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HOUSEHOLD MODELING FOR THE DESIGN OF POVERTY ALLEVIATION STRATEGIES[1]

by

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Abstract

Insufficient access to assets is the main determinant of poverty. We analyze the role of access to assets in explaining household labor allocation strategies, sources of income, levels of income achieved, and poverty headcount ratios among classes of Mexican rural households. To assess the gains from asset redistribution, we both measure the direct income effects from redistribution and simulate the general equilibrium effects of redistribution in a computable non-separable household model. Results show that land redistribution allows to achieve both equity and efficiency gains. However, there are economies of scale in self-employment in microenterprise, human capital assets for labor market participation, and social capital for international migration, implying conflicts between equity gains and social efficiency in redistributing these assets towards those with lower endowments.

I. Assets and poverty

Insufficient asset entitlements is the main determinant of poverty. For rural households, who typically pursue multiple sources of income, assets that determine the choice of income earning strategies and the levels of income achieved are quite diverse. In agriculture, they include land, irrigation, productive capital, and livestock for direct production and organizational capital for the reduction of transactions costs in accessing markets. For wage earnings on the labor market, they include the number of adults in the household who can participate the labor market and the level of human capital embodied in each. For self-employment in microenterprise activities, they include

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fixed capital committed to these activities. And for migration, they include the stock of migration capital constituted by the existing network of individuals with migratory experience to which household members have access for information and support. Entitlement failures in all of these assets is near certain poverty, and welfare rises as claims over one or several of these assets increase.

In designing rural poverty alleviation strategies, policy makers need to deal with both the high degree of heterogeneity that characterizes rural populations and the broad array of types of assets that could be transferred as instruments to reduce poverty among specific groups of households. The problem is thus highly multidimensional and requires careful empirical analysis to disentangle the many dimensions involved and anticipate the expected impact of targeted resource transfers, both in terms of direct (first round) effects as well as total effects through resource reallocation in the household as a consequence of the transfers. Methodologically, this calls upon a detailed characterization of existing poverty in relation to asset entitlements, and construction of simulation models to anticipate the household-level general equilibrium effects of the transfers.

In this paper, we use a national survey of Mexican rural households to conduct this type of analysis. We first analyze the role of access to assets in determining household income strategies, levels of income achieved, and incidence of poverty among different groups. We do this by constructing a typology of households where asset entitlement is the discriminating factor. We then build a household model that is based on the role of different categories of assets in explaining behavior. Specification of the role of assets and the differential tradability of particular products and factors is developed by close analogy with Computable General Equilibrium models for small open economies. We then proceed to quantify this model and use it to simulate the consequences of improvement in specific asset entitlements across household groups. This allows us to measure the expected income, equity, and social efficiency effects of alternative targeting of assets transfers. It also allows to contrast the magnitude of first round and general equilibrium effects of these transfers, and hence identify the role of differential flexibility in resource reallocation across households in taking advantage of the transfers. Most particularly, the results allow to identify

transfers for which there are diseconomies of scale, and hence where objectives of equity and social efficiency are reconciled.

II. An assets-based household typology

The data we use are from a 1994 national survey of households in the Mexican ejido (land reform) sector. It consists in 1,377 observations in 250 ejidos. Typical of smallholders, these households are engaged in crops and livestock production, wage labor on local labor markets, self-employment in microenterprise activities, domestic migration, and international migration.

In Table 1, households are categorized by their current control over the three types of assets which are the main determinants of time allocation strategies and levels of income achieved. They are:

- Agricultural assets, measured in hectares of national rainfed equivalent (haRE) for corn production, with a threshold of 4 haRE for high assets.

- Labor force assets, measured in number of unskilled equivalent adults (UEA) in the household, with a threshold of 6 UEA for high assets. For each adult in the household, UEA is defined as: 1.06^i for $i \leq 6$, $1.06^i\ 1.12^{i-6}$ for $6 < i \leq 12$, and $1.06^6\ 1.12^7$ for $i > 12$, where i is the number of years of schooling, a scale based on the role of education in labor market earnings estimated by T.P. Schultz (1993).

