal, a 10-percent increase in international remittances reduces poverty by 1.64 percent in the West-Center (according to the FGT index with $\alpha=2$), compared with only 0.11 percent in the South-Southwest. Based on the headcount measure, poverty decreases by 1.68 percent in the West-Center, but there is no change in poverty in the South-Southwest. The poverty gap measures reveal a similar pattern of greater sensitivity of poverty to remittances in regions in which a large percentage of households have international migrants. This is illustrated in Figure 3. The relationship between poverty impacts of remittances (for $\alpha=2$) and the extent of household participation in international migration is monotonically negative, and it is more pronounced than the relationship between remittance impacts on inequality and migration prevalence reported in Figure 2. As for the case of inequality, bootstrapped confidence intervals were calculated for the poverty elasticities.

These findings suggest that the ameliorative effect of international remittances on rural poverty increases with the prevalence of migration. They would appear to represent a poverty corollary to the argument advanced by Stark, Taylor and Yitzhaki (1986), illustrated in Figure 2, that the distributional effects of migration become more equal as increasing numbers of households gain access to foreign labor markets. In theory, the relationship between poverty elasticities and the prevalence of migration is no more obvious than the relationship between migration and inequality. It depends on the extent to which poor households gain access to migrant labor markets over time, which is an empirical question. It appears that, in the case of international migration, the expansion of migration networks plays a critical role in shaping the impact of remittances on rural poverty.

IV

Conclusions

Our findings using nationally and regionally representative data from Mexico indicate that remittances from migrants abroad slightly increase rural income inequalities, while remittances from internal migrants are income equalizers. However, both types of remittances have an equalizing effect on incomes in high-migration areas. Our findings reinforce the argument advanced in Stark, Taylor and Yitzhaki (1986) that expansion of migration has an initially unequalizing effect on the rural income distribution, but the

diffusion of access to migration eventually makes the effect of remittances on rural incomes more equitable (or at least, less inequitable). This may explain inconsistencies in the estimated effects of remittances on income inequalities from existing studies, using data from economies with different levels of integration with migrant labor markets.

Despite their positive effect on inequality, international migrant remittances reduce rural poverty, by a greater amount than internal remittances. The ameliorative effect of remittances on poverty increases as economies become more integrated with migrant labor markets, as reflected in migration prevalence. To our knowledge, there is no precedent in the literature to this finding, which holds in rural Mexico regardless of whether the migration is to internal or foreign destinations.

These findings have a number of policy implications. Policies that restrict migration increase poverty, especially in regions where the prevalence of household participation in migration is high. On the other hand, measures that promote remittances or that enhance remittance multipliers on incomes in migrant-sending households can be an effective poverty-reduction tool. The impacts of these measures on poverty and inequality would appear to be most favorable in the highest migration regions.

Table 1. Migration Summary Statistics for Rural Mexico, by Region

Region	Variable	Percentages	Sample Mean	Standard Deviation	Minimum	Maximum
South-South East	Households with US migrants (%)	7.53%	-	0.26	-	-
	US Migrants per Household		0.10	0.42	0	3
	Households with Internal migrants (%)	34.95%	-	0.48	-	-
	Internal Migrants per Household		0.89	1.61	0	8
	Household Sample Size		372			
Center	Households with US migrants (%)	14.52%	-	0.35	-	-
	US Migrants per Household		0.27	0.89	0	8
	Households with Internal migrants (%)	29.32%	-	0.46	-	-
	Internal Migrants per Household		0.70	1.48	0	8
	Household Sample Size		365			
Center-West	Households with US migrants (%)	27.75%	-	0.45	-	-
	US Migrants per Household		0.62	1.29	0	7
	Households with Internal migrants (%)	30.06%	-	0.46	-	-
	Internal Migrants per Household		1.02	1.99	0	10
	Household Sample Size		346			
Northwest	Households with US migrants (%)	12.09%	-	0.33	-	-
	US Migrants per Household		0.23	0.79	0	9
	Households with Internal migrants (%)	22.42%	-	0.42	-	-
	Internal Migrants per Household		0.72	1.71	0	8
	Household Sample Size		339			
Northeast	Households with US migrants (%)	19.72%	-	0.40	-	-
	US Migrants per Household		0.54	1.43	0	9
	Households with Internal migrants	11.67%	-	0.32	-	-

