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by
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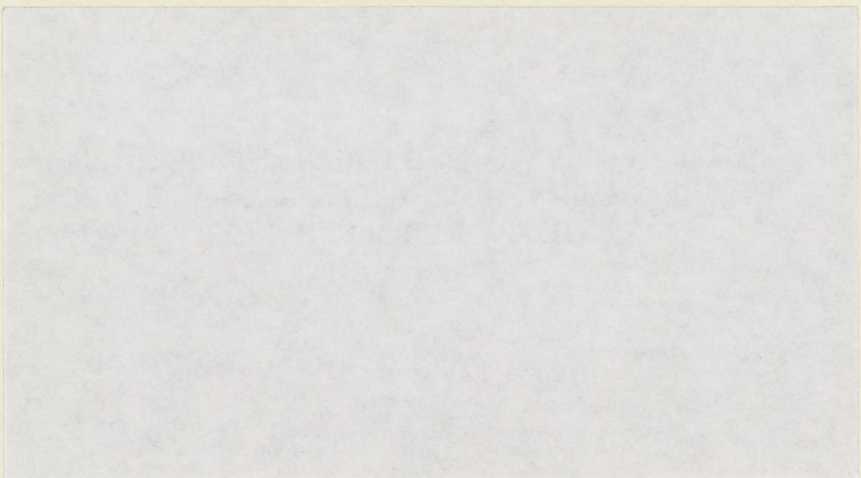

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J. Edward Taylor and TJ Wyatt

Working Paper No. 92-13

Migration, Assets and Income Inequality in a Diversified Household-Farm Economy: Evidence from Mexico.

Economic studies produce conflicting findings concerning the impact of migrant remittances on the level and distribution of income in rural, migrant-sending communities (Adams, Oberai and Singh, Knowles and Ankar, Stark, Taylor and Yitzhaki, 1986 and 1988). Existing studies of remittances and income inequality treat total migrant remittances to households (and frequently, income from other sources) as given. However, income from migration, like income from other sources, is shaped by the underlying distribution of, and returns to, physical, human and migration capital assets in the diversified household-farm economies that characterize many LDC rural areas. Differences in the accumulation and distribution of these assets and differences in the economic returns to these assets across the portfolio of household-farm activities, therefore, influence the effect of migration and other income sources on household-farm income inequality. The accumulation and distribution of income-producing assets and the returns to these assets vary across economic settings and over time. Thus, it is not surprising that economic studies do not find a consistent pattern of migration and other income-source effects on rural income inequality.

In this paper we use econometric and Gini-decomposition techniques to construct asset decompositions of household-farm income inequality for two migrant-sending villages in central Mexico in 1982 and 1988. These villages were the focus of Stark, Taylor and Yitzhaki's (1986 and 1988) studies of remittances and inequality. Those studies, however, were limited to a single

point in time (1982) and did not explore the effects of asset distributions and returns in explaining differences in the impacts of income sources on inequality between the two villages. In 1982, the two villages displayed different patterns of migration and asset distribution. Our findings reveal substantial changes in the structure of village incomes and inequality during the 1980s which are explained by changes in asset accumulation, distributions and returns in the context of expanding Mexico-to-U.S. migration and economic change in Mexico.

I. MIGRATION, INCOME SOURCES AND INEQUALITY

Lipton argued that if migration is risky and costly, migrants will originate from rural households that can finance the costs and are willing to bear the risks associated with this labor-market investment. These households are likely to be situated in the middle to upper-middle of the rural income distribution. Positive net income gains from migration, therefore, are not likely to significantly reduce rural income inequalities, and they may widen them.[1]

Stark, Taylor and Yitzhaki (1986, 1988) attempted to reconcile conflicting findings of empirical studies of remittances and inequality by arguing that household-farms' adoption of migration strategies, like their adoption of new production technologies, is characterized by a diffusion process in which access to information and markets plays a central role. Villagers who migrate provide other villagers with networks of contacts at migrant destinations. These contacts, which we refer to as "migration capital," are better known in other disciplines as "social networks" or "migrant kinship networks (Massey, Mines)." They can be viewed as a positive externality of investing in

migration which shapes both the subjective and objective distributions of returns to future migration, reducing migration costs and risks while increasing migrants' expected earnings. As more families gain access to migration capital, cost and risk impediments to migration fall and socioeconomic differences among households become less important in explaining migration behavior. (For recent evidence from Mexico, see Massey and Durand, 1992). As a result, initially unequalizing effects of migrant remittances tend to be dampened or reversed at later stages of what might be viewed as a self-perpetuating migration process. Stark, Taylor and Yitzhaki found evidence to support this hypothesis from a cross-section comparison of the impacts of migrant remittances on inequality in Mexican villages at different stages in this migration process.

Existing studies of remittances and inequality treat migrant remittances as exogenous injections of income into household-farm economies. In a diversified household-farm economy, migration is one of several income sources, each shaped by family holdings of income-producing assets. Human capital, physical capital and migration capital may influence migrant earnings at the destination, migrants' motivations to remit (Lucas and Stark, 1985) and the household-farm's opportunity cost of sending migrants (Taylor, 1987). Migration capital, in turn, may influence the returns to other household-farm activities, both directly (e.g., by transferring knowledge and skills from migrant destinations to the village) and indirectly (e.g., by influencing the opportunity cost of investing in farm production and reducing overall income risk by providing access to new income sources that are not positively correlated with village production; see Stark and Levhari). In addition to

having a contemporaneous effect on incomes and inequality, migration capital may influence income inequality over time if it facilitates the accumulation of income-producing assets, for example, by easing financial and risk constraints on farm investments over time (Taylor, 1992).

The rest of this paper is organized as follows: Part II presents a technique to construct an asset decomposition of total household-farm income inequality, measured by a Gini coefficient. In Part III, the income-source decomposition method employed in Stark, Taylor and Yitzhaki (1986 and 1988) is used to identify differences between villages and over time in the contributions of migrant remittances and other income sources to income inequality. Asset Gini decompositions, constructed from matched longitudinal household-farm data, are then used to explain these differences in terms of the underlying distributions of income-producing assets and changes in the returns to these assets over time. Our definition of assets for purposes of this study is broad, including traditional physical and human capital assets as well as "migration capital," or family contacts with migrants in the U.S. or in urban Mexico.