- Migration assets, measured as the sum of the number of permanent migrants from the extended family (brothers and sisters of the head of household), members of the household who have migrated in the past either seasonally or permanently, and members of the household who are currently engaged in migration minus one (since this is the migration capital for one migrant in the household). The threshold is migration assets greater than zero.

In Table 1, households are classified in eight groups according to their endowments in these assets, from those who are below the threshold for all three assets (group 1), to those with one asset above threshold (groups 2, 3, and 4), two assets above threshold (groups 5, 6, and 7), and all three assets above the threshold (group 8). Ownership of these assets represents the <u>potential</u> which

households have in designing income earning strategies that capitalize on these assets, not the actual income strategies, and the potential which they have in reaching higher income levels as asset ownership increases, not the actual income levels achieved. If the typology has predictive power, these potentials are translated in contrasted income earning strategies that specifically correspond to asset ownership. In addition, income level should rise as asset endowments place households above the threshold in a larger number of asset categories. These expected regularities provide us with a test of the validity of the proposed assets approach to the characterization of household behavior.

The income data for the seven groups of households show that assets do indeed matter on incomes levels achieved: households with zero assets achieve 22% of the income achieved by those with all three assets, while those with one asset achieve between 46 and 56%, and those with two assets 59 and 92% of that level. The poverty headcount ratio also falls regularly as the number of assets owned increases, from 76% with zero assets, to between 54 and 44% with one, between 39 and 25% with two, and 23% with three. The predictive power of assets on income and poverty is thus very strong.

The predictive power of assets on income strategy is also strong. Households with:

- Only agricultural assets (group 3) derive 68% of their income from crops and livestock.
- Only labor market assets (group 4) derive 57% of their total income from wage labor.
- Only migration assets (group 2) derive 44% of their income from remittances.

Among households with two types of assets:

- Those with agricultural and migration assets (group 6) derive 81% of their income from crops, livestock, and remittances.
- Those with agricultural and labor market assets (group 7) derive 83% of their income from crops, livestock, and wage earnings.
- Those with labor market and migration assets (group 5) derive 74% of their income from wage earnings and remittances.

Finally, households with the three types of assets (group 8) derive 85% of their income from crops, livestock, wage earnings, and remittances.

Household labor allocation parallels the relative importance of the various sources of income in response to asset ownership. These remarkable regularities allow us to proceed with the construction and calibration of a household model that will serve to predict how households adjust their labor allocation strategies to changing levels of asset ownership. This in turn allows to predict what is the poverty reduction value and the social efficiency gain or cost of policies that target asset transfers to specific classes of households.

III. A household model with several categories of effective labor

The household allocates its total family time endowment E_l to a set of productive activities both on farm and off farm, as well as to home time (leisure). The activities that compete for family labor are agriculture, self-employment in household-based microenterprises, labor market employment, domestic migration, and international migration. Each of these activities uses specific assets z_i owned by the household. For instance, agriculture uses land and fixed agricultural capital assets (z_a); microenterprises uses (non-observable) implements and a stock of accumulated experience in crafts or trade; labor market employment uses human capital assets composed of both the number of household workers and their educational levels; and migration uses social capital assets under the form of the accumulated stock of kin with migratory experience (migration capital). For agriculture, labor may be hired and inputs purchased. This allocation can be summarized as follows:

Activities	Fixed assets	Household time	Hired labor	Purchased inputs
Agriculture	z_a	l_a	$\{-q_a\}$	$\{-q_a\}$
Microenterprises	z_{na}	l_{na}		
Labor market	z_w	l_w		
Domestic migration	z_{dm}	l_{dm}		
International migration	z_{im}	l_{im}		
Home time		c_l		
Total household time		E_l		

2.1. Household productive activities depend on technological specifications as follows:

i) Agricultural production technology, with imperfect substitution between family and hired labor:

$g\left(\left\{q_j\right\}, l_a, z_a\right) = 0$, where

$q_j > 0$ for agricultural commodities produced,

$q_j < 0$ for purchased variable inputs, including hired labor.

ii) Other activities: family labor-based microenterprise production, labor market employment, domestic migration, and international migration:

$q_i = q_i\left(l_i, z_i\right)$, $i = na, w, dm, im$.