	(%)					
	Internal Migrants per Household		0.23	0.80	0	8
	Household Sample Size		360			
Total	Households with US migrants (%)	16.22%	-	0.37	-	-
	US Migrants per Household		0.35	1.04	0	9
	Households with Internal migrants (%)	25.76%	-	0.44	-	-
	Internal Migrants per Household		0.71	1.58	0	10
	Household Sample Size		1782			

Source: ENHRUM, 2003

Table 2. Rural Mexico Household Income and Remittances, 2002

	South-South east	Center	West-Center	Northwest	Northeast	TOTAL
Total Net Income (average per household)						
Pesos	27,400	48,285	52,353	87,841	54,351	53,465
U.S. Dollars	2,740	4,828	5,235	8,784	5,435	5,347
Migrant Remittances as % of Total Income	10.37%	16.25%	14.79%	4.85%	20.69%	12.69%
Internal	3.66%	3.26%	1.04%	1.20%	0.54%	1.68%
International	6.71%	12.99%	13.75%	3.64%	20.15%	11.01%

Sample size: 1,782

Source: ENHRUM,2003

Table 3. Gini Decomposition by Income Source: Mexico National Sample

Income Source	(1) Share in Total Income (S)	(2) Income Source Gini (G)	(3) Gini Correlation with Total Income Rankings (R)	(4) Share in Total- Income Inequality	(5) % Change in Gini from a 10% Change in Income Source
Government Transfers	.045	0.79	0.29	.017	-0.280 (-0.323, -0.237)
U.S. Remittances	.140	0.95	0.78	.169	0.281 (0.079, 0.532)
Internal Remittances	.020	0.96	0.36	.011	-0.089 (-0.118, -0.062)
Family production	.288	1.00	0.75	.350	0.630 (0.299, 0.925)
Agriculture wages	.117	0.82	0.37	.057	-0.601 (-0.675, -0.528)
Non-agriculture wages	.390	0.80	0.78	.396	0.061 (-0.178, 0.337)
Total Income	1.000	0.61	1.00	1.000	

Source: Estimates from Mexico National Rural Household Survey, 2003.

N = 1782 households. All incomes are per-capita.

Bootstrapped percentile confidence intervals in parentheses.

Table 4a. Gini Decomposition by Income Source: High Migration (West-Center) Region

Income Source	(1) Share in Total Income (S)	(2) Income Source Gini (G)	(3) Gini Correlation with Total Income Rankings (R)	(4) Share in Total- Income Inequality	(5) % Change in Gini from a 10% Change in Income Source
Government					
Transfers	0.047	0.84	0.25	0.019	-0.279
U.S. Remittances	0.159	0.87	0.50	0.133	-0.263
Internal					
Remittances	0.009	0.98	0.42	0.007	-0.019
Family					
production	0.231	1.00	0.72	0.320	0.880
Agriculture wages	0.110	0.83	0.20	0.035	-0.746
Non-agriculture					
wages	0.445	0.75	0.76	0.487	0.428
Total Income	1.000	0.52	1.00	1.000	

Source: Estimates from Mexico National Rural Household Survey, 2003.
N = 346 households. All incomes are per-capita.

Table 4b. Gini Decomposition by Income Source: Low Migration (South-Southeast) Region

Income Source	(1) Share in Total Income (S)	(2) Income Source Gini (G)	(3) Gini Correlation with Total Income Rankings (R)	(4) Share in Total- Income Inequality	(5) % Change in Gini from a 10% Change in Income Source
Government					
Transfers	0.083	0.60	0.19	0.015	-0.674
U.S. Remittances	0.064	0.98	0.87	0.086	0.224
Internal					
Remittances	0.038	0.93	0.42	0.024	-0.145
Family					
production	0.438	0.92	0.86	0.550	1.092
Agriculture wages	0.126	0.77	0.42	0.064	-0.610
Non-agriculture					
wages	0.252	0.86	0.77	0.265	0.114
Total Income	1.000	0.63	1.00	1.000	

Source: Estimates from Mexico National Rural Household Survey, 2003.
N = 372 households. All incomes are per-capita.

