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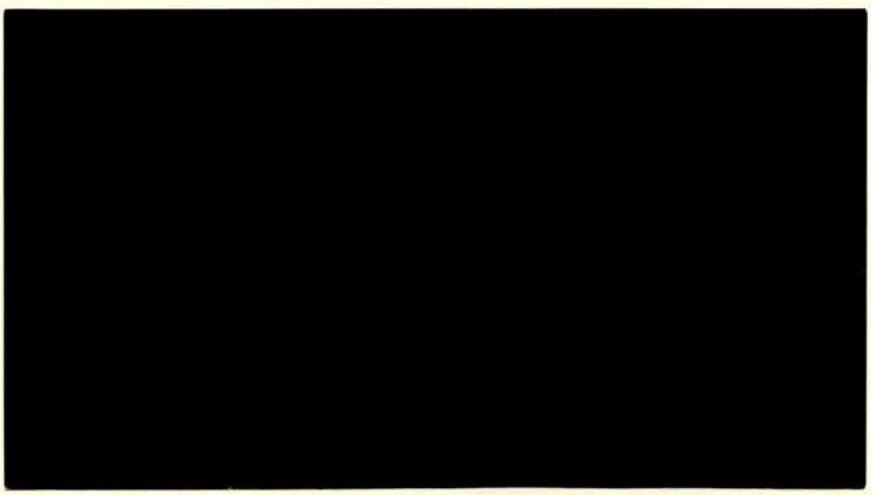

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REMITTANCES AND INEQUALITY RECONSIDERED; DIRECT, INDIRECT, AND INTERTEMPORAL EFFECTS

by
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Remittances and Inequality Reconsidered: Direct, Indirect, and Intertemporal Effects

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Remittances and Inequality Reconsidered: Direct, Indirect, and Intertemporal Effects

The impact of migrant remittances on the size distribution of income in LDC rural areas has received growing attention in the economics literature because of the importance of migration income in rural household budgets, the contribution of rural income inequalities to overall income inequality, concerns for rural poverty, and investment and consumption linkages. Gini decompositions (Stark, Taylor, and Yitzhaki, 1986 and 1988; Adams, 1991) and comparisons of Gini coefficients with and without migrant remittances (Oberai and Singh, 1980; Knowles and Anker, 1981) produce conflicting findings with regard to the direct short-run impact of remittances on income inequality in different LDC rural settings.

There are theoretical reasons to suspect that the direct impacts of migrant remittances do not capture the full short-run impact of remittances on income inequality. Income from labor migrants may contribute to household-farms' total income not only directly but also indirectly, by influencing income from other sources (i.e., crop income). In the long run, remittances may finance the accumulation of income-producing assets on household farms. By influencing the distribution of these assets, remittances may help reshape the distribution of total household-farm income over time.

Non-unitary short-run impacts of migrant remittances on household-farm full incomes are ruled out by the neoclassical household-farm model (e.g., see Singh, Squire, and Strauss, 1986), which disregards risk and assumes that rural markets (including credit markets) are complete and well-functioning.[1] Under these assumptions, the household-farm model is recursive: production decisions are independent of the household-farm budget constraint and of other sources of

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[1]Bardhan (1988) offers a critique of these assumptions of neoclassical household-farm models.

household-farm income. Migrant remittances increase the utility of the household-farm by loosening the budget constraint by the amount of the remittances (net of migration costs and household-to-migrant transfers), which in turn leads to increases in consumption of normal goods, including possibly leisure. Hired labor may be used as a substitute for family labor to make room for increases in family leisure. But unless relative prices change, migrant remittances do not influence other household-farm income activities (for example, cropping) in this model. The effect of remittances on the rural income distribution, as measured by a Gini coefficient, in this case depends only on the share of remittances in total rural income, the distribution of remittances, and the correlation between remittances and household-farm total income rankings (Lerman and Yitzhaki, 1985; Stark, Taylor, and Yitzhaki, 1986 and 1988).

Recent theoretical and empirical evidence suggests that net remittances may not represent the full contribution of remittances to rural incomes because risk matters and rural insurance and credit markets often are missing or imperfect (Stark, 1982). By extension, the remittance share, distribution and correlation with total income rankings may not capture the full impact of remittances on the rural income distribution. The presence of an income source that influences overall household-farm income risk may influence production decisions on risk-averse household farms. Even in an expected-income model of household-farm production, migrant remittances may influence (nonmigration) farm income if imperfections in local credit or labor markets exist. For example, in the absence of perfect credit markets, liquidity constraints may limit the use of hired labor or output-enhancing modern inputs on the farm at planting time. Migrant remittances which loosen the household-farm budget constraint may encourage the use of such inputs and thus may be associated with higher crop incomes. The marginal impact of remittances on household-farm incomes thus may be greater

than unitary. By contrast, if leisure is a normal good and local labor markets cannot provide perfect substitutes for family labor on the farm (especially for the management expertise of the household-farm head), then migrant remittances may be associated with a decline in non-remittance farm incomes (as family demand for leisure increases), and the marginal income effect of remittances may be less than unitary. The short-run influence of remittances on farm incomes is ambiguous theoretically. However, it potentially may alter the impact of remittances on the rural income distribution.

A positive long-run effect of migrant remittances on agricultural productivity is suggested by Lucas (1987). However, the effect of remittances on asset accumulation at the farm level and the resulting impacts on the distribution of household-farm incomes over time have not been explored quantitatively. These long-run asset-accumulation effects may comprise an important part of the overall effect of remittances on the income distribution. For example, Stark, Taylor, and Yitzhaki (1986) find evidence that initially unequalizing (direct) effects of remittances on the income distribution decrease at later stages of a village's migration history. This equalizing trend may be offset by an *unequalizing* trend in (nonremittance) farm income if remittances to "pioneer" migrant households are invested in income-producing farm assets.