II. ASSET DECOMPOSITIONS OF INCOME INEQUALITY

Household-farm income in LDC rural areas typically consists of income streams from a portfolio of farm and nonfarm activities (e.g., see Reardon, Delgado, and Matlon). These income streams, in turn, are shaped by household-farm assets and by the returns to these assets in specific income-generating activities. Assets are accumulated differentially across households and over time. The returns to assets are influenced by government policies, the integration of household farms into national and international

commodity and labor markets, and changes in market conditions. In the 1980s, for example, household-farm economies in Mexico experienced a withdrawal of the state from institutions that previously had served small farmers, an economic crisis which restricted employment in urban areas, and a comprehensive reform of U.S. laws governing the incorporation of migrants into the U.S. economy. These policies and macroeconomic events undoubtedly altered the accumulation of assets and the returns to those assets across the portfolio of economic activities in which Mexico's household farms participated. Changes in the accumulation of income-producing assets and in the returns to these assets, in turn, reshape household-farm incomes and income inequality.

Asset decompositions of village income inequality can be obtained by extending the income-source Gini decomposition (Lerman and Yitzhaki, 1985; Stark, Taylor and Yitzhaki, 1986 and 1988) via a regression of income from different sources on household-farm asset holdings (Taylor, 1992). The Gini coefficient of income inequality (G_0) can be written as a function of the covariance between income and its cumulative distribution (Stuart, 1954),[2]

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

where $F(y_0)$ is the cumulative distribution of total income and μ_0 is mean income. Income-source decompositions of income inequality are obtained by expressing total income as the sum of income from different sources,

$$y_0 = \sum_{k=1}^{K} y_k \tag{2}$$

and then substituting for y_0 in equation (1). Following this procedure, the contribution of income from source k to total inequality can be derived as the product of three terms: the share of income from source k in total income (S_k), the Gini coefficient of inequality for income from source k (G_k), and the (Gini) correlation between source-k income and the distribution of total income (R_k). The Gini coefficient for total income inequality is the sum of the individual income source contributions to inequality:

$$G_0 = \sum_{k=1}^{K} S_k G_k R_k \tag{3}$$

The income-source elasticity of inequality, i.e., the percentage effect of a 1 percent change in source-k income on the Gini for total income inequality, can be obtained as the difference between source k's share in total income inequality and its share in total income. (See Lerman and Yitzhaki.)

Carrying this procedure one step further, consider a reduced-form representation of income from source k as a stream of returns from household-farm assets x_j, j=1,...,J:

$$y_k = \alpha_k + \sum_{j=1}^{J} \beta_{kj} X_j \tag{4}$$

where β_{kj} denotes the return to asset j in income activity k. Then,

$$G_0 = \sum_{k=1}^{K} \frac{2\mathrm{cov}(\sum_j \beta_{kj} X_j, F(y_0))}{\mu_0} \tag{5}$$

which reduces to:

$$G_0 = \sum_{k=1}^{K} \sum_{j=1}^{J} s_{kj} g_j r_j \qquad (6)$$

where $s_{kj} = \frac{\beta_{kj}\mu_{x_j}}{\mu_0}$ is the share of total income explained by asset j's effect on source-k income; g_j is the Gini coefficient of inequality for asset j; and r_j is the (Gini) correlation between asset-j holdings and the distribution of total income; that is:

$$r_j = \frac{\text{cov}(X_j, F(y_0))}{\text{cov}\,(X_j, F(X_j))} \qquad (7)$$

Equation (6) makes it possible to decompose the effects of assets on income inequality on a source-by-source basis. It also permits an asset decomposition of total income inequality. Let β_j^* denote the combined return to asset j across all income activities, i.e., $\beta_j^* = \sum_{k=1}^{K} \beta_{kj}$. Then

$$G_0 = \sum_{j=1}^{J} s_j^* g_j r_j \qquad (8)$$

where $s_j^* = \frac{\beta_j^* \mu_{x_j}}{\mu_0}$ is the share of total income explained by asset j.

Analogous to the income-source case, the elasticity of total income inequality with respect to asset j is given by

$$\eta_{Gx_{j'}} = \frac{s_{j'}^* g_{j'} r_{j'}}{G_0} - s_{j'}^* \qquad (9)$$

that is, the difference between the percentage contribution of asset j′ to total income inequality and the asset's percentage contribution to total income.

Equation (6) highlights the complexity of an asset's income-distributional effect in a diversified household-farm economy, where the returns to an asset may have different signs for different income sources. For example, schooling or migration capital may be positively related to off-farm earnings while increasing the opportunity cost of farm work. In a diversified household-farm economy, therefore, it would not be surprising to observe a negative relationship between these variables and crop income. (On the other hand, there may be some productivity returns to schooling (Welch) and to migration (Stark; Taylor, 1992; Lucas and Stark, 1985) in crop production.) The returns to specific assets may be sensitive to changes in the level and portfolio of asset holdings over time. For example, the accumulation of range-fed livestock, which we find to be an important means of storing wealth (including remittances; see Taylor 1992) in Mexican migrant-sending communities, is likely to increase the shadow price of land in noncrop activities. The expansion of herds also may increase the shadow price of land in crop production, if range and crop lands are substitutes. Household-farms will not have an economic incentive to invest in an asset or to alter their income portfolios in response to increased access to an asset unless the combined returns to the asset ($\beta^*_{j'}$) are positive. Thus, the sign of the elasticity (9) generally will be the same as the sign of ($r_{j'} g_{j'} - G_0$).

The inequality elasticity with respect to the returns to an asset (j') in some activity (k') is given by

$$\eta_{G\beta_{k'j'}} = \frac{s^*_{k'j'} g_{j'} r_{j'}}{G_0} - s^*_{k'j'} \qquad (10)$$

where $s^*_{k'j'} = \beta_{k'j'}\,\mu_{x_{j'}}/\mu_0$ is the share of total household-farm income explained by the contribution of asset j′ to income source k′. The sign of this effect depends on the return to the asset in activity k′ and also on inequality in the distribution of the asset relative to the distribution of (initial) total income, as reflected in $\frac{g_{j'}r_{j'}}{G_0}$. If the initial return to asset j′ in activity k′ ($\beta_{k'j'}$) is positive (negative), the sign of this effect will be positive (negative) if $g_{j'}\,r_{j'} > G_0$ and negative (positive) otherwise. That is, if $\beta_{k'j'}$ is positive (negative), a small percentage increase in the return to a relatively unequally distributed asset in some activity ($g_{j'}\,r_{j'} > G_0$) increases (decreases) income inequality, while an increase in the return to an equally distributed asset ($g_{j'}\,r_{j'} < G_0$) decreases (increases) inequality.