Table 5. Inter-regional Comparison of Marginal Effects of Migrant Remittances on Inequality of Per-capita Total Income (Gini Elasticities)

Region	International Migration		Internal Migration	
	Percentage of Households with Migrants	Effect of 10% Increase in Remittances on Gini of Total Per-capita Income	Percentage of Households with Migrants	Effect of 10% Increase in Remittances on Gini of Total Per-capita Income
South-Southeast	7.530	0.224	34.950	-0.145
Northwest	12.090	-0.114	22.420	-0.044
Center	14.520	0.784	29.320	-0.170
Northeast	19.720	.0576	11.670	-0.018
West-Center	27.750	-0.263	30.060	-0.019
All Regions	16.220	0.281	25.760	-0.089

Table 6. Incidence of Rural Poverty, National and by Region in 2002 using the Headcount Measure

Region	Percentage of Rural Population in Impoverished Households Using Poverty Line Constructed from Cost of Basic Basket of...		
	Food	Food, Basic Health, and Education	Food, Basic Health, Education, Clothing, Shelter, Utilities and Transportation
South-Southeast	0.62	0.69	0.81
Center	0.36	0.45	0.63
West-Center	0.30	0.36	0.52
Northwest	0.20	0.25	0.35
Northeast	0.38	0.43	0.58
All Regions	0.38	0.44	0.58

Table 7. Rural Poverty Impacts of a 10% Increase in Migrant Remittances

Region	International Migrants				Internal Migrants			
	% of Households with Migrants	% Change in Poverty Resulting from a 10% Increase in Remittances Using FGT Index			% of Households with Migrants	% Change in Poverty Resulting from a 10% Increase in Remittances Using FGT Index		
		$\alpha=0$ (Headcount)	$\alpha=1$ (Poverty Gap)	$\alpha=2$ (Squared Poverty Gap)		$\alpha=0$ (Headcount)	$\alpha=1$ (Poverty Gap)	$\alpha=2$ (Squared Poverty Gap)
South-Southeast	7.53	0.00%	-0.11%	-0.11%	34.95	-0.33%	-0.41%	-0.45%
Northwest	12.09	-0.85%	-0.30%	-0.31%	11.67	0.00%	-0.16%	-0.13%
Center	14.52	-1.30%	-0.35%	-0.33%	22.42	-0.87%	-0.61%	-0.67%
Northeast	19.72	-0.48%	-0.58%	-0.51%	11.67	-0.48%	-0.10%	-0.08%
West-Center	27.75	-1.68%	-1.65%	-1.64%	30.06	0.00%	-0.05%	-0.05%
Rural Mexico	16.22	-0.77%	-0.53%	-0.53%	25.76	-0.39%	-0.30%	-0.30%

Figure 1. Trends in International Migration, By Village and Region of Rural Mexico, 1980-2002