This paper proposes a method to estimate direct and indirect short-run impacts of migration income on the size distribution of income as measured by a Gini coefficient, and it uses this method to test the effect of migrant remittances on household-farm income inequalities using new matched-longitudinal data from rural Mexico. It also explores the long-run distributional effect of remittances via the contribution of remittances to asset accumulation over time, using an intertemporal Gini decomposition. The empirical findings provide evidence that migrant remittances had a large direct effect on household-farm incomes, and small

changes in remittances had a small unequalizing direct effect on the household-farm income distribution in the most recent year for which data are available (1988), but a large unequalizing effect in the earlier year (1982). These findings offer longitudinal support for Stark, Taylor, and Yitzhaki's (1986 and 1988) hypothesis that the initially unequalizing effects of remittances are dampened or reversed over time as access to migrant labor markets becomes diffused across villages and household-farms.[2] The unequalizing effect of remittances in 1982 highlights the importance of intervillage income inequalities in determining the overall impact of remittances on the rural income distribution. (Adelman, Taylor, and Vogel (1988) and Stark, Taylor, and Yitzhaki (1986 and 1988) found evidence of equalizing *intravillage* impacts of remittances in 1982.)

Direct remittance effects, however, understate the full short-run effect of remittances on the level and distribution of household-farm incomes. Consistent with Stark's (1982) hypothesis, income from migration appears to positively influence nonremittance farm income in the most recent year. When this indirect effect of remittances is considered, the small unequalizing effect of remittances on the household-farm income distribution increases substantially. The intertemporal Gini decomposition findings suggest that migrant remittances had a small equalizing long-run effect on the household-farm income distribution through their influence on the accumulation of income-producing assets.

Methodology

Let y_k, $k = 1,...,K$ denote components of household-farm income y_0 such that $\sum_{k=1}^{K} y_k = y_0$. The Gini coefficient of income inequality (G_0) can be written as a

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[2]The earlier studies were based on a cross-section comparison of villages that appeared to be at different stages in the migration process.

function of the covariance between income and its cumulative distribution (Stuart, 1954; Pyatt, Chen, and Fei, 1980; Lerman and Yitzhaki, 1985):

$$G_0 = \frac{2\,\mathrm{cov}(y_0, F(y_0))}{\mu_0} \tag{1}$$

where $F(y_0)$ is the cumulative distribution of total household-farm income and μ_o denotes mean household-farm income. When incomes from all sources are independent (i.e., $\frac{\partial y_k}{\partial y_j} = 0$ for all $k \neq j$), the Gini coefficient for total household-farm income can be written as:

$$G_0 = \sum_{k=1}^{K} S_k G_k R_k \tag{2}$$

where S_k is the share of income from source k in total household-farm income; G_k is the Gini coefficient for the distribution of source-k income; and R_k is the Gini correlation between income from source k and the distribution of total household-farm income,[3] defined as

$$R_k = \frac{\mathrm{cov}(y_k, F(y_0))}{\mathrm{cov}(y_k, F(y_k))}$$

If income component j is increased by a factor of e such that $y_j(e) = (1 + e)y_j$, the marginal effect on the Gini of total income is:

$$\frac{\partial G_0}{\partial e} = S_j(R_j G_j - G_0) \tag{3}$$

where S_j, R_j, G_j, and G_0 are measured prior to the marginal income change, and the relative effect is:

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[3]The properties of the Gini correlation are a mixture of the properties of Spearman's and Pearson's correlation coefficients. These properties are derived in Schechtman and Yitzhaki (1985) and discussed in Stark, Taylor, and Yitzhaki (1986).

$$\frac{\partial G_0/\partial e}{G_0} = \frac{S_j G_j R_j}{G_0} - S_j \qquad (4)$$

That is, the relative effect of a marginal percentage change in source-j income on the Gini for total income equals the relative contribution of source j to overall income inequality minus the share of source j in total income. Equations (2)-(4) measure direct contributions and direct effects of income sources on total income inequality.

Consider, however, the case where income from source k′ (for example, nonremittance, hereafter referred to as farm, income) is a function of source j income (for example, migrant remittances); that is, $y_{k'} = f(y_j, x)$, where x is a vector of other (exogenous) variables influencing $y_{k'}$. The contribution of income source j to total income inequality now consists of both direct and indirect effects. To see this let

$$y_{k'} = \alpha + \beta_1 y_j + \beta_2 x.$$

Then,
$$y_0 = \sum_{k \neq k'} y_k + \alpha + \beta_1 y_j + \beta_2 x \qquad (5)$$