III. Decompositions of Village Income Inequality

Asset and income-source Gini decompositions were constructed using matched longitudinal household-farm data from two villages located approximately one mile apart on an isolated shore of Lake Pátzcuaro in the state of Michoacán, which traditionally has been the major source state for Mexican migration to the United States. At the time of our surveys, the village of Napízaro (hereafter referred to as Village 2) was connected by a 2-mile dirt road to Erongarícuaro, the administrative center of the municipio (roughly equivalent to a U.S. county) of the same name. Large-scale participation of Village-2 families in U.S. migration began during the early years of the bracero program, by way of labor recruiters in Erongarícuaro. By 1983, the year of our first survey, 88 percent of all families in this village had at least one migrant in the United States, most in California. The village of

Puácuaro (Village 1), more isolated than Village 2, participated only peripherally in the bracero program and did not begin to send many migrants to the United States until the late 1970s. In 1983, 17 percent of the families in this village had one or more Mexico-to-U.S. migrants.

Sixty-one households in these two villages were surveyed by Taylor in 1983. Detailed data were gathered on household socioeconomic characteristics, assets, and incomes from all sources inside and outside the village in 1982. This region, like many throughout Mexico, is characterized by rain-fed corn-and-beans agriculture (the *milpa*), livestock production, and some handicrafts. The villages' location on the shore of Lake Pátzcuaro provides some opportunity for fishing and gathering of reeds for local basket making. The returns to these activities, however, declined in the 1980s due to overfishing and ecological decline, particularly from deforestation of surrounding hills which has destroyed many of the most productive reed beds. In 1982, income sent home by migrants in the United States and in urban Mexico combined comprised 38.5 and 44.9 percent of total income in Villages 1 and 2, respectively.

Fifty-five of the households were successfully re-interviewed by Fletcher and Taylor in 1989 (all members of the remaining six households had relocated to urban Mexico or to the United States between 1982 and the beginning of 1988). The two surveys utilized the same survey instrument. The empirical analysis that follows is based on the 55 households for which matched longitudinal data are available. The income sources and household-farm assets (physical capital, human capital and migration) of these

households are defined in Table 1; summary statistics for each of the two villages in 1982 and 1988 appear in Table 2.

Between 1982 and 1988, the share of households with family migrants in the United States more than doubled in Village 1, where relatively few households (17 percent) had U.S. migrants in 1982, and it was unchanged in the high-migration village. Average livestock herds increased by more than one-third in both villages. Average schooling levels are low (less than two adults with primary education per household). Village 2 households enjoy a larger average endowment of both high-quality lakeside land and other (hill) land. These differences in landholdings do not reflect land investments (e.g., out of migrant remittances) in Village 2; all but a negligible share of land holdings is *ejido* (reform-sector) land, the rights to which could be inherited but, until the revision of Mexican *ejido* law in 1992, were not permitted to be transacted in markets. The distribution of land in these villages in 1982 and 1988 primarily reflects the original allocation of *ejido* plots, which dates to the 1930s (Village 2 was the center of an expropriated *hacienda* whose lands originally surrounded both villages). Village 1 families also have been more inclined to redistribute land intergenerationally by dividing *ejido* plots among family members. Total village income increased between 1982 and 1988.

Table 3 reports the estimated percentage contributions of Mexico-to-U.S. migrant remittances, internal (rural-to-urban) migrant remittances, crop income and noncrop farm income (primarily livestock and dairy products) to total household-farm income and income inequality in the two villages in 1982 and 1988. It also presents elasticities of income inequality with respect to

these income sources. Both the inequality shares and elasticities of income inequality are estimated using the income-source Gini decomposition techniques developed by Lerman and Yitzhaki and utilized by Stark, Taylor and Yitzhaki (1986 and 1988).[3]

The decade of the 1980s was a period of economic crisis and adjustment in Mexico, with increasing unemployment and declining real wages for Mexican workers, high inflation, and massive devaluations of the peso (from an average of 55 pesos to one U.S. dollar in 1982 to 2,200 pesos in 1988). Table 3 shows a near disappearance of internal migrant remittances from the two village economies during this period. U.S.-migrant households in the villages were relatively insulated from domestic economic events, however; the purchasing power in domestic currency of dollar remittances from migrants in the U.S. increased, at least temporarily, with the peso devaluations. Between 1982 and 1988 the shares of U.S. remittances in village income remained high through 1988.

Table 3 presents evidence that the contribution of migrant remittances and other income sources to total income inequality differs among migrant-sending villages, and these income-source effects are not stable over time. The contribution of U.S. migrant remittances to total income inequality in Village 1 is higher than in Village 2, and it declines over time (from 26 percent of inequality in 1982 to 20 percent in 1988). The Gini elasticities indicate that a small percentage increase in U.S. remittances, *ceteris paribus*, increases inequality in Village 1 (although less so over time) while decreasing inequality in Village 2. These remittance effects are consistent with the Stark, Taylor and Yitzhaki migration diffusion hypothesis.

Changing remittance effects, however, are part of what appears to be a major structural change in the roles of farm and off-farm income sources in village income inequalities over time. Between 1982 and 1988, the contribution of rural-to-urban migrant remittances to inequality declined sharply (from 33 percent to 9 percent) in Village 2, and it nearly disappeared in Village 1. The shares of crop income in inequality decreased by more than one-third in both villages. Meanwhile, the share of other (non-remittance and non-crop) income increased dramatically, from 34 to 45 percent of total inequality in 1982 to 65 and 70 percent in 1988. Changes in the share of migrant remittances in total income inequality may result from changes in the level or distribution either of remittances or of income from other sources. Understanding the changing role of income sources in income inequality requires understanding the underlying distributions of assets which shape these income sources and changes in the returns to these assets over time.

An Asset Decomposition of Village Income Inequality

Estimating asset Gini decompositions requires first estimating the returns to household-farm assets in each income activity (β_{kj}), and then using these estimated returns to decompose the Gini coefficient of total income inequality using equations (6) and (8). This procedure was followed to obtain asset decompositions of household-farm inequality for each village and for each of the two years covered by the survey.

Returns to Assets in Household-farm Activities

The returns to assets in farm and nonfarm income activities were estimated using an econometric specification of equation (4):

$$y_k = \alpha_k + \sum_{j=1}^{J} \beta_{kj} x_j + \varepsilon_k \quad k = 1,\ldots,4 \qquad (11)$$

For each income source, the stochastic error term ε_k is assumed to be approximately normally and independently distributed with zero mean and a variance of σ_k^2. The four income-source equations were estimated using ordinary least squares.[4] Data from the two villages were pooled for this estimation. Equation-by-equation Chow tests failed to reject the null hypothesis that the returns to assets were equal between the two villages. Nevertheless, a village dummy variable was significant for some income sources, indicating intercept shifts in income sources between villages that are not explained by the asset information obtained in the survey.