In these equations, l_i is measured in <u>units</u> of family labor time with an opportunity cost w^* equal to the marginal productivity of labor in agriculture. q_i is measured in <u>effective units</u> of family labor in the corresponding activity, with a price equal to the hourly income in that activity. For example, if the activity is international migration, z_i is migration capital, l_i is family labor time allocated to international migration, and q_i are units of migrant time with a wage $p_i > w^*$ equal to the hourly income of migrants.

2.2. Household consumption is a vector c that includes food consumed, purchased goods, and home time.

2.3. The price regime includes both price bands on food markets and shadow prices for nontradables as follows:

i) Prices are equal to market prices $\bar{p}_k$ for tradables (T). Products and factors under this price regime are:

- Food bought by the household at a price $\bar{p}_f^b$

Food sold by the household at a price $\bar{p}_f^s$

- Prices for hired labor in agriculture, labor sold on the labor market, migration wages, and purchased inputs. We denote by {T*} this set of commodities.

For these commodities, the prices are $p_k = \bar{p}_k, k \in T$.

ii) Prices are equal to shadow prices for non-tradables (NT). This includes:

- Food, if the household is self-sufficient in food. In this case, the shadow price of food, p_f^*, is determined by $q_f = c_f$..

- Family labor allocated across activities under the time constraint

$$\sum_i l_i + c_l = E_l,\ i = a, na, w, dm, im,$$

which determines the shadow wage w^*. This shadow wage will be measured as the effective unitary family labor cost in agriculture (see below). Family labor is thus treated as homogenous, measured in number of adults, with an opportunity cost w^*. Total labor time E_l is allocated to the various activities l_a, l_i ($i = na, w, dm, im$). Through the specialized assets z_i and the transformation functions $q_i = q_i(l_i, z_i)$, this homogenous labor is transformed into units of effective self-employed (*na*), wage (*w*), and migrant (*dm, im*) labor with activity specific prices p_i ($i = na, w, dm, im$).

Note that, under this system of labor accounting, the wage received on the labor market does not determine the opportunity cost of adult family labor, since this wage applies to units of family labor l_w transformed into units of effective wage labor q_w through the transformation function $q_w = q_w(l_w, z_w)$. Units of effective labor receive different remunerations in the activities *na, w, dm, im*. However, the household cannot specialize in

the most profitable of these activities because it has limited given endowments in each of the corresponding assets z_i.

2.4. Cash constraint: $\sum_{i \in T} p_i\left(q_i + E_i - c_i\right) + S = 0$, where

E_i are changes in stocks

S are exogenous cash transfers.

2.5. For a given status of participation to the food market, and given household characteristics z_h, the household's problem is to:

(1a) $\underset{c,q,l}{\text{Max}}\ u(c, z_h)$

subject to the following constraints:

(1b) $\sum_{i \in T} p_i(q_i + E_i - c_i) + S = 0,$ cash constraint,

(1c) $g(\{q_j\}, l_a, z_a) = 0,$ production technology for agriculture, $j \in A,$

(1d) $q_i = q_i(l_i, z_i),$ production technology in non-agricultural activities, $i \in NA = \{na, w, dm, im\},$

(1e) $p_k = \bar{p}_k, \quad k \in T,$ exogenous effective market prices for tradables,

(1f) $q_k - c_k = 0, \quad k \in NT,$ equilibrium conditions for food if household is food self-sufficient, which establishes the shadow price of food p_f^*,

(1g) $\sum_i l_i + c_l = E_l,$ equilibrium conditions for family labor, $i \in \{a, NA\}$, which establishes the shadow price of family labor w^*.