Analogous to Lerman and Yitzhaki,

$$G_0 = \frac{2\,\mathrm{cov}(y_0, F(y_0))}{\mu_0} = \sum_{k \neq k'} S_k G_k R_k + S_{k'j} G_j R_j + S_x G_x R_x \qquad (6)$$

where S_k, G_k, and R_k are the (direct) income share, Gini coefficient, and Gini correlation for income source k; G_x and R_x are the Gini coefficient of asset inequality and the Gini correlation between assets and the distribution of total household-farm income, respectively:

$$G_x = \frac{2\,\mathrm{cov}(x, F(x))}{\mu_x}$$

$$R_x = \frac{\text{cov}(x,F(y_0))}{\text{cov}(x,F(x))}$$

S_x is the share of returns to asset x in total household-farm income:

$$S_x = \frac{\beta_2 \mu_x}{\mu_0}$$

and $S_{k'j}$ is the indirect share of income source j in total income through its effect on farm income:

$$S_{k'j} = \frac{\beta_1 \mu_j}{\mu_0}.$$

The indirect share of income source j may be either positive or negative, depending upon whether the affected income source ($y_{k'}$) increases ($\beta_1 > 0$) or decreases ($\beta_1 < 0$) in the presence of y_j. If $y_{k'}$ and y_j are independent ($\beta_1 = 0$), then $y_{k'} = \alpha + \beta_2 x$, and the expression for the full-effect Gini collapses to (2). If, on the other hand, income from source j has a significant effect on source-k′ income, the interaction term $S_{k'j}$ in (6) will either increase or decrease the full contribution of source j income to income inequality. For example, suppose that migration income accrues primarily to households in the middle and lower segments of the income distribution (R_j is negative), and the (indirect) effect of remittances on farm income—the farm-income return to $y_{k'}$—is positive. Then the interaction term β_1 in (6) will lower the overall (direct and indirect) contribution of y_j to the Gini of total income. On the other hand, if remittance income is positively correlated with the distribution of total income (R_j is positive), both the direct and indirect contributions of migration income to the total-income Gini will be positive. The same will be true if R_j is negative but the effect of remittances on farm income is also negative ($\beta_1 < 0$).

Indirect effects of y_j on y_0 also influence the effects of marginal changes in y_j on inequality. If G_j and R_j are large, an unequalizing direct effect of marginal changes in migrant remittances may be dampened or even reversed by an equalizing indirect (negative) effect of remittances on farm income, or vice-versa. In these cases, estimates of direct effects of remittances on income inequality may misrepresent the total (direct plus indirect) effects both quantitatively and qualitatively.

Following a derivation analogous to Stark, Taylor, and Yitzhaki (1986), the effect of a small percentage change in remittances (y_j) on the Gini of total income, considering both direct and indirect (through $y_{k'}$) effects, is given by:

$$\frac{\partial G_0}{\partial e} = (S_j + S_{k'j})(R_j G_j - G_0) \tag{7}$$

where S_j, $S_{k'j}$, G_j, R_j, and G_0 denote the direct and indirect remittance shares, remittance Gini coefficient, remittance Gini correlation, and total Gini before the income change.

The full-remittance share term $(S_j + S_{k'j})$ may be negative if income from remittances has an effect on $y_{k'}$ that is less than –1 (i.e., $\beta_1 < -1$). More generally, a negative indirect effect of y_j as measured by β_1 dampens or reverses a positive direct effect of y_j on the total-income Gini and it dampens a negative effect (that is, if $R_j G_j < G_0$). Consider the following cases:

Case 1: $G_j R_j > G_0$; remittances are relatively unequally distributed and positively correlated with total income. The direct effect of a small percentage change in y_j on G_0 is positive. Then:

Case 1a: If $\beta_1 > -1$, the indirect effect of the marginal change in y_j (through $y_{k'}$) is positive or else not sufficiently negative to reverse the unequalizing direct effect on the income distribution. This is the

case where farm income increases (or else does not decrease by more than 1 unit) for each 1-unit increase in remittances.

Case 1b: If $\beta_1 < -1$, the indirect effect of the change in y_j on G_0 is negative and sufficiently strong to reverse the unequalizing direct effect of y_j on G_0. This is the case if farm income falls by more than 1 unit for each 1-unit increase in remittances.

Case 2: $G_jR_j < G_0$. Here, remittances have an equalizing direct effect on the income distribution. However,

Case 2a: If $\beta_1 < -1$, the indirect (negative) effect of remittances on farm income reverses the equalizing direct effect. This would be the case, for example, if low and middle-income households benefit disproportionately from remittances but reduce their farm production such that a 1-unit increase in remittances results in more than a 1-unit decrease in farm income.

Case 2b: If $\beta_1 > -1$, the indirect effect is either equalizing (i.e., farm income increases), or else it is not sufficiently less than zero to reverse the equalizing direct effect on G_0.

Findings

Direct and indirect-effects Gini decompositions were derived using matched longitudinal data from rural Mexico. Two components of household-farm income are considered in this paper: non-remittance farm income and migrant remittances. First, the direct-effects Gini decompositions by the two income sources for the two years covered by the surveys (1982 and 1988) are derived. Then the full (direct and indirect) effects of migrant remittances on household-farm income are estimated and used to obtain a decomposition of the full effect of remittances on income inequality. The direct and full-effects Gini decompositions are compared.

Intertemporal effects of remittances on (1988) household-farm assets were estimated jointly with the 1982 and 1988 income equations. Estimates of these asset-accumulation effects are used to estimate long-term impacts of remittances on the household-farm income distribution.