Inverse-Mills ratios were included in the remittance equations to correct for possible censorship bias resulting from the presence of households without U.S. or internal migrant remittances in our sample. These were obtained from probit regressions of dichotomous remittance variables (D_m=1 if remittances from migrants at place m are positive, zero otherwise, for m = U.S. and urban Mexico), following Amemiya's extension of Heckman's two-step estimator.

The asset holdings included in the regressions include physical capital (land, livestock), human capital (education, experience, adult family size) and migration capital (family contacts at migrant destinations in the United States and in Mexico). Both the quantity and the quality of these assets may be

important in shaping income streams. The quality of assets usually is difficult to measure. Nevertheless, two indicators of asset quality are available from our survey: land quality (holdings in lakeside and hillside land) and the age of migrant networks with the United States and to urban Mexico. The age of migrant networks may influence the quality of this asset if migrants' motivation to remit declines over time, as some studies suggest (e.g., see Todaro). The asset and asset-quality variables are defined and summarized in Tables 1 and 2, respectively.

Tables 4a-b report the estimated returns for each income source and asset combination for which the estimated return was not significantly different from zero (two-tailed t-test, .10 percent significance level). The econometric findings reveal clear differences in the returns to assets across income sources and over time. Migration networks and network age are the major variables influencing U.S. remittances in 1982. The presence of family contacts in the United States at the start of the year has a $139 effect on 1982 U.S. remittances. The maturity of U.S. migrant networks also positively influences remittances in 1982 ($15 per year; see column 1 in Table 4a). In 1988, the presence of U.S. migrants continues to have a positive and significant effect on U.S. remittances ($535). However, the effect of the age of these networks is negative (-$39), suggesting a decline in the returns to individual migrant contacts in the United States over time. The income effects of U.S. networks in 1988 are not limited to U.S. remittances. The presence of family contacts in the United States has a significant negative effect on noncrop income in 1988 (-$472) but no significant effect in 1982. This finding suggests that the

opportunity cost of family labor drawn by these contacts to the U.S. increased in noncrop production between 1982 and 1988.[5]

The accumulation of livestock appears to have influenced the returns to nonmigration assets, as well. Household-farm holdings of hillside land, in which livestock production is concentrated, have no significant effect on noncrop income in 1982, but they have a significant positive effect ($448 per hectare) in 1988, suggesting an increase in the shadow price of this fixed resource as herds expanded in the 1980s. Holdings of relatively level, lakeside lands have a positive effect on crop income in both years; this effect is slightly higher in 1988, ($95 per hectare, compared with $83 in 1982). One might argue that the low return to relatively high quality, lakeside land in crop production relative to the return to land in noncrop production should encourage a switch in land use towards specialization in livestock. Currently, however, crop and noncrop activities are complementary; one half of all grain output from lakeside lands is utilized as feedgrain. It is possible that as market reforms progress and inexpensive feedgrains become available in these villages, livestock production eventually will extend down to the lakeshore, with adverse consequences for the lake ecology.

As employment in urban Mexico contracted and asset accumulation in the villages increased in the 1980s, the returns to education declined in migration but increased in village production activities. The returns to schooling in internal migration were large and positive in 1982 ($218 per adult family member with some secondary schooling) but declined to an insignificant amount in 1988. The combined estimated returns to secondary schooling in the two village income sources, however, were more than one-

third greater in 1988 than in 1982 ($349, compared with $260 in 1982). Secondary schooling had an insignificant or negative association with U.S. remittances in the two years, due to low returns to schooling in low-skill migrant labor markets in the United States (e.g., see Taylor, 1987). The juxtaposition of positive returns to migration and human capital with negative returns to adult family size illustrates the importance of schooling and migration contacts to the productivity of family labor. Finally, controlling for family asset holdings, the tables reveal a significant disparity in U.S. remittance income between the two villages, suggesting that while Village 1 families have begun investing in migration capital, their U.S. contacts are not yet as productive as the established contacts of Village 2 families.

Asset Decompositions of Household-Farm Income Inequality

Changes in the returns to assets and changes in asset holdings reshaped the contributions of income sources to income inequality. Asset decompositions of household-farm income inequality for the two villages and the two years appear in Tables 5a-b. Tables 6a-b report percentage contributions of assets to total income and income inequality through their effects on each income source. To determine whether an asset has a relatively equalizing or unequalizing effect on income inequality, it is useful to compare the asset's share in total income inequality to its share in total income. By equation (9), if the inequality share is greater (less) than the income share, a small percentage increase in asset holdings will increase (decrease) inequality. By this measure, U.S. migration capital has the most unequalizing effect on Village-l income of any household-farm asset in 1982,

with the number of family migrants explaining only 3.7 percent of total village income but 9.2 percent of total income inequality, and accumulated migration experience explaining 2.3 percent of income but 6.6 percent of inequality. The unequalizing effect of U.S. migration capital in Village 1 in 1982 operates entirely through the influence of migration capital on remittances from family members in the U.S. (Table 6a). By contrast, U.S. migration capital has an equalizing effect on the Village 2 1982 income distribution (10.4 percent of income compared to 0.7 percent of inequality; Table 5b), due to its equalizing effect on remittances from U.S. migrants (Table 6b). It also has an equalizing effect on the Village 1 income distribution in 1988 (1.2 percent of income inequality and 2.1 percent of inequality). That is, there has been a qualitative change in the effect of U.S. migration capital on income inequality in Village 1 over time. Part of this change is explained by a negative association between U.S. migration capital and non-crop village production activities in 1988, which can be seen in the bottom panel of Table 6b. However, migrant contacts in the U.S. also had an equalizing effect through remittance income from the U.S. in 1988 (Tables 6A-B). These contacts' effect on U.S. remittance income explained 18 to 28 percent of total household-farm income but only 10 percent of inequality in the most recent year. These findings offer longitudinal support for the hypothesis that access to U.S. migration capital becomes diffused across the household-farm population and eventually has an equalizing effect on the household-farm income distribution.