If the household is self-sufficient in food, $T = \{T^*\}$ and $NT = \{f\}$;

If the household is either a buyer or seller of food, $T = \{T^*, f\}$ and $NT = \{0\}$.

Solving the first-order conditions, the reduced form of the model can be written as follows. Agricultural production decisions regarding all products and inputs (including family labor) are represented by a system of supply and factor demand functions in the decision prices p^* and the shadow wage for family labor w^*:

(2a)
$$q_j = q(\{p_j^*\}, w^*, z_a)$$
$$l_a = l_a(\{p_j^*\}, w^*, z_a), \quad j \in A.$$

The household thus behaves as if it were maximizing profit using w^* and p^* as prices. Optimum levels of products and factors yield maximum agricultural profit:

(2b) $$\pi_a^* = \sum p_j^* q_j - w^* l_a, \quad j \in A.$$

Allocation of family time to the other activities equalizes the marginal productivity of labor to the shadow wage w^*:

(2c)
$$p_i^* \frac{\partial q_i}{\partial l_i} = w^*,$$
$$q_i = q_i(l_i, z_i), \quad i \in NA,$$

which yield the maximum non-agricultural activity profits:

(2d) $$\pi_i^* = p_i^* q_i - w^* l_i, \quad i \in NA.$$

On the demand side, decisions are also made in terms of the w^* and p^* prices. Using (1b), (1e), (1f), (1g), (2b), and (2d), the full-income constraint in w^* and p^* prices is written:

(2e) $$\sum_{k \in \{T, NT\}} p_k^* c_k + w^* c_l = \pi_a^* + \sum_{i \in NA} \pi_i^* + w^* E_l + S = y^*,$$

and the demand system is:

(2f) $$c = c(p^*, w^*, y^*, z_h).$$

On the consumption side, the household thus behaves as if it were maximizing utility using w^* and the p^* prices.

Decision on the food market regime is made as follows: if the shadow price of food, p_f^*, is lower than the market sale price, the household opts for the seller regime; if p_f^* is greater than the purchase price, it chooses the buyer regime; and if p_f^* lies between the two market prices, it remains self-sufficient:

$$
\begin{array}{lll}
p_f^* \le \overline{p}_f^s & \text{then} & f \in T \quad \text{and} \quad \overline{p}_f = \overline{p}_f^s, \\
\overline{p}_f^s < p_f^* < \overline{p}_f^c & \text{then} & f \in NT, \\
p_f^* \ge \overline{p}_f^c & \text{then} & f \in T \quad \text{and} \quad \overline{p}_f = \overline{p}_f^c.
\end{array} \tag{2g}
$$

IV. Measurement problems

To calculate the shadow wage w^* of family labor in agriculture, we proceed as follows. For each crop, region, and technological level, we know the total labor cost $w_a l$ from a study by Matus (1994). This is equivalent to technical coefficients in units of hired labor equivalent. These coefficients can be used to derive the total labor cost that would be incurred by each household in the survey, given its crop mix, region, and technological level in each crop. From the survey, we also know, for each household, the share of family labor in total labor. This gives us the family labor cost $w^* l_a$. Using the observed family labor availability for agriculture, l_a, (and not the labor time spent farming) we derive the shadow wage of family labor w^*. This shadow wage measures the average labor return per unit of family labor in agriculture. It is lower than the agricultural wage w_a since there is considerable hidden unemployment among family members in agriculture. At an equilibrium point, the marginal productivity of family labor in all activities is equal to this shadow wage. These values for each household category are given in Table 3.

