Determinants of Mexico-U.S. Migration: The Role of Household Assets and Environmental Factors[1]

A Report Prepared for the Natural Heritage Institute
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Concerns with illegal migration to the United States originating in Mexico's rural population, and the possibility of defining a set of interventions to reduce incentives to migrate at the source, require a precise understanding of the current determinants of migration for this population. Clearly, poverty and the expected income gap between emitting and receiving areas are major determinants of migration. The role of remittances in compensating for credit and insurance market failures for Mexican smallholders is an additional incentive to migrate. As migration networks mature, both at the level of individual households and at the community level, the nature of migration changes and becomes increasingly difficult to detain. Finally, environmental factors, particularly population pressure on scarce agricultural resources, limit the options in agriculture for individuals who reach working age and induce migration.

In this report, we try to assess the relative importance of these various determinants of migration for the purpose of identifying policy and programmatic interventions that can be used to reduce incentives to migrate. In Part I, we review the determinants of Mexico-U.S. migration that have been identified in an increasingly rich array of past studies. We then use a 1994 nationwide survey (excluding Chiapas because of political events in that year) of rural households in the social sector of Mexican agriculture, the so-called ejido sector that includes half of Mexico's territory and nearly 60% of its farm population. This is the sector where most of Mexican rural poverty is located, and it is an important source of rural migrants to the North. In Part II, we provide descriptive statistics about rural households who participate in international migration. In Part III, we introduce a number of environmental variables that characterize pressure on the environment as a potential determinant of migration. The role of these variables is analyzed by income levels to establish a relation with poverty. Since poverty is a major determinant of the decision to migrate, we analyze in Part IV the determinants of the income levels achieved by rural households, including the role of migration in the levels of income achieved. To do this, we stress the role of a household's asset position defined in a broad sense to include not only land assets, but also human capital, social, institutional, organizational, migration, and infrastructure assets. In Part V, we analyze the determinants of migration, stressing not only the asset position of households but also the strength of the family and community migration networks to which they have access, and the role of environmental variables. We find strong support for the role of these networks in migration. We pursue this idea by identifying how the role of individual characteristics in migration changes as family and community networks mature. Finally, in Part VI, we extract a number of recommendations for policy and programmatic interventions that could be used to reduce the incentive to migrate among these households. Some of these initiatives could be pursued by United States assistance to rural development and environmental initiatives pursued by the Mexican government or NGOs.

I. Determinants of Mexico-U.S. migration: a literature review

[1] We are grateful to Klaus Deininger from the World Bank for access to his data on deforestation.

1. Characteristics of migrants

Individual and household characteristics of international migrants are, in general, difficult to identify due to the heterogeneity of migrants and because the explanatory power of these characteristics diminishes as a community's migration network grows. A strong community migration network, synergistically composed of the migration experience of its individual members, ends up dominating the individual and household determinants of migration.

1.1. Early migration in a community

Individual and household characteristics do matter in explaining migration, particularly at the initial stage of migration in a community. Searching to identify migrant characteristics, Cornelius (1976a, 1976b) found that migrants are overwhelmingly males of working class age. Although unmarried on their fist-trip, most migrants are subsequently married, traveling without documentation and without their wives. These migrants come from the lower-middle segments of the income distribution (Portes and Rumbaut, 1990). This is because the rich have less incentive to migrate and the very poor cannot afford the costs and risks of migration. Education is, similarly, not linearly related to migration (Massey 1987, Massey, Espinosa, and Durand 1996, Massey and García España 1987, Stark and Taylor 1991a, Taylor 1986). It is those in the middle range of educational levels who migrate most internationally. The economic returns to those with the most schooling are highest if they migrate within Mexico. Massey (1987) additionally found that the likelihood of a first trip was dependent on having a father with U.S. migration experience. Whether migrants are documented or undocumented in part depends on the industry in which they work in the U.S. In particular, efforts of U.S. agricultural employers to stabilize their labor force have enabled farm workers to obtain legal status consistently more often that urban workers (Reichert, 1979).