Two other assets stand out as shaping income inequality in different ways between the two villages and over time. Family education explained

large shares of total income in 1982 (62 percent in Village 1 and 29 percent in Village 2). The largest part of the income contribution of education came from a significant positive effect of secondary schooling on remittance income from internal migrants (28 percent and 13 percent of 1982 total income in Villages 1 and 2, respectively; see the top panels of Tables 6a-b). A somewhat smaller share was explained by the positive effects of schooling on crop and non-crop farm incomes (24 percent and 10 percent, respectively, in Village 1; 11 percent and 5 percent, respectively, in Village 2). Schooling did not significantly affect remittance income from migrants in the United States. Table 5 reveals a qualitative difference in the distributional effect of education between the two villages in 1982. Schooling accounts for 62 percent of 1982 total income but only 49 percent of inequality in Village 1. By contrast, schooling has an unequalizing effect on the Village-2 income distribution in 1982, accounting for 29 percent of income and 60 percent of inequality. Lacking access to U.S. migrant networks, it appears that Village-l families at the middle and lower end of the income distribution invested in schooling for young family members, mostly in preparation for internal migration. In Village 2, where access to U.S. migrant networks is widespread, the opportunity cost of sending children to secondary school was high, and few middle or low-income families pursued this strategy.

In 1988, the large positive effect of schooling on internal migrant remittances disappears, reflecting a decline in migrant job opportunities in Mexican cities during the economic crisis years and also probably a decrease in the returns to secondary schooling in these jobs. A negative effect of the economic crisis on internal-migrant remittances is also suggested by our

findings with regard to internal migration capital. Family contacts with migrants in Mexican urban areas explained important shares of total internal remittance income in 1982 (31 percent and 15 percent in Villages 1 and 2, respectively), but these migration-capital effects disappeared in 1988. Schooling continued to contribute to total household-farm income in 1988 through positive contributions to crop and especially non-crop village income. The influence of schooling on non-crop village income explained 22 percent of total Village-1 income and 8.5 percent of total Village-2 income in the second year, compared to much smaller shares in 1982 (Tables 6a-b). Increases in the non-remittance shares of schooling in total income reflect sharp increases in the returns to schooling in crop and non-crop farm activities between 1982 and 1988 (see Table 4).

A second striking change in asset effects on inequality over time occurs with regard to livestock and its asset complements. Family livestock holdings, which account for approximately one-fifth of total income in 1982, explain 82 percent of Village-1 income and 70 percent of Village-2 income in 1988. (See the bottom panel of Tables 5a-b.) Most of this effect operates through the contribution of livestock to non-crop income (53 percent and 45 percent, respectively; bottom panel of Tables 6a-b). This asset has an unequalizing effect on the distribution of total income in both villages in 1988, explaining 94 to 97 percent of total income inequality. The central role of livestock in village incomes and inequality in 1988 is due to the large return to this asset in non-crop farm income (Table 4) and the accumulation of livestock over time (Table 2). The large contribution of livestock to village income inequalities results from these changes as well as from an increasingly

inequitable distribution of livestock holdings (Tables 5a-b). In Village 1, the distribution of livestock, as measured by a Gini coefficient, was virtually unchanged between 1982 and 1988 (Gini=.68). However, the (Gini) correlation between the distribution of livestock holdings and total income rankings increased, indicating that livestock holdings have become concentrated in upper-middle to upper income households. In Village 2, both the livestock Gini and (Gini) correlation with total income rankings increased between the two years.

As livestock holdings expanded, they appear to have raised the shadow price of hillside lands on which herds are concentrated. In 1982, family holdings of hillside lands did not significantly explain crop or non-crop farm income. (See top panels of Tables 6a-b). By 1988, there were significant positive returns to hillside landholdings in noncrop production (Table 4), and these landholdings accounted for 18 percent to 27 percent of total household-farm income (Tables 6a-b). (Holdings of lakeside lands, which are used almost exclusively for crop production, had a significant positive effect on crop income in both years.) This finding suggests that as herds expanded during the 1980s, holdings of hillside land became a constraint on livestock production. The contribution of this livestock complement to total income inequalities, however, is small (4-8 percent). This is because of the relatively equal distribution of ejido, or state-sector, land, which comprises almost all landholdings in the two villages. The Gini coefficient for hillside landholdings in the two villages is .42 and .43, and the (Gini) correlations between these landholdings and the distribution of total income remained low in 1988 (.19 and .25) although they were higher than in 1982 (–0.04 and

0.09, respectively). Under the Mexican land reform law, the concentration of the lands was discouraged by restrictions on the exchange and rental of *ejido* lands. These restrictions will be lifted under the current reform of Mexico's agrarian laws.

Inequality and the Returns to Assets

It is often assumed in the development economics literature that food price policies can have significant distributional impacts on household-farm incomes. In the case of Mexico, the removal of state price subsidies for maize and beans in the context of economic restructuring and the impending North American Free Trade Agreement (NAFTA) will substantially reduce the returns to cultivating these crops.[6] The distributional effects of changes in agricultural policies can easily be exaggerated in the context of diversified household-farm economies, however, where food production is one of several income sources and where households may be able to shift resources among a portfolio of income activities.

Government price policies and changes in market conditions influence household-farm incomes and inequality by affecting the returns to household-farm assets in one or more income activities. The full distributional effect of changes in the returns to assets in specific activities is influenced in part by households' behavioral response to these changes. For example, a decrease in the returns to land and other assets in maize production should lead to a decrease in the allocation of these family resources to maize production and an increased allocation to other activities in the household-farm's income portfolio (e.g., Mexico-to-U.S. migration). Measuring these long-term behavioral responses are beyond the scope of the

present study. The initial effects of changes in the returns to assets, however, can be explored by estimating inequality elasticities with respect to these returns, holding other returns and asset distributions constant. Table 7 reports these elasticities for each asset and income-source combination.

The most salient finding that emerges from Table 7 is the small magnitude of the distributional effects of changes in the returns to household-farm assets in crop production in these highly diversified household-farm economies. For example, the inequality elasticity of returns to (lakeside) land in crop production for 1988 ranges from -0.03 to -0.05 in Villages 1 and 2, respectively. The largest (in absolute value) inequality elasticities of asset returns reported in the Table are for assets in noncrop farm production: -0.18 (education) in Village 1 and -0.19 (holdings of hillside land) in Village 2. These findings highlight the extent to which the household-farms in our sample have diversified into noncrop production (principally livestock). They are not intended to diminish the importance of changes in government price policies and market conditions in small-farm economies, but rather to highlight the importance of considering the full portfolio of household-farm income activities when exploring the effects of these changes on the level and distribution of household-farm incomes. First-round impacts of price policies on household-farm income are muted by the high degree of income diversification in household farms. The full impact of these policies on household-farm incomes may be muted further by farmers' portfolio responses to policy changes, e.g., by shifting family resources from crop production into noncrop farm production and migration activities. The impact of food price policies on the distribution of household-farm incomes

will depend in part on differences in the ability to diversify away from crop production in response to these policies in households at different points in the income distribution.