The non-agricultural activities only use family labor. Hence, gross revenue from the activity is distributed over family labor and the corresponding fixed asset as:

$$p_i q_i = w^* l_i + r_i z_i.$$

At equilibrium allocation of family labor across activities, $MP_{z_i} = r_i$. Hence, we can measure the marginal productivity of the asset z_i as:

$MP_{z_i} = r_i = \dfrac{1}{z_i}\left(p_i q_i - w^* l_i\right)$, using observations on z_i, $p_i q_i$, l_i, and the measured w^*. The values for asset income ($r_i z_i$) and the marginal productivity of assets (MP_{z_i}) are given in Table 3 for the different household categories.

For self-employment in microenterprises, z_{na} is not directly observable. In this case, we measure z_{na} as the difference between income received in this activity and the cost of family labor used in this activity measured at its opportunity cost:

$z_{na} \equiv r_{na} z_{na} = p_{na} q_{na} - w^* l_{na}$, where z_{na} has a return of one.

The profit function for agriculture is specified as a Generalized Leontief. The parameters of the derived system of supply and factor demand, for the average farm, are derived from best guess price elasticities derived from Sullivan et al. (1988), calibrated to satisfy the homogeneity and symmetry constraints. They are scaled for different farm size groups based on the profit share of each commodity or factor in that farm group relative to the average farm (see de Janvry, Sadoulet, Fafchamps, and Raki, 1992).

Non-agricultural activities respond to a CES transformation function, with elasticity of substitution σ and share parameter α. Starting from given values of σ and the elasticities of price response, the share parameters can be derived.

The consumption system is derived from a Translog indirect utility function in food, purchased goods, and home time. The parameters are derived from prior estimates of price and income elasticities, calibrated to satisfy the additivity and symmetry constraints.

The household model is thus identical to a Computable General Equilibrium (CGE) model for a small open economy with both tradables and non-tradables, and with a multimarket specification of the agricultural sector (Sadoulet and de Janvry, 1992), an approach which we referred to as Computable Nonseparable Household (CNH) models (de Janvry, Sadoulet, Fafchamps, and Raki). This particular CNH model has five sectors (agriculture, microenterprises, wage labor, domestic migration, and international migration), tradables (food when sold or bought, and other products and factors bought and sold), and nontradables (food when fully home consumed and family labor).

V. Asset transfers and poverty

If assets $\Delta z_i > 0$ are transferred to a household, this induces two adjustment effects: first, additional assets z_i increase the number of effective units q_i for a given amount of family labor l_i allocated to this activity; second, family labor time is reallocated toward this activity as it becomes relatively more profitable, increasing further the level q_i of this activity.

We have seen that the structure of asset ownership is a powerful determinant of the income strategy followed and of the levels of income achieved. Poverty reduction strategies can thus effectively focus on improving access to assets for different categories of households. In comparing the impact of this asset transfer across households, two measures can be used:

i) The absolute income effect created by transfer of one unit of a particular asset. This gives us a measure of the social value of asset use by different groups. Of particular interest is whether the marginal unit of this asset creates a higher income gain among those who have relatively lower or higher initial endowments of that asset. If the former, there are diseconomies of scale in the use of the asset, and a progressive redistribution of the asset is also socially efficient. If the latter, there are economies of scale in the use of the asset, creating a tradeoff between equity and efficiency: a progressive redistribution of the asset is at the cost of a global efficiency loss.

ii) The percentage gain in income for each household category created by transfer of one unit of a particular asset. This gives us a measure of the welfare enhancement value of the asset for each household category.

There are two measures of impact of the asset transfer on household income which we can use and contrast:

i) We have seen that we can measure the marginal productivity of each asset (MP_{z_i}) in each household category. This gives us the direct contribution to agricultural profit and to net income in each activity of the marginal asset transfer, without taking into account resource reallocation in production and consumption.

ii) Through solution of the CNH model, we can measure the change in income induced by the asset transfer, after full reallocation of resources in production and consumption has occurred.