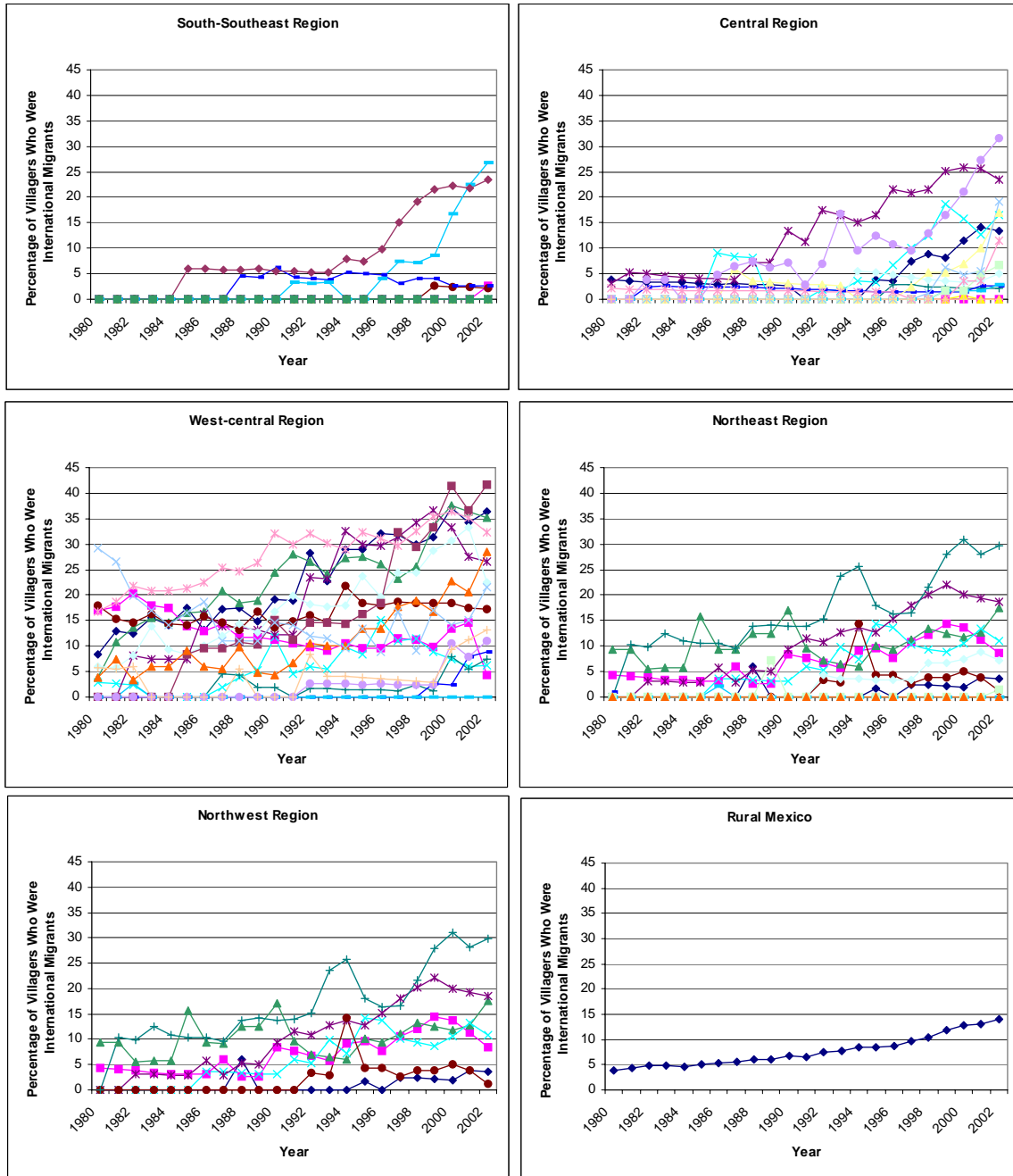
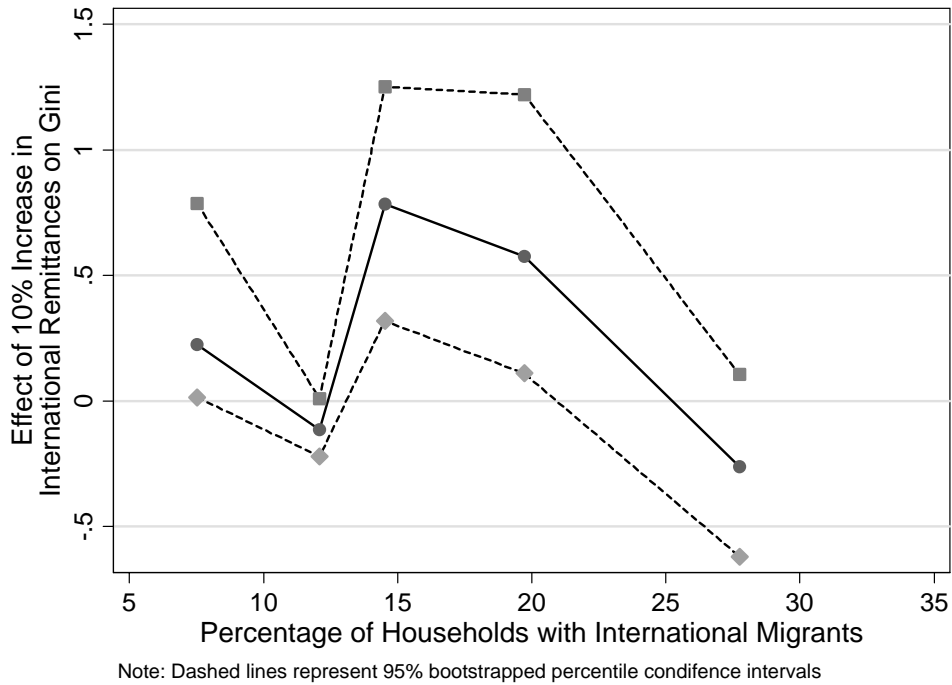