IV. CONCLUSIONS

Our regression findings and asset Gini decompositions reveal fundamental changes in the structure of village incomes and inequality that can be explained by changes in the distribution of household-farm assets and changes in the returns to these assets over time. Several methodological and policy implications emerge from this research.

First, income-source decompositions of household-farm income inequality offer a useful overview of the components of inequality in diversified household-farm economies, but they do not provide a means of explaining why income-source effects on inequality vary across space and over time. Asset Gini decompositions make it possible to explain income-source effects on inequality as a function of the distribution and returns to income-producing assets, and to relate these effects to changes in policies, markets and the macro economy. In the Mexican villages we studied, the diffusion of contacts with family migrants in the United States (U.S. migration capital) reversed an initially unequalizing effect of U.S. migrant remittances on household-farm income inequality. A decline in the returns to migrant contacts and schooling in urban areas in the context of Mexico's economic crisis dramatically reduced the role of rural-to-urban migrant remittances in household-farm income and inequality, while U.S. migration capital, the value of which depends on employment opportunities abroad, continued to play a central role in explaining village income. An expansion

of livestock herds substantially altered income portfolios, the role of noncrop farm income, and the importance of complementary assets (e.g., hillside land) in the village income distributions.

Second, researchers and policymakers easily may overestimate the income impacts of food price policies in highly diversified household-farm economies. Even a large decrease in the returns to household-farm assets in crop production, as would result, for example, from the impending liberalization of maize and beans prices in Mexico, would have a disproportionately small impact on household-farm incomes. For example, a 30% decrease in income from maize and beans production would decrease total household-farm income by 3.2 to 4.4 percent in the villages that are the focus of the present study, assuming that families did not reallocate their resources among income activities in response to this change. It is characteristic of diversified household-farm economies, however, that changes in the returns to one activity trigger compensating changes in the allocation of family resources to this and other activities. The full impact of food price decreases, therefore, is likely to be smaller than these numbers suggest. When assessing the impacts of policy changes on income inequality, it is important to consider the access of households at different points in the income distribution to income-producing assets in noncrop activities.

Third, because of the important role that migration traditionally has played in Mexico's diversified household-farm economies, a decrease in the returns to maize and beans production as a result of economic liberalization almost undoubtedly will increase Mexico-to-U.S. migration in the short-to-medium run, for three reasons. First, economically rational farmers will

reallocate resources away from less profitable maize and beans production toward other activities, including migration. Second, rural-to-urban migration opportunities and a tradition of sending migrants to the city appear to have evaporated (and families' internal migration capital lost its value) during Mexico's economic crisis of the 1980s. The once-important role of internal migrant remittances in these household-farm economies is not likely to recover in the 1990s, given constraints on employment creation that result from Mexico's relatively poor infrastructure and given Mexico's rapid labor-force growth (in excess of 3%) over the next 10 years and beyond. Finally, a decrease in the returns to traditional crop activities creates an incentive to invest in new village production activities, and past research (Taylor, 1992; Fletcher and Taylor, 1992) indicates that migration has played an important role in alleviating financial and also perhaps risk constraints on the accumulation of income-producing assets for these activities in the past.

Increases in Mexico-to-U.S. migration induced by maize price declines in Mexico, however, are easily exaggerated by models that ignore the diversification of local income sources in Mexico's household-farm economies.

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FOOTNOTES

[1]Net income gains from migration by a family member include income sent home, or remitted, by the migrant minus the sum of migration costs paid by the household and the loss of household income from cropping and other activities that may be associated with the loss of family labor to migration; see Taylor, 1987.

[2] A number of different measures of income inequality and decompositions of inequality by income source are available, and none is universally preferred (e.g., see Shorocks). We use the Gini coefficient and its decomposition for several reasons: it is intuitively appealing, it has a straightforward economic interpretation as a derivative of the Lorenz curve and is widely used, and it performs favorably relative to other measures of income inequality (Atkinson (1970)). The Gini coefficient is defined relative to the mean, is unaffected by proportional increases in all incomes, and is sensitive to transfers on the same side of the mean, so that any transfer from a wealthier to a poorer household will decrease the Gini coefficient. In its most common form, the Gini is most sensitive to the middle range of the distribution; however a simple adjustment can be made to weight other income classes more heavily if desired (Lerman and Yitzhaki, 1985; Stark, Taylor and Yitzhaki, 1988). Yitzhaki (1982) has shown that the Gini and the mean permit the formation of necessary conditions for stochastic variance. One drawback to the Gini is that it implies constant inequality aversion, whereas for many welfare measures increasing inequality aversion might be preferable.

[3]The properties of these decompositions are derived and discussed in Schechtman and Yitzhaki (1985) and in Stark, Taylor and Yitzhaki (1986).

[4]Because of the possibility of cross-equation error correlations ($E(\varepsilon_k \varepsilon_{k'}) \neq 0$ for $k \neq k'$) the equations were also estimated jointly using seemingly unrelated regression (SUR; see Zellner), with both qualitatively and quantitatively similar results.

[5]Taylor (1987) found that the principal influence of migration capital on household remittance income is through the effect of family contacts on the decision to send migrants to the United States.

[6]The impact of price reforms on farmgate prices for maize in Mexico will depend on a number of factors including the substitutability of (imported) yellow corn for (local) white varieties and the price elasticity of foreign supplies of white corn. Nevertheless, there is general agreement that farmgate prices for maize in Mexico will decrease considerably once government price supports are phased out, perhaps on the order of 40 percent or more.

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TABLE 1. Description of Variables.

Experience	Experience of household head (defined as age - education - 6).
Education	Number of adults in the household with at least 6 years of schooling.
Adults	Total number of family members 15 years of age or older. Includes migrants and other members in the village who may not live together.
US migrants	Number of family members who were US migrants in 1981, the year preceding the period covered by the survey.
US migrant capital age	Total accumulated years of US migration experience of current Mexico-to-U.S. migrants in 1981.
Mexican migrants	Number of family members, who were rural-to-urban (internal) migrants in 1981.
Mexican migrant	Total accumulated internal migration experience of current rural-to-urban migrants in 1981.
Livestock	Number of animal units; small animals (mostly swine) weighted at one-half a large animal (predominantly cattle).
Hillside Land	Area of upland fields controlled by the household (hectares).
Lakeside Land	Area of lowland fields controlled by the household (hectares).
USIMR	Inverse Mill's Ratio for US remittance equation.
MXIMR	Inverse Mill's Ratio for internal remittance equation.
Village	Dummy variable equal to one if Village 1, zero otherwise.