The difference between marginal productivity and full income effects gives a measure of the degree of flexibility in adjusting to the change, and hence in deriving greater benefit from the transfer.

We simulate the transfer of fixed amounts of each of the assets to the different household classes. For all four transfers, the results in Table 4 and in Figure 1 show that asset redistribution is progressive: for one unit of asset transfer, the percentage gain is income is larger for the poorer than for the richer households. From an equity standpoint, asset redistribution is thus an effective way of improving the distribution of income. Comparing the marginal productivity and total income effects shows that flexibility in resource reallocation is important for agricultural assets. In this case, the total income effect is less inversely related to the level of household income than the marginal effect, indicating that high income households have more flexibility in reallocating resources to accommodate a change in farm size than poor households.

The absolute effect of a change in assets has more surprises. Agricultural assets displays the expected inverse relation between income (both marginal productivity and total income) and farm size. There are thus diseconomies of scale in farm size which justify redistributive land reform, whereby land is redistributed from large to small farms. Land redistribution is thus both progressive and socially efficient. However, greater flexibility in resource reallocation on larger farms diminishes somewhat, without erasing it, the inverse relation. This greater flexibility comes from the fact that large farms use the labor market more expensively, and hence have more flexibility in adjusting the labor force to changing farm size.

There are clear economies of scale in human capital assets, at least to the scale of 9 unskilled adult equivalent. This includes both family size and educational level. A larger family is better for resource reallocation. And there are increasing returns to education up to 12 years of schooling. In this case, educating those with low education is progressive, but it is not socially efficient: it is better to concentrate resources to bring to 12 years of education those who are being educated.

In microenterprise activities, higher flexibility in resource reallocation among those with higher levels of microenterprise assets also creates strong economies of scale. Here also,

distributing microenterprise assets toward those with low asset levels is progressive but not socially efficient.

Finally, the marginal effect of migration capital is neutral to scale, but not the second round effects in resource reallocation which create increasing returns to scale. Allowing for resource reallocation, migration is thus a cumulative phenomenon: the accumulation of migration in an extended family system makes a marginal unit of this capital increasingly profitable. This observation confirms the role of migration assets in migration as described by many analysts of migration (Durand and Massey, 1992).

VI. Conclusions

Insufficient access to assets is a fundamental determinant of poverty. Understanding the equity and social efficiency effects of redistributing assets toward the poor is thus important for the design of poverty alleviation programs. We analyzed both the directly measured first round effects of assets transfers and simulated the general equilibrium effects of these transfers in a computable non-separable household model. Results show that asset redistribution toward the poor is always progressive in that it generates a larger percentage income gain for those with lower income levels. However, the absolute income gains may not be largest among those with low assets levels, particularly when resource reallocation effects are taken into account. For land, equity and efficiency are compatible as there exists an inverse relation between the income effect of an additional unit of land and farm size. Redistributive land reform thus remains a fundamental instrument of an assets-based poverty reduction program. This is not the case for the other assets: there are economies of scale in human capital assets, microenterprise assets, and migration capital, implying a tradeoff between equity and efficiency gains. Deriving full social benefits from education thus requires extending educational investments through seven years of schooling. Through the accumulation of social capital, migration is also a cumulative process that explains why successful migration breeds more migration.

The gap between marginal productivity and total income effects indicate the importance of flexibility in resource reallocation in taking maximum advantage of assets transfers. In particular, a larger family size allows greater flexibility in resource reallocation. Greater participation to the labor market as employers also gives a flexibility advantage to the larger farms. Increasing flexibility in resource reallocation among the poor is thus fundamental in helping them derive full benefit from programs of assets transfers.