Data

Data to construct the direct and full-effects Gini decompositions were gathered by the author in 1989 and 1983 surveys of household farms in the state of Michoacán, Mexico. The field site is in the Pátzcuaro region, approximately 2,000 miles south of the Mexico-California border. The 1983 survey sample included 61 household-farms. (Those data were the basis for Stark, Taylor, and Yitzhaki, 1986 and 1988; and Adelman, Taylor, and Vogel, 1988). Fifty-five of these household-farms were reinterviewed in the 1989 survey (all members of the other six households had migrated out of rural Mexico by 1988.). The matched longitudinal sample thus consists of 55 household-farms, which included 451 adult members 15 years of age or older (7.8 adults per family) in 1988. Data were collected on the socioeconomic characteristics of all family members, whether present on the farm or not; household-farm assets; and household-farm income from all sources, including remittances from family migrants in Mexico and in the United States, for the complete calender years prior to the survey years (1982 and 1988, respectively). Farm income includes income from crop production, estimated on the basis of a detailed farm budget survey; livestock production; local wage labor; and other household-farm activities (handicrafts, commerce, etc.). Migrant remittances are all net of household-to-migrant flows and direct migration costs. Both of the latter, however, were extremely rare. All but a few migrants in the sample (94 percent) had been residing continuously outside the household-farm for at least one year prior to 1988 and most (69 percent) since before 1982; the average for all migrants in the sample

was nine years. Eighty-one percent of total 1988 remittances came from migrants in the United States, principally in Southern California. The rest came from rural-to-urban migrants in Mexico.

The income and farm asset variables used in the analysis are defined and summarized in Table 1. The direct contribution of migrant remittances to the total income of the household-farms in the sample is substantial: in 1988 (right panel), one out of every four dollars of household-farm income (evaluated at the 1988 exchange rate of 2,200 pesos per dollar) originated from migrants. (The remittance share was somewhat higher in 1982.) Migration is selective of the young, as illustrated by the high average age of household heads in the sample (56 years in 1988). Average schooling levels are low; education is probably discouraged by low returns to schooling for undocumented migrant workers in the United States (Taylor, 1987) and by a scarcity of secondary schools outside the major towns in the region. Thirty-four percent of all household heads in the sample supplemented crop production with some other kind of local work in 1987, the year prior to the period covered by the survey. Nonfarm occupations primarily include handicrafts (principally basket weaving), fishing in nearby lake Pátzcuaro, local housing construction, and commerce (small food stores). The average household farm in 1988 possessed just under four hectares of farmland, mostly *ejido* (reform-sector) land, and it owned a herd of eight animals (cattle, oxen, and horses). Livestock has become a preferred means of storing wealth in this zone.

Direct-Effects Gini Decomposition

Decompositions of the direct contributions of migrant remittances and farm income to household-farm income inequality in 1982 and 1988, based on Equation (2), appear in Table 2. The first column of the Table, labeled S, presents the direct shares of each income source in total income (24 percent and 76 percent for

remittances and farm income, respectively, in 1988 compared with 43 and 57 percent, respectively, in 1982). The sharp decrease in the remittance share between 1982 and 1988 is striking. It does not reflect an absolute decline in remittances: Average remittances per household increased 14 percent over this period, to $897.[4] Nonremittance farm income, however, more than doubled to $2,701. This farm income growth is consistent with the hypothesis that migration promotes economic development in migrant-sending areas over time.

The Gini coefficients for farm income (0.53 and 0.52 in column (G)) reflect household-farm income inequality when remittances are ignored. Remittances are less equally distributed than farm income: The Ginis for remittances are 0.66 in 1982 and 0.69 in 1988. Nevertheless, income inequality decreases, or at least does not increase, when remittances are included in household-farm income (0.48 in 1982 and 0.52 in 1988.) This equalizing average direct effect of migrant remittances is explained by the Gini correlations reported in columns (R). Although remittances are less equally distributed than farm income, their (Gini) correlations with household-farm total income rankings are lower than those of farm income (0.77 and 0.79, compared with 0.85 and 0.99 for farm income). The percentage contributions of remittances to income inequality (0.46 and 0.25) are similar to the shares of remittances in total income.

The last columns in Table 2 report the relative direct effects of small percentage changes in each income source on the Gini coefficients for total income. This marginal effect is positive for migrant remittances in 1982 (0.03 percent) but lower in 1988 (0.01 percent). This finding is consistent with Stark, Taylor, and Yitzhaki's (1986) finding using cross-section data that initially unequalizing effects of migrant remittances on household-farm income distributions decrease over time, as

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[4]If the 1988 figure is adjusted by the change in the purchasing power of the dollar (–18 percent), remittances in 1982 U.S. dollars declined slightly.

access to migrant labor markets becomes "diffused" through the household-farm population. That study and Adelman, Taylor, and Vogel (1988) found evidence of some income-equalizing effects of remittances within villages in 1982. The present findings highlight the importance of intervillage inequality in determining the impact of changes in remittances on the household-farm income distribution.

In contrast to remittances, the marginal effect of farm income is negative in both years but smaller in absolute value in 1988 (–0.03 percent and –0.01 percent). That is, in contrast to remittances, small increases in farm income appear to have a less equalizing direct effect on the household-farm income distribution over time. This finding may reflect greater inequality in the distribution of income-producing farm assets over time.

Migrant Remittances and Farm Income

A three-stage least squares regression was used to test for a nonunitary effect of migrant remittances on household-farm incomes in 1982 and 1988 and for an effect on the accumulation of income-producing assets between 1982 and 1988. For two income sources in year t, y_{1t} (farm income) and y_{2t} (migrant remittances), total income $y_{0t} = y_{1t} + y_{2t}$, and from (5)

$$y_{0t} = \alpha_t + \beta^*_{1t} y_{2t} + \beta_{2t} x_t \qquad (8)$$

where $\beta^*_{1t} = (1 + \beta_{1t})$ denotes the combined direct and indirect effect of remittances on total farm income and β_2 denotes the returns to household-farm variables (e.g., farm assets). The econometric form of (8) is

$$y_{0t} = \alpha_t + \beta^*_{1t} y_{2t} + \beta_{2t} x_t + \varepsilon_t$$

where ε_t is a stochastic error term assumed to have zero mean and a variance of σ^2_t. The household-farm variables x include indicators of human capital (family education, age of the household head, number of adult family members, and off-

farm occupations) and physical capital (landholdings and animals, which are the major capital input in the low-input agriculture that is characteristic of this region).