TABLE 2. Descriptive statistics.

	Village 1				Village 2			
	1982		1988		1982		1988	
Asset	mean	st. dev.	mean	st. dev.	mean	st. dev.	mean	st. dev.
Experience	42.8	13.4	47.8	13.4	45.7	11.9	50.7	11.9
Education	1.52	1.43	1.93	1.89	1.58	2.47	1.85	2.92
US migrants	.310	.806	.759	1.30	1.92	1.98	2.85	2.34
US migrant capital age	1.05	3.24	3.73	8.62	13.3	18.5	26.5	25.2
Mexican migrants	1.17	1.17	1.28	1.31	1.23	1.75	1.65	1.98
Mex migrant capital age	3.67	6.31	8.75	10.5	10.2	18.9	17.2	27.2
Adults	6.52	2.75	7.59	3.05	6.81	3.18	8.65	3.01
Livestock	4.14	5.95	6.12	10.2	9.54	8.19	13.0	14.3
Hillside Land	.876	.638	.876	.638	3.29	2.57	3.29	2.57
Lakeside Land	1.79	1.59	1.79	1.59	3.27	2.02	3.27	2.02
Total income	1163	797	2201	1624	2575	2302	5383	7076
	n = 29				n=26			

U.S. Remittance Income

TABLE 3. Income inequality shares and elasticities of income sources.

Village and Income Source	1982 Income Share	1982 Inequality Share	1982 Elasticity*	1988 Income Share	1988 Inequality Share	1988 Elasticity*
Village 1						
TOTAL	1	1.0	0.0	1	1.0	0.0
US remittances	0.144	.255	0.11	0.136	.198	0.06
Total internal inc	0.856	.747	-0.11	0.864	.802	-0.06
Internal remit	0.241	.126	-0.12	0.037	.008	-0.03
Village income	0.615	.618	0.00	0.827	.794	-0.03
Farm	0.113	.163	0.05	0.145	.091	-0.05
Other	0.501	.455	-0.05	0.682	.703	0.02
Village 2						
TOTAL	1	1.0	0.0	1	1.0	0.0
US remittances	0.212	.133	-0.08	0.214	.141	-0.07
Total internal inc	0.788	.867	0.08	0.786	.859	0.07
Internal remit	0.237	.333	0.10	0.053	.087	0.03
Village income	0.551	.533	-0.02	0.733	.772	0.04
Farm	0.125	.194	0.07	0.106	.123	0.02
Other	0.425	.340	-0.09	0.628	.649	0.02

The elasticity of total income inequality with respect to income source is obtained by considering an exogenous change in each household-farm's source-j income by a factor of e, i.e., $y_k(e) = (1 + e)\, y_k$, and then calculating the elasticity $\eta_{G,k} = \frac{\partial G_0 \partial_e}{G_0}$ (see Stark, Taylor and Yitshaki, 1986).

TABLE 4. OLS Estimates of Activity-Specific Returns to Assets.

A. 1982.

ASSET	Income Source				Total $\left(\sum_{k=1}^{4}\beta_{kj}\right)$
	US remit	Int remit	Farm	Other	
Constant	90.41	339.3	-518.2	698.8	310.3
	(1.234)	(1.404)	(2.107)	(3.431)	
Experience			9.468		9.468
			(1.644)		
Education		217.9	182.0	78.81	478.7
		(4.500)	(4.804)	(1.476)	
Adults		-98.06			-98.06
		(2.502)			
US migrants	139.1				139.1
	(2.516)				
US migrant capital age	15.02	29.90	-19.22		25.71
	(2.351)	(4.199)	(3.073)		
Mexican migrants		309.8	-272.8		37.01
		(3.975)	(3.625)		
Mexican migrant capital age	-9.472		14.15		4.68
	(2.393)		(1.861)		
Livestock			29.44	28.58	58.01
			(2.381)	(1.642)	
Hillside Land	37.16	-80.76			-43.59
	(1.401)	(1.956)			
Lakeside Land			83.11		83.11
			(2.183)		
Village				-353.2	-353.2
				(1.642)	
US inverse Mills ratio	$4.5x10^5$				$4.5x10^5$
	(.848)				
Mexican inverse Mills ratio		332.1			332.1
		(2.144)			
R^2	.6253	.5955	.5868	.2243	

System R^2 = .9044 n = 55
Values in parentheses are t-statistics.

B. 1988.

ASSET	Income Source				Total $\left(\sum_{k=1}^{4}\beta_{kj}\right)$
	US remit	Int remit	Farm	Other	
Constant	655.9	-125.3	-110.2	84.18	504.6
	(2.565)	(.999)	(.750)	(.157)	
Education	-99.92		100.6	248.0	248.7
	(2.214)		(2.594)	(1.673)	
Adults					0.0
US migrants	534.6			-472.4	62.26
	(5.573)			(2.840)	
US migrant capital age	-39.38	-12.76	-6.320		-58.46
	(3.878)	(2.937)	(1.497)		
Mexican migrants					0.0
Mexican migrant capital age		7.529			7.529
		(1.728)			
Livestock	39.41	42.18	22.91	189.8	294.3
	(4.233)	(5.669)	(2.790)	(6.447)	
Hillside Land				448.2	448.2
				(2.823)	
Lakeside Land	-91.43		95.13		3.699
	(1.670)		(2.025		
Village	-500.1				-500.1
	(2.221)				
US inverse Mills ratio	449.6				449.6
	(2.489)				
Mexican inverse Mills ratio		109.8			109.8
		(.769)			
R^2	.6255	.4442	.4567	.6120	

System R2 = .9178 n = 55

Values in parentheses are t-statistics. Critical levels are: $t_{.05} = 1.679$; $t_{.10} = 1.301$

TABLE 5. Asset contributions to village income inequality.