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Table 1 - Typology of households by asset ownership

	Household classes								
	Zero assets	One asset			Two assets			Three assets	
Agricultural assets†	low	low	high	low	low	high	high	high	
Labor market assets	low	low	low	high	high	low	high	high	All
Migration assets	none	yes	none	none	yes	yes	none	yes	households
	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	
Number of observations	341	114	349	101	24	204	132	112	1377
Percent of households	24.8	8.3	25.3	7.3	1.7	14.8	9.6	8.1	100.0
Agricultural assets									
Land									
Total (ha)	2.9	3.3	17.5	3.1	3.7	15.6	15.2	20.7	11.2
Share in irrigated (%)	3.7	4.3	8.4	6.8	8.5	7.6	14.0	9.0	8.6
Crop land (adjusted ha)**	2.1	2.3	13.9	2.2	2.3	12.6	12.9	17.2	8.9
Livestock (cattle heads)	2.1	2.2	6.8	4.2	5.8	10.0	10.4	12.8	6.4
Human capital assets									
Family size	4.6	5.0	4.3	7.1	6.8	4.7	6.7	7.4	5.2
Education°	3.2	3.7	3.5	8.3	7.5	3.5	8.8	8.8	4.8
Microenterprise (% of households)	2.6	5.3	3.2	5.9	4.2	2.5	9.1	2.7	3.8
Migration assets°°									
to Mexico	0	0.98	0	0	1.29	0.64	0	0.61	0.25
to USA	0	1.23	0	0	0.63	1.57	0	1.68	0.48

† High agricultural assets is more than 4 ha of rainfed equivalent.
High labor force (education) assets is more than 6 unskilled equivalent adult.
** Area adjusted for quality by agroecological zone and irrigation status, in national average rainfed equivalent hectares.
° Education capital for each member over 14 years of age (see text for definition).
°° Migration asset = permanent migrants from extended family and from household + (current migrants from household – 1).

Table 2. Households assets and income

	Household classes								
	Zero assets	One asset			Two assets			Three assets	
Agricultural assets	low	low	high	low	low	high	high	high	
Labor market assets	low	low	low	high	high	low	high	high	All
Migration assets	none	yes	none	none	yes	yes	none	yes	households
	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	
Percent of households	24.8	8.3	25.3	7.3	1.7	14.8	9.6	8.1	100.0
Labor allocation (number of adults)									
Total in household	2.48	3.35	2.59	5.48	5.37	3.24	5.44	5.95	3.54
Main activity									
On-farm	1.02	1.10	1.18	1.83	1.79	1.12	1.89	1.65	1.29
Self employed	0.03	0.07	0.03	0.07	0.04	0.02	0.14	0.04	0.05
Off-farm	0.14	0.13	0.14	0.95	0.29	0.13	0.69	0.70	0.30
Migration									
in Mexico	0.17	0.40	0.07	0.15	0.79	0.31	0.08	0.31	0.20
to the USA	0.01	0.47	0.02	0.00	0.17	0.44	0.01	0.69	0.17
Sources of income by activity (percent)									
Crops	16.0	24.2	49.4	8.6	1.0	42.3	36.1	9.5	31.6
Livestock	12.3	5.3	18.1	12.5	10.0	10.1	12.3	15.3	13.0
Self-employment in non-ag.	7.0	2.9	2.6	2.6	11.9	7.5	5.4	7.3	5.4
Wage labor	33.1	20.3	18.1	57.4	28.5	5.7	34.1	27.6	23.3
Remittances from	21.1	44.3	5.5	8.6	45.4	28.7	3.1	32.1	19.6
Hh member in Mexico	18.9	16.3	3.8	8.6	28.5	6.0	2.8	8.1	7.9
Hh member in US	2.1	17.7	1.6	0.0	5.8	13.4	0.3	15.6	7.3
Non hh member	0.0	10.3	0.1	0.0	11.1	9.3	0.0	8.5	4.3
Other sources	10.7	3.1	6.4	10.3	3.2	5.7	9.0	8.1	7.2
Total income (pesos)									
per household	4,840	12,669	11,664	10,253	13,262	19,124	20,625	22,526	12,844
per capita	1,061	2,516	2,685	1,452	1,953	4,094	3,069	3,036	2,459
Poverty (headcount ratio in %)	75.9	43.8	53.6	52.5	25.0	39.2	35.6	23.2	51.4