Testing for an indirect effect of remittances on household-farm incomes is equivalent to testing the null hypothesis that $\beta_1^* = 1$. Even if we reject this null hypothesis, however, remittances may have an indirect effect on incomes (and income inequality) in the long run by influencing the accumulation of income-producing household-farm assets, through their contribution to total income and possibly independently as well (e.g., by influencing income risk). Household-farm asset holdings in year 2, x_2, are modeled as

$$x_2 = \gamma_0 + \gamma_1 x_1 + \gamma_2 y_{01} + \gamma_3 y_{21} + u \qquad (9)$$

where x_1 denotes asset holdings in year 1 and u is a stochastic error term, $u \sim (0,\sigma_u^2)$. Three of the household-farm variables listed above can be altered over the relevant time period: animal stocks, family education, and the existence of off-farm occupations. The prevalence of *ejido* or reform-sector lands in this region precludes an active land market.[5] As a result, household-farm landholdings in this sample were unchanged from 1982 to 1988. Farmers' off-farm occupations were also unchanged in this sample. By contrast, there were changes in family education and especially in animal herds over this period.

For these last two household-farm assets, the asset-accumulation equation (9) was estimated jointly with the two income equations (8) using three-stage least squares (3SLS). The stochastic error terms ε_t, t = 1, 2 and u are assumed to be distributed independently across observations but not necessarily across equations (σ_{12} and σ_{tu} for t = 1, 2 may be nonzero). The 3SLS estimation takes account of potential cross-equation error correlations when estimating the equation system and it produces consistent and efficient estimates of the equation parameters.

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[5]Ejido lands cannot legally be bought or sold.

The regression findings for 1988 support the hypothesis that migrant remittances had a greater-than-unitary effect on household-farm income. *Ceteris paribus,* a one-unit increase in migrant remittances is associated with a 1.85-unit increase in total household-farm income. This finding supports the view that migration income loosens liquidity and risk constraints on household-farm production, and it suggests that remittances may have important indirect effects on income inequality.

The 1982 findings, by contrast, reveal a less-than-unitary association between remittances and total income (0.67). On the one hand, this finding might be interpreted as evidence against the migration and development hypothesis. It is consistent with the hypothesis that family leisure is a normal good and perfect hired substitutes for family labor in household-farm production are not available. In this case, an increase in migration income is partially offset by a decrease in income from other sources.

On the other hand, the combination of a β^* less than one in 1982 but greater than one in 1988 is consistent with Lucas' (1987) finding (for five Southern African countries) that migration diminishes crop production in the short-run (due, perhaps, to a lost labor effect) but enhances farm productivity in the long run (through positive remittance effects). In the Mexico sample, remittances reflect both income contributions by migrants and the loss of household-farm labor to migration. The delayed positive effect of remittances on non-remittance farm income may reflect a lag in household-farm adjustments to labor "lost" to migration and/or in the productivity-enchancing effect of remittances. It also may reflect changes in the incentives to invest remittances in household-farm production over time.

Two other variables stand out as significantly affecting household-farm income in both years. Education positively influences income. Other things being

equal, an additional family member with secondary schooling is associated with a $281 increase in farm income in 1982 and a $452 increase in 1988. The returns to livestock are also high: a one-animal increase in herd size is associated with increases in household-farm income of $99 in 1982 and $125 in 1988. Because of these significant returns, the distribution of assets, in addition to the distribution of remittances, potentially may have an important influence on household-farm income inequalities, and changes in asset holdings may help reshape the income distribution over time.

Estimates for the asset equations appear in the bottom half of Table 3. Controlling for 1992 herd size, 1982 remittances have a positive effect on the size of animal herds in 1988. The effect of 1982 total income (including remittances) is also positive. To the extent that these variables capture permanent remittance and income effects on livestock investments, these findings suggest that migration income plays a significant role in the accumulation of livestock over time. The effects of these income variables on changes in family education, however, are not significant. The 1982 schooling variable dominates the 1988 schooling equation. The findings in Table 3, together with a comparison of schooling averages for 1982 and 1988 in Table 1, suggest that there has not been a great deal of increase in family education that is not explained by "momentum" effects (children who were in secondary schools in 1982 who had become adults by 1988). The economic crisis in Mexico, where the returns to schooling were high in 1982 (Taylor, 1987), may have discouraged household-farm investments in education during the 1980s.

Direct and Indirect Contributions of Remittances to Inequality

The parameter estimates in Table 3 were used to derive the full (direct and indirect) average and marginal contributions of remittances to the total-income Gini based on equations (6) and (7). For the two income sources, equation (6) reduces to

$$G(y_0) = S_2^* G_2 R_2 + S_x G_x R_x \tag{10}$$

and equation (7) becomes

$$\frac{\partial G_0}{\partial e} = S_2^* (R_2 G_2 - G_0)$$

where

$$S_2^* = \frac{\beta_1^* \mu_2}{\mu_0}$$

The findings of the full-effect Gini decompositions appear in Table 4.

Although marginal changes in farm income are negatively associated with total income inequality as measured by a Gini coefficient (Table 2), small increases (decreases) in variables that positively influence farm income may not decrease (increase) inequality if the distribution of these variables across households is unlike that of farm income.