1.2. Migration in a community with a strong migratory network

Massey, Goldring, and Durand (1994), in their study using data from 19 agrarian communities in Jalisco, Michoacan, Guanajuato, and Nayarit, all states that have a well established migratory tradition, conclude that although "the first international migrants tend to be married male household heads of prime labor force age, usually from a nonagricultural background and often from a property-owning class, as migration becomes more prevalent and social capital accumulates, this profile changes" (p. 1528). Migration may begin within a narrow, identifiable range of a community's socioeconomic structure, but it broadens over time to include other social groups. Individual characteristics lose importance as those with initially adverse characteristics, such as the poor, the landless, women, and children, are able to also migrate, taking advantage of their community's growing migration network. As they participate in migration, they gain relatively most from migration (Stark, Taylor, and Yitzhaki, 1988). Numerous studies show that communities sending large numbers of women and children have long histories of migration. (Reichert and Massey 1980; Massey, Donato, and Liang 1990; Fonseca and Moreno 1988; Gonzalez and Escobar 1990). This explains the difficulty of narrowly defining migrant characteristics without relating them to a stage in the development of migratory networks. As Massey, Goldring, and Durand (1994, p. 1507) conclude: "questions about migrants' characteristics—whether they are predominantly male or female, young or old, legal or illegal, rich or poor, sojourners or settlers—are misplaced because these traits do not describe the migrant flow per se, but rather, a phase in its development". From a policy standpoint, what these findings imply is that targeting anti-migration interventions could be focused on categories of individuals at early stages of migration and on communities at later stages.

2. Determinants of migration

2.1. Traditional migration theory: International expected earnings gaps

According to traditional migration theory, the primary determinant of migration is the international expected earnings gap, namely an individuals expected positive net return from migration based on a cost-benefit calculation. (Sjaastad 1962; Todaro 1969, 1976, 1989; Todaro and Maruzko, 1987). For Mexican migrants from rural areas, this gap is explained by five factors: wage differentials, relative unemployment rates, labor productivity in Mexican agriculture, the transactions costs and risks of migration, and greater market integration.

In his 1980 study, Conroy (1980) observed that average wage rates differ by a factor of five to one between the U.S. and Mexico, "and even after adjusting for the costs of transportation, entry, and foreign living, most Mexican workers can expect to earn three times what they would at home (Cuthbert and Stevens, 1981)" (Massey et al., 1994 p.705). With the 70% devaluation of the real exchange rate between December 1994 and 1997, this wage gap has now increased to at least eight to one, thus creating a strong additional incentive to migrate. Differences in the supply and demand for labor between the U.S. and Mexico have indeed long been recognized as the primary cause of migration (Lewis, 1954; Ranis and Fei, 1961; Harris and Todaro, 1970; Todaro, 1976). According to this theory, low wage rates in Mexico indicate a labor surplus that emigrates to fill the excess demand for labor in the U.S. and attain higher wages.

Blejer, Johnson, and Prozecanski (1978), who assessed the effects of only two variables on migration, wage differentials and unemployment rates, found Mexican unemployment to have the most explanatory power. Similarly, in the studies reviewed by Massey, the "effects of employment related variables generally equaled or exceeded those of wage-related indicators" (Massey et al. 1994 p. 710). Jenkins (1977) analyzes INS data and finds that push factors in Mexico, taken together, are stronger than pull factors in the U.S. This is likely due to the higher variability on the Mexican side of the factors that determine the expected earnings gaps. Hence, push factors would be statistically more important than pull factors in explaining variations in migration flows. With the current sharp downturn of the Mexican economy and very high unemployment rates, strong push factors are at play, inducing Mexican labor to migrate to the North.

Labor productivity in Mexican agriculture affects the expected profitability of farming activities and the decision to migrate. Productivity is affected negatively by population pressure on resources, resource degradation, and an unfavorable policy context for agriculture. For example, Frisbie (1975) used INS data and found that when farm wages and agricultural productivity rose in Mexico, migration rates fell. U.S. farm wages and productivity affected migration in the opposite direction. Roberts (1982) found that the effects of agricultural development in Mexico on migration depended on the distribution and quality of farmland. Commercial crops and capital-intensive methods introduced to areas with poor distribution and quality of land induced migration. Similar findings have been reported by others (Arroyo 1989; Arroyo, de León, and Valenzuela 1990). Thompson, Amón, and Martin (1986) found that the development of an export tomato industry in the state of Sinaloa did not reduce out-migration, and that without a change in rural development policies, liberalization of agricultural policy would increase pressure for outmigration.

The transactions costs and risks of migration are other factors contributing to the international expected earnings gap. Apprehension rates can be used to measure these costs and risks. By contrast, the growth of informal institutions that support illegal immigration reduces the risks and transactions costs of migration. These institutions allow migrants to rely on trusted coyotes from the community and border settlements linked to the emitting communities to reduce the costs and risks of crossing the border. Also, greater bi-national labor market integration improves information flow and reduces transaction costs. Zabin and Huges (1994) argue that exposure to export agriculture in Mexico lowers the cost of U.S. migration by

providing workers with information about the U.S. and steady employment in Mexico for women and children, freeing the male household head to migrate.