Table 3 - Asset incomes

	Household classes								
	Zero assets	One asset			Two assets			Three assets	
Agricultural assets	low	low	high	low	low	high	high	high	
Labor force assets	low	high	low	low	high	low	high	high	All
Migration assets	none	none	none	yes	yes	yes	none	yes	households
	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	
Percent of households	24.8	7.3	25.3	8.3	1.7	14.8	9.6	8.1	100.0
Shadow wage of family labor (pesos)	1374	678	2315	1185	870	2078	1821	2381	1752
Asset income (pesos)									
Agriculture	-36	923	5134	2429	-10	7704	6543	1658	3464
Self-employment	296	224	231	279	1632	1383	857	1559	603
Off farm labor	1408	5243	1786	2418	3756	828	5785	4560	2464
Migration to Mexico	683	777	282	1592	3315	508	429	1081	668
Migration to the United States	88	0	142	1685	670	1647	48	1861	646
Marginal productivity of assets (pesos)									
Agriculture	1303	1737	1034	2257	1285	1227	1525	838	1170
(with adjustment for purchased inputs)	650	995	566	1659	687	796	776	325	643
Off farm labor	443	628	509	659	501	235	656	516	512
Migration to Mexico				1620	2566	791		1780	2688
Migration to the United States				1372	1072	1046		1109	1340

Table 4 - Simulation of income effects of assets transfers

	Household classes								
	Zero assets	One asset			Two assets			Three assets	
Agricultural assets	low	low	high	low	low	high	high	high	
Labor force assets	low	high	low	low	high	low	high	high	All
Migration assets	none	none	none	yes	yes	yes	none	yes	households
	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	
Percent of households	24.8	7.3	25.3	8.3	1.7	14.8	9.6	8.1	100.0
Increase in agricultural asset by 1 ha NRE									
Marginal productivity effect (pesos)	650	995	566	1659	687	796	776	325	643
Marginal productivity effect (% of income)	26.9	16.9	8.9	17.8	9.7	6.4	7.4	3.7	9.1
Total income effect (pesos)	351	803	466	1316	421	669	649	242	527
Total income effect (% of income)	7.3	7.8	4.0	10.4	3.2	3.5	3.1	1.1	4.1
Increase in microenterprise asset by 60 effective pesos									
Marginal productivity effect (pesos)	60	60	60	60	60	60	60	60	60
Marginal productivity effect (% of income)	1.2	0.6	0.5	0.5	0.5	0.3	0.3	0.3	0.5
Total income effect (pesos)	60	67	67	67	59.0	58	68	59	63
Total income effect (% of income)	1.2	0.7	0.6	0.5	0.4	0.3	0.3	0.3	0.5
Increase in labor force asset by 1 unskilled adult equivalent									
Marginal productivity effect (pesos)	443	628	509	659	501	235	656	516	512
Marginal productivity effect (% of income)	9.1	6.1	4.4	5.2	3.8	1.2	3.2	2.3	4.0
Total income effect (pesos)	440	669	537	653	507	262	713	616	557
Total income effect (% of income)	9.1	6.5	4.6	5.2	3.8	1.4	3.5	2.7	4.3
Increase in US migration assets by 1 migrant									
Marginal productivity effect (pesos)				1372	1072	1047		1109	1340
Marginal productivity effect (% of income)				10.8	8.1	5.5		4.9	10.4
Total income effect (pesos)				1557	1182	1272		1690	1665
Total income effect (% of income)				12.3	8.9	6.6		7.5	13.0

Figure 1. Simulation of assets transfers