Changes in remittances have a positive direct effect on the Gini of total income (Table 2). The positive indirect effect of remittances on farm income in 1988 reported in Table 3 magnifies this unequalizing direct effect. The full effect of a marginal percentage change in remittances on the total income Gini, reported in Table 4, is 0.02 percent, higher than the direct effect of 0.01 percent reported in Table 2. The direct shares of remittances in total household-farm income and income inequality in 1988 (from Table 2) are 24 percent and 25 percent, respectively. The findings in Table 4 indicate that, indirectly, remittances account for an additional 20 percent of total income and 21 percent of total income inequality.

By contrast, in 1982, the negative indirect remittance effect on farm income partially offsets the negative direct effect of remittances on the total-income Gini. The full effect of a percentage change in remittances on income inequality reported

in Table 4 (0.02 percent) is smaller than the direct effect reported in Table 2 (0.03 percent).

Family education and livestock holdings, like remittances, have a significant positive effect on household-farm incomes (Table 3). However, in contrast to remittances, small changes in these assets have a *negative* effect on total income inequality (Table 4). This is because family education and livestock are relatively equally distributed (that is, their Gini coefficients and Gini correlations are low relative to the Gini for total income). Education and livestock account for 23 percent and 28 percent of 1988 total household-farm income, respectively, and 9 percent and 28 percent of 1988 income inequality. They comprise 23 and 33 percent of 1982 total income, respectively and 18 and 25 percent of 1982 income inequality. There is evidence that the income-equalizing effect of small changes in livestock assets declined over time (from –0.08 in 1982 to –0.01 in 1988), due to the growing inequality in the distribution of this asset which is evident in the Table. By contrast, the importance of schooling as an income equalizer increased (from –0.05 in 1982 to –0.13 in 1988).

Remittances and Intertemporal Changes in Inequality

The positive effect of livestock holdings on 1988 farm income, coupled with the positive effect of remittances on the accumulation of livestock, suggest that remittances may have an indirect dynamic effect on income inequality. Let G_{0x} denote the contribution of asset x to the total 1988 income Gini G_0. From equations (5) and (6), letting the subscript t = 2 denote 1988, this contribution can be expressed as:

$$G_{0x} = \frac{2\,\mathrm{cov}(\beta_{22}x, F(y_{02}))}{\mu_{02}} \qquad (11)$$

where μ_{02} is 1988 mean total income. Substituting for x_2 from equation (9), and following the derivation in Lerman and Yitzhaki (1985) and Stark, Taylor, and Yitzhaki (1986), equation (11) becomes

$$G_{0x} = \sum S_\theta G_\theta R_\theta$$

for $\theta = x_1$ (asset holdings in 1982), y_{01} (1982 total income), and y_{21} (1982 remittances). S_θ denotes the share of 1988 total income "explained" by θ through θ's effect on 1988 asset holdings. For 1982 asset holdings,

$$S_\theta = \frac{\beta_{22}\gamma_1\mu_{x1}}{\mu_{02}}$$

for 1982 total income,

$$S_\theta = \frac{\beta_{22}\gamma_2\mu_{01}}{\mu_{02}}$$

and for 1982 remittances,

$$S_\theta = \frac{\beta_{22}\gamma_3\mu_{21}}{\mu_{02}}$$

G_θ is the Gini for the distribution of θ. R_θ is the intertemporal (Gini) correlation between θ and 1988 total income:

$$R_\theta = \frac{\text{cov}(\theta, F(y_0))}{\text{cov}(\theta, F(\theta))}$$

The effect of a small percentage change (e) in θ on the 1988 total income Gini is given by:

$$\frac{\partial G}{\partial e} = S_\theta(G_\theta R_\theta - G_0) \qquad (12)$$

If $S_\theta > 0$, this asset-accumulation effect of marginal changes in θ (1982 remittances, herds or total income) will be positive if the product of G_θ and R_θ is greater than the 1988 total income Gini, and negative otherwise.

The decomposition of the livestock contribution to total income inequality appears in Table 5. The first column of Table 5 presents the estimated shares of 1988 income that are "explained" by 1982 animal herds, remittances and total income through these variables' effects on the accumulation of livestock assets over time. These shares add up to the estimated percentage contribution of 1988 livestock assets to 1988 total income reported in Table 4 (28 percent).

1982 remittances indirectly "explain" 8 percent of 1988 total income and 6 percent of income inequality through their influence on households' accumulation of income-producing livestock assets. The livestock-accumulation effect of 1982 income accounts for 10 percent of 1988 income and 7 percent of 1988 income inequality. The livestock-accumulation effect of 1982 herds accounts for 13 percent of 1988 income and 9 percent of 1988 income inequality.

A marginal percentage increase in 1982 remittances produces a small decrease in the 1988 total income Gini (–0.01 percent) through its influence on 1988 animal herds. This finding may seem perplexing in light of the unequalizing effect of remittances on the 1982 income distribution, the positive effect of 1982 remittances on livestock investments, and the positive effect of livestock assets on 1988 income. The negative asset-accumulation effect of 1982 remittances is due to a low 1982 remittance Gini (0.66) and a low (Gini) correlation between 1982 remittances and 1988 total income (0.67) relative to the 1988 total income Gini (0.52). (See equation (11).) Marginal percentage changes in 1982 total income and herd size have negative effects on the 1988 total income Gini (–0.03 percent for 1982 total income and –0.04 percent for 1982 livestock holdings).