Figure 2. Relationship Between Regional Percentages of Households with Migrants and Effect on Gini of a 10% Increase in Remittances, by Migrant Destination

(a) International Migration



(b) Internal Migration

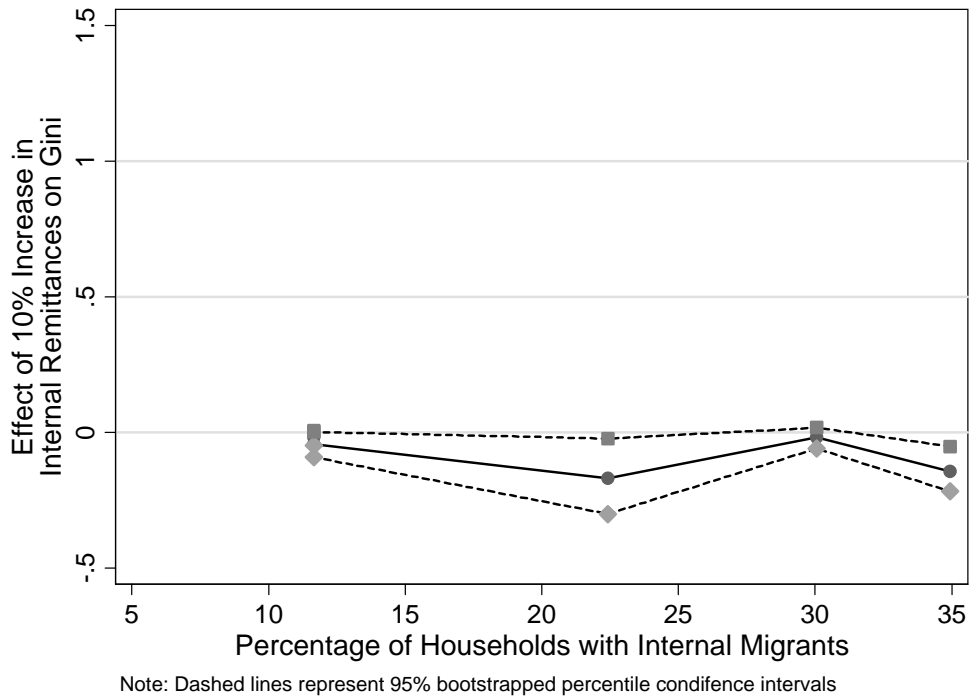