A. Village 1
1982

Asset	Share of Total Income Explained by Asset (S_j)	Gini Coefficient for Asset (G_j)	Gini Correlation Between Asset and Total Income Rankings (R_j)	Asset Share in Total Income Inequality ($S_jG_jR_j/G_0$)
Constant	.221	0	0	0
Experience	.348	.179	.315	.094
Education	.624	.532	.308	.491
Adults	- .549	.238	.475	- .298
US migrants	.037	.905	.570	.092
US migrant capital age	.023	.940	.631	.066
Mexican migrants	.037	.555	.227	.023
Mexican mig. capital age	.015	.782	.317	.018
Livestock	.206	.682	.581	.393
Hillside Land	- .033	.418	- .037	.002
Lakeside Land	.128	.480	.406	.119
Total	1.057	.380[1]		
Constant	.002	0	0	0
Education	.218	.552	.132	.041
US migrants	.021	.750	.281	.012
US migrant capital age	- .099	.880	.244	- .055
Mexican mig. capital age	.030	.640	- .120	- .006
Livestock	.818	.679	.673	.971
Hillside Land	.178	.418	.185	.036
Lakeside Land	.003	.480	.441	.002
Total	1.172	.394[1]		

[1] Observed Gini Coefficient.

B. Village 2
1982

Asset	Share of Total Income Explained by Asset (S_j)	Gini Coefficient for Asset (G_j)	Gini Correlation Between Asset and Total Income Rankings (R_j)	Asset Share in Total Income Inequality ($S_jG_jR_j/G_0$)
Constant	.237	0	0	0
Experience	.168	.142	.257	.021
Education	.293	.752	.806	.602
Adults	- .259	.270	.090	- .021
US migrants	.104	.109	.118	.007
US migrant capital age	.132	.697	.538	.168
Mexican migrants	.018	.722	.055	.002
Mexican mig. capital age	.019	.819	- .069	- .004
Livestock	.215	.476	.647	.224
Hillside Land	- .056	.433	.089	- .007
Lakeside Land	.106	.357	.057	.007
Total	.976	.476[1]		
Constant	.094	0	0	0
Education	.085	.743	.565	.098
US migrants	.033	.476	.277	.012
US migrant capital age	- .288	.534	.317	- .133
Mexican mig. capital age	.024	.755	- .021	- .001
Livestock	.697	.562	.880	.942
Hillside Land	.274	.433	.255	.083
Lakeside Land	.002	.357	.103	.000
Total	.921	.496[1]		

[1] Observed Gini coefficient.

TABLE 6. Percentage contributions of assets to total income and inequality through income sources.

A. Village 1
1982.

Asset	US remittances S_{kj}	US remittances SGR/G_0	Internal remit. S_{kj}	Internal remit. SGR/G_0	Farm S_{kj}	Farm SGR/G_0	Other S_{kj}	Other SGR/G_0
Constant	.078	0	.292	0	-.445	0	.297	0
Experience					.348	.096		
Education			.284	.226	.237	.188	.103	.082
Adults			-.549	-.298				
US migrants	.037	.092						
US migrant capital age	.014	.038	.027	.077	-.017	-.048		
Mexican migrants			.312	.188	-.275	-.168		
Mexican mig. capital age	-.030	-.034			.045	.053		
Livestock					.105	.202	.102	.192
Hillside Land	.028	-.002	-.061	.005				
Lakeside Land					.128	.120		
Total	.126	.091	.305	.097	.125	.438	.501	.274
Constant	.071	0	-.057	0	-.050	0	.038	0
Education	-.088	-.016			.088	.016	.217	.042
US migrants	.184	.101					-.163	-.088
US migrant capital age	-.067	-.036	-.022	-.013	-.011	-.005		
Mexican mig. capital age			.030	-.005				
Livestock	.110	.130	.117	.140	.064	.075	.528	.626
Hillside Land							.178	.036
Lakeside Land	-.074	-.042			.077	.042		
Total	.136	.138	.069	.122	.168	.130	.799	.616

B. Village 2
1982.

Asset	US remittances S_{kj}	US remittances SGR/G_0	Internal remit. S_{kj}	Internal remit. SGR/G_0	Farm S_{kj}	Farm SGR/G_0	Other S_{kj}	Other SGR/G_0
Constant	.035	0	.132	0	-.201	0	.271	0
Experience					.168	.020		
Education			.133	.275	.111	.231	.048	.098
Adults			-.259	-.020				
US migrants	.104	.007						
US migrant capital age	.077	.098	.154	.197	-.099	-.125		
Mexican migrants			.148	.020	-.130	-.017		
Mexican mig. capital age	-.038	.007			.056	-.010		
Livestock					.109	.115	.106	.112
Hillside Land	.047	.007	-.103	-.014				
Lakeside Land					.106	.007		
Total	.226	.119	.205	.454	.120	.217	.425	.210
Constant	.122	0	-.023	0	-.020	0	.016	0
Education	-.034	-.038			.035	.038	.085	.098
US migrants	.283	.101					-.250	-.090
US migrant capital age	-.194	-.090	-.063	-.030	-.031	-.014		
Mexican mig. capital age			.024	-.001				
Livestock	.093	.126	.100	.134	.054	.074	.450	.607
Hillside Land							.274	.082
Lakeside Land	-.056	-.005			.058	.005		
Total	.214	.093	.038	.104	.095	.104	.575	.697

TABLE 7. Elasticity of Gini with respect to returns to household-farm assets.

A. Village 1
1982

Asset	Elasticity of Income Inequality with Respect to Returns to Asset In: US Migration	Internal Migration	Crop Production	Non-Crop Production
Constant	- .078	- .292	.445	-.297
Experience			- .254	
Education		- .060	- .050	- .021
Adults		.251		
US migration capital	.055			
US migration capital age	.025	.050	- .032	
Mexican migration capital		- .123	.108	
Mexican migration capital age	- .006		.009	
Livestock			.095	.091
Hillside Land	- .030	.065		
Lakeside Land			- .008	
Constant	- .071	.057	.050	- .038
Education	.071		- .072	- .176
US migration capital	- .083			.074
US migration capital age	.030	.010	.005	
Mexican migration capital age		- .036		
Livestock	.020	.022	.012	.098
Hillside Land				- .143
Lakeside Land	.033		- .035	

B. Village 2
1982

Asset	Elasticity of Income Inequality with Respect to Returns to Asset In: US Migration	Internal Migration	Crop Production	Non-Crop Production
Constant	- .035	- .132	.201	- .271
Experience			- .147	
Education		.141	.117	.051
Adults		.238		
US migration capital	- .097			
US migration capital age	.021	.042	- .027	
Mexican migration capital		- .128	.113	
Mexican migration capital age	.045		- .067	
Livestock			.005	.005
Hillside Land	- .041	.090		
Lakeside Land			- .098	
Constant	- .122	.023	.020	- .016
Education	- .005		.005	.012
US migration capital	- .181			.160
US migration capital age	.104	.034	.017	
Mexican migration capital age		- .025		
Livestock	.033	.035	.019	.158
Hillside Land				- .191
Lakeside Land	.050		- .052	