Conclusions

The findings reported in this paper support the hypothesis that migrant remittances have both indirect short-term effects and long-term asset accumulation effects on the level and distribution of household-farm income in migrant-sending areas of LDCs. In the sample of Mexican household-farms examined here, migrant remittances (mostly from the United States) had a large direct effect on household-farm incomes in both 1982 and 1988. In addition to this direct effect, however, remittances generated indirect effects by influencing household-farm incomes from other sources. These indirect remittance effects on income are negative in 1982 but large and positive in 1988. They generate correspondingly negative and positive influences on the Gini for total household-farm income in these two years. Finally, in addition to contributing to 1982 household-farm income, remittances affect household-farms' accumulation of income-producing assets. The distribution of these assets, in turn, influences the distribution of total income over time. In the Mexico sample, 1982 remittances are positively associated with the accumulation of animal herds, which in turn explain a large share of 1988 income. Small changes in livestock holdings are negatively associated with 1988 income inequality.

These findings suggest a number of implications for future research and policy design.

First, efforts to measure the impacts of migrant remittances on the size distribution of income in migrant-sending areas should take into account both indirect contemporaneous and long-term effects of remittances on household-farm incomes. Studies that limit themselves to measuring direct remittance effects may capture only part of the full influence of remittances on the household-farm income distribution. The signs of the indirect and long-term influences of remittances on income inequality are generally ambiguous theoretically, in part because the signs of

the indirect and intertemporal effects of remittances on non-remittance farm income are not known *a priori*. These influences potentially may increase, reduce or even reverse the measured direct effects of remittances on the level and inequality of household-farm incomes.

Second, where credit and insurance markets are missing or imperfect, migrant remittances may promote the growth of nonremittance incomes—and thereby influence the income distribution—by enabling household-farms to overcome liquidity and risk constraints (Stark, 1982; Lucas, 1985). The findings reported in this paper support this "remittance and development" hypothesis, and they illustrate the potential for the resulting indirect effects of remittances on household-farm incomes to influence income inequalities.

Third, the present findings point to the importance of considering new influences on income inequality if policy makers are not indifferent to the distributional impact of development programs and policies. A policy designed to reduce income inequalities (e.g., through income transfers to the poor) potentially may produce unequalizing indirect effects (e.g., if the policy negatively affects income from other sources). This indirect effect could dampen or even reverse the equalizing direct effect of the policy. A policy that both targets the poor and encourages the growth of new or existing income sources in the income portfolios of the target group, by contrast, can generate indirect effects that reinforce income-equalizing direct effects. Finally, policies and programs that target the rich (or that do not explicitly target the poor) may produce direct and indirect effects that sharpen income inequalities in both the short and the long run.

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Table 1

Definition of Variables and Descriptive Statistics

	1982		1988	
Variable	Sample Mean	Standard Deviation	Sample Mean	Standard Deviation
TOTINC-Total Income[a]	1,831.00	1,813.70	3,597.50	5,091.80
REMITS - Migrant Remittances[a]	783.18	1,140.80	896.74	1,220.50
AGE - Age of Household Head	49.66	12.88	55.66	12.88
ED - Family Education (Number of Family Members with More than 6 Years of Completed Schooling	1.51	1.99	1.78	2.38
OCC - Off-Farm Occupation Index (= 1 if Household-head Had a Non-farm Occupation in 1987)	0.34	0.48	0.34	0.48
ADS - Family Adults (≥ 15 Years of Age)	6.65	2.93	7.78	3.27
ANIM - Animal Herd Size (Oxen, Cattle, Horses)	6.09	6.83	8.00	11.81
LAND - Landholdings (Hectares)	4.69	3.58	3.81	3.49

Sample Size = 55 Household-farms

[a]Current U.S. dollars.

Table 2

Direct-Effects Gini Decomposition Results

Income Source	Share in Total Household Income (S)	Gini Coefficient for Income Source (G)	Gini Correlation with Total Income Rank (R)	Contribution to Gini of Total Income (SGR)	Percentage Share in Gini of Total Income (SGR/G)	Percentage Change in Gini Coefficient $(\frac{\partial G/\partial e}{G_0})$
1982:						
Migrant Remittances	0.43	0.66	0.77	0.22	0.46	0.03
Farm Income	0.57	0.53	0.85	0.26	0.54	–0.03
Total Income	1.00	0.48	1.00	0.48	1.00	—
1988:						
Migrant Remittances	0.24	0.69	0.79	0.13	0.25	0.01
Farm Income	0.76	0.52	0.99	0.39	0.75	–0.01
Total Income	1.00	0.52	1.00	0.52	1.00	0.00

Sample Size = 55 Household-farms

Table 3

3SLS Regression Results for Household-farm Income and Asset Accumulation Equations[a]

Income Equations:	1982		1988	
Variable	Estimated Coefficient	t-Statistic	Estimated Coefficient	t-Statistic
REMITS	0.665	4.476	1.854	4.180
AGE	30.489	1.906	35.729	0.780
ED	281.260	3.500	451.950	2.500
OCC	382.920	1.270	1370.300	1.600
ADS	−136.380	−2.140	−265.740	−1.500
ANIM	98.598	3.840	124.850	2.570
LAND	7.185	0.160	114.770	0.940
CONST	−560.750	−0.810	−635.140	−0.300
Asset Equations: Livestock (ANIM(88))				
Variable				
ANIM(82)			0.619	2.940
REMITS(82)			0.003	1.890
TOTINC(82)			0.002	1.650
Constant			−0.495	−0.283
Family Education (ED(88))				
Variable				
ED(82)			1.187	16.035
REMITS(82)			0.000	−0.320
TOTINC(82)			0.000	−1.185
AGE(82)			−0.026	−1.909
ADS(88)			0.090	1.700
Constant			0.930	1.700

Sample Size = 55 Household-farms
System R-Square = 0.97
Chi-Square (df) = 198.74 (22)

[a]Current U.S. dollars.