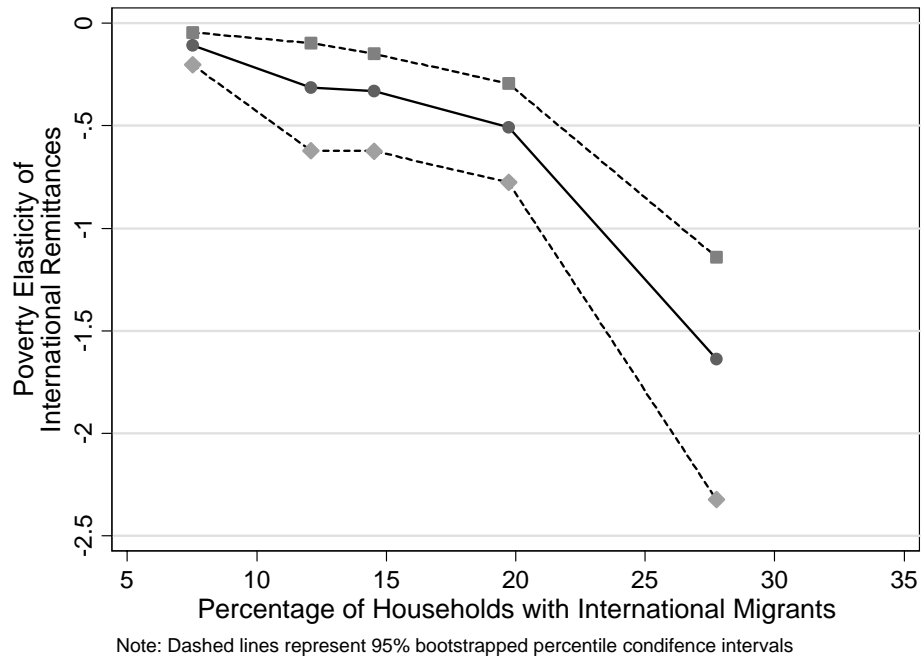
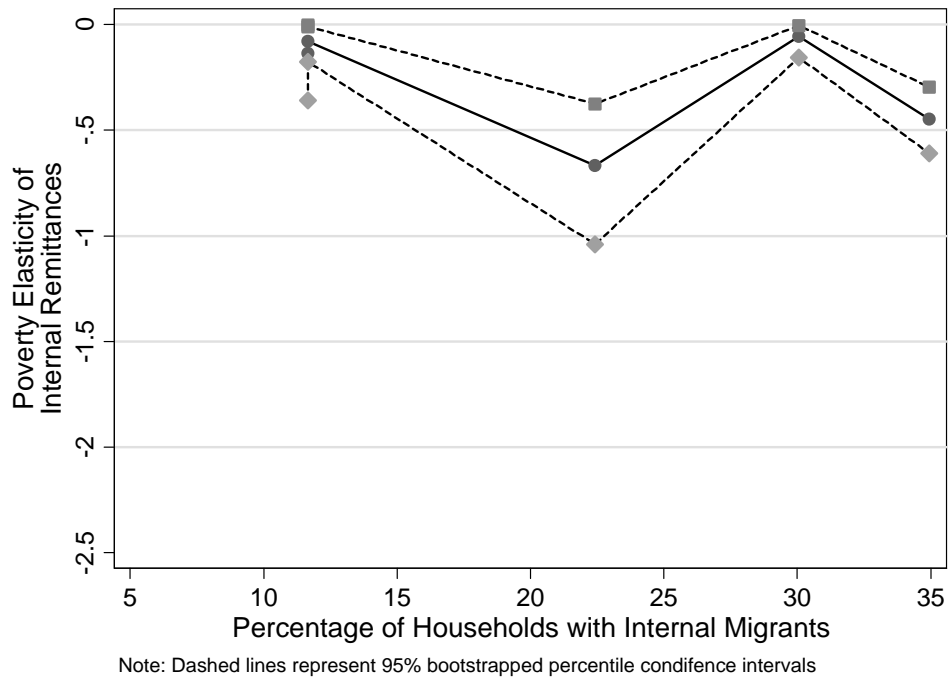


Figure 3. Relationship Between Poverty Elasticity of Migrant Remittances and Regional Percentage of Households with International Migrants (FGT Index, $\alpha=2$)