Table 4

Full Remittance-Effect Gini Decomposition Results

Variable	Share in Total Household Income (S*)	Gini Coefficient for Income Source (G)	Gini Correlation with Total Income Rank (R)	Contribution to Gini of Total Income (SGR)	Percentage Share in Gini of Total Income (SGR/G_0)	Percentage Change in Gini Coefficient $(\frac{\partial G/\partial e}{G_0})$
1982:						
REMITS**	0.28	0.66	0.77	0.14	0.30	0.02
AGE*	0.87	0.13	0.28	0.03	0.06	–0.88
ED**	0.23	0.67	0.56	0.09	0.18	–0.05
OCC	0.07	0.67	0.06	0.00	0.01	–0.07
ADS**	–0.50	0.25	0.25	–0.03	–0.07	0.43
ANIM**	0.33	0.58	0.62	0.12	0.25	–0.08
LAND	0.02	0.43	0.33	0.00	0.01	–0.01
CONST	–0.31	0.00	–	0.00	0.00	–
TOTINC	1.00			0.36	0.74	
1988:						
REMITS**	0.44	0.69	0.79	0.24	0.46	0.02
AGE	0.55	0.12	0.19	0.01	0.02	–0.05
ED**	0.23	0.68	0.31	0.05	0.09	–0.13
OCC	0.13	0.68	0.01	0.00	0.00	–0.13
ADS	–0.58	0.21	0.32	–0.04	–0.07	0.51
ANIM**	0.28	0.64	0.80	0.14	0.28	–0.01
LAND	0.12	0.50	0.39	0.02	0.05	–0.08
CONST	–0.17	0.00	–	0.00	0.00	–
TOTINC	1.00			0.43	0.82	

*(**) denotes significance in explaining total income at the 0.10 (0.05) level (See Table 3)

Table 5

Intertemporal Gini Decomposition Results for Livestock Holdings

	Estimated 1988 Income Share (S(i))	1982 Gini (G(i))	Gini Correlation with 1988 Total Income (R(i))	Estimated Share in 1988 Total Income Gini (SGR/G_0)	Percentage Change in 1988 Gini Coefficient ($\partial G/\partial e/G_0$)
Variable					
ANIM(82)**	0.13	0.58	0.61	0.09	–0.04
REMITS(82)*	0.08	0.66	0.67	0.06	–0.01
TOTINC(82)*	0.10	0.48	0.79	0.07	–0.03
Constant	–0.02				
Total[a]	0.28				

*(**) denotes significance in explaining 1988 livestock share at the 0.10 (0.05) level.

[a]The shares do not appear to add up to exactly 0.28 due to rounding error.

References

Adams, Richard H., Jr. "The Effects of International Remittances on Poverty, Inequality and Development in Rural Egypt," International Food Policy Research Institute, Research Report No. 86, May 1991.

Adelman, I., Taylor, J. E., and Vogel, S. "Life in a Mexican Village: A Sam Perspective," *Journal of Development Studies* 25(1), 5-24, 1988.

Bardhan, Pranab. "Alternative Approaches to Development Economics." In Chenery, H. and Srinivasan, T.N., eds., *Handbook of Development Economics, Volume I.* Elsevier Science Publishers, 1988.

Knowles, J. C. and Anker, R. "An Analysis of Income Transfers in a Developing Country," *Journal of Development Economics* 8:205-226, 1981.

Lerman, R. and Yitzhaki, S. "Income Inequality Effects by Income Sources: A New Approach and Applications to the U.S." *The Review of Economics and Statistics* (February), vol. 67, no. 1, pp. 151-56, 1985.

Lucas, R. E. B. "Emigration to South Africa's Mines." *American Economic Review* 77(3): 313-330, 1987.

Oberai, A. S. and Singh, H. K. M. "Migration, Remittances and Rural Development, Findings of a Case Study in the Indian Punjab," *International Labor Review* 119(2):229-241, 1980.

Pyatt, G., Chen, C., and Fei, J. "The Distribution of Income by Factor Components," *Quarterly Journal of Economics.* 95(November):451-473, 1980.

Schechtman, E. and Yitzhaki, S. "A Measure of Association Based on Gini's Mean Difference," Hebrew University, The Center for Agricultural Economic Research, Working Paper Number 8503, February 1985.

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

Stark, O. "Research on Rural-to-Urban Migration in LDCs: The Confusion Frontier and Why We Should Pause to Rethink Afresh," *World Development* 10:63-70, 1982.

Stark, O., Taylor, J. E., and Yitzhaki, S. "Remittances and Inequality, " *The Economic Journal* 96:722-740, 1986.

Stark, O., Taylor, J. E., and Yitzhaki, S. "Migration, Remittances and Inequality: A Sensitivity Analysis Using the Extended Gini Index. *Journal of Development Economics* 28:309-322, 1988.

Stuart, A. "The Correlation Between Variate-Values and Ranks in Samples From a Continuous Distribution." *British Journal of Statistical Psychology,* vol. 12: 37-44, 1954.

Taylor, J. E., "Undocumented Mexico-U.S. Migration and the Returns to Households in Rural Mexico," *American Journal of Agricultural Economics* 69(3):626-638, 1987.