(a) International Migration



(b) Internal Migration



REFERENCES

- Adams, Jr., Richard H., 2004. Remittances and Poverty in Guatemala. World Bank Policy Research Working Paper 3418, September.
- _____, 1989, Worker Remittances and Inequality in Rural Egypt, Economic Development and Cultural Change 38:45-71.
- _____, 1986, The Effects of International Remittances on Poverty, Inequality and Development in Rural Egypt. IFPRI Research Report 86.
- _____, 1991, The Economic Uses and Impact of International Remittances in Rural Egypt, Economic Development and Cultural Change 39:695-722.
- Adams, R.H. and H. Alderman, 1992, Sources of Inequality in Rural Pakistan: A Decomposition Analysis, Oxford Bulletin of Economics and Statistics 54(4):591-608.
- Adams, R.H. and J. Page. 2003. International Migration, Remittances, and Poverty in Developing Countries. World Bank Policy Research Working Paper 3179, December.
- Barham, Bradford and Stephen Boucher, 1998, Migration, Remittances, and Inequality: Estimating the Net Effects of Migration on Income Distribution, Journal of Development Economics 55(2):307-331, April.
- Chernick, M. 1999. Bootstrap Methods: A Practitioner's Guide .Wiley-Interscience.
- Foster, J., J. Greer and E. Thorbecke, "A Class of Decomposable Poverty Measures," Econometrica, Vol. 52, No. 3 (1984), pp. 761-766.
- Knowles, J.C. and R.B. Anker, 1981, Analysis of Income Transfers in a Developing Country: The Case of Kenya, Journal of Development Economics 8:205-26.
- Lewis, W. Arthur, 1954, Economic Development with Unlimited Supplies of Labour, Manchester School of Economic and Social Studies 22:139-91.
- Lerman, Robert and S. Yitzhaki: Income Inequality Effects by Income Source: A New Approach and Application to the U.S., Review of Economics and Statistics, 67, No.1, February 1985, 151-56.
- Lucas, Robert E.B., 1987, Emigration to South Africa's Mines, American Economic Review 77:313-30.
- Lucas, Robert E.B. and Oded Stark, 1985, Motivations to Remit: Evidence from Botswana, Journal of Political Economy 93:901-18. (Reprinted in Stark, 1991.)

Massey, Douglas S., Luin P. Goldring, and Jorge Durand, 1994, Continuities in Transnational Migration: An Analysis of 19 Mexican Communities, American Journal of Sociology 99:1492-1533.

Mora, Jorge and J. E. Taylor. 2004. Determinants of International Migration: Disentangling Individual, Household and Community Effects (Working Paper).

Oberai, A.S. and H.K.M. Singh, 1980, Migration, Remittances and Rural Development: Findings of a Case Study in the Indian Punjab, International Labor Review 119:229-41.

Portes, Alejandro and Rubén G. Rumbaut, 1990, Immigrant America: A Portrait (University of California Press, Berkeley and Los Angeles).

Rozelle, Scott, Alan deBrauw and J.E. Taylor. 1999. "Migration, Remittances, and Agricultural Productivity in China." American Economic Review 89(2):287-291 (May, 1999).

Singh, I., L. Squire, and J. Strauss, 1986, An Overview of Agricultural Household Models-The Basic Model: Theory, Empirical Results, and Policy Conclusions, in Agricultural Household Models, Extensions, Applications and Policy, eds., I. Singh, L. Squire, and J. Strauss (The World Bank and the Johns Hopkins University Press, Baltimore), pp.17-47.

Stark, Oded and David Levhari, 1982, On Migration and Risk in LDCs, Economic Development and Cultural Change 31:191-96. (Reprinted in Stark, 1991.)

Stark, Oded, J. Edward Taylor, and Shlomo Yitzhaki, 1986, Remittances and Inequality, The Economic Journal 96:722-40. (Reprinted in Stark, 1991.)

_____, 1988, Migration, Remittances in Inequality: A Sensitivity Analysis Using the Extended Gini Index, Journal of Development Economics, 28:309-22. (Reprinted in Stark, 1991.)

Taylor, J. Edward, 1992, Remittances and Inequality Reconsidered: Direct, Indirect and Intertemporal Effects, Journal of Policy Modeling 14:187-208.

_____, Alan de Brauw and Scott Rozelle. 2003. "Migration and Incomes in Source Communities: A New Economics of Migration Perspective from China." Economic Development and Cultural Change 52(1):75:102 (October 2003).

Taylor, J. Edward and T.J. Wyatt, 1996, The Shadow Value of Migrant Remittances, Income and Inequality in a Household-farm Economy, Journal of Development Studies 32 (6):899-912.

Wodon, Q. and S. Yitzhaki. 2002. Inequality and Social Welfare, in J. Klugman, ed., Poverty Reduction Strategy Papers Sourcebook. Washington, DC: The World Bank.