Greater bi-national labor market integration induces U.S. employers to pro-actively search for unskilled labor in Mexico. As a result, migration becomes increasingly demand-driven, a factor that may be facilitated or deterred by the U.S. government through legislation that affects access to this labor. Piore (1979) argues that a permanent demand for unskilled immigrant labor is built into the structure of advanced industrial countries where this type of labor is the relatively scarce factor.

2.2. Role of community networks

There are many studies demonstrating that the probability of migration increases as a community's prior migratory experience grows (Taylor, 1986 and 1987; Massey, 1987; Massey et al., 1987; Stark and Taylor, 1991a and 1991b). As Massey et al. (1994, p. 729) conclude, "the probability of undertaking subsequent trips, however, was unrelated to these individual or household characteristics; it depended entirely on the migratory experience of the individual and his social connection to other migrants". It is this accumulated migratory experience and the social connections to other migrants which make up migration networks. Once established, these networks are themselves a powerful determinant of migration (Taylor, 1986; Stark and Taylor, 1991b). Community networks improve information and reduce transactions costs (Stark, Taylor, and Yitzhaki, 1988), enabling others to migrate. As the network grows, the migration of individuals creates positive externalities on the migration of others, accelerating the pace of migration and the further expansion of the network.

Eventually, the causal force of the network overwhelms the initial determinants of migration, progressively separating migration from its initial determinants. This process has been called the "cumulative causation" of migration (Mydral, 1957; Massey, 1990), where "each act of migration alters the social context within which subsequent migration decisions are made, typically in ways that make additional movement more likely" (Massey et. al., 1993, p. 451). Massey, Goldring, and Durand (1994), advocating a cumulative causation theory of migration, observe that migration "tends to increase in prevalence and become more diverse because transnational movement causes relatively permanent changes in individual motivations, social structures, and cultural milieus, and these changes cumulate over time to change the context within which subsequent migration decisions are made. As more people are induced to migrate, knowledge and network connections expand further, inducing more people to migrate, and so on" (p. 1528). This process of cumulative causation is accompanied by a number of secondary effects in the community that also affect migration. They include changes in the distribution of income, changes in the distribution of land, extensification of land use, and changes in consumption habits.

Migration may increase income inequality in the community. In this case, a relative deprivation effect would induce non-migrants to participate in migration. Stark (1991) and Stark and Taylor (1989) show that households migrate in a desire to increase their income relative to the rest of the community. Stark and Taylor (1991a) show that relative deprivation significantly raised the probability of migration to the U.S., but not internal migration.

Migration might worsen the distribution of access to land in the community if households with migrants use remittances to buy land from smallholders. Many studies suggest that purchasing land is indeed an important goal of international migrants (Reichert, 1981; Mines, 1984; López, 1986; Massey et al., 1987; Grasmuck and Pessar, 1991; Taylor and Wyatt, 1993). If land becomes more concentrated, sources of employment are lost for those who sold land, pushing them to migrate.

Ownership of land by migrants may also lead to extensification of land use. For example, remittances are commonly used to buy livestock as a store of value to compensate for the lack of financial instruments (Taylor and Wyatt, 1993). If land is used to raise livestock instead of producing crops, which are more labor intensive, then agricultural production in the community may decline, reducing sources of employment and inducing others to migrate. Alternatively, when remittances are invested in capital intensive technological improvements such as mechanization (Fletcher and Taylor 1992), they may also reduce local employment opportunities and induce others to migrate.

Finally, cultural changes induced by migration tend to promote consumerism which creates additional incentives to migrate.

The empirical evidence for the cumulative perpetuation of migration based on secondary effects of migration such as changes in income inequality, land distribution, agricultural production, and culture is mixed. It is difficult to sort out the causal relationships between all these factors. If migration is itself a cause of migration, then there is a need to study "the processes that shape the spread of migration within communities to understand why some places rapidly attain a state of mass migration while others develop more slowly and achieve only modest rates of out-migration" (Massey, Goldring, and Durand, 1994, p. 1529). Clearly, the cumulative effect of migration on migration depends on the nature of these secondary effects, and they are bound to differ widely across communities. However, it is precisely because they differ and can be altered by policy interventions that they suggest entry points for identifying interventions to reduce migration at the source.

2.3. Development of commercial, export-oriented agriculture in Mexico and NAFTA

In principle, the development of commercial, export-oriented agriculture, stimulated by NAFTA, should create employment and help reduce migration. However, as mentioned before, more capital intensive farming may lead to loss of jobs. The concentration of land ownership may displace peasant households. Employment in commercial farming operations provides information to workers about U.S. work conditions and helps develop skills for employment in U.S. agriculture, creating opportunities for migration. Finally, commercial agriculture may provide steady employment opportunities to women and children from landless or peasant households, freeing male household heads to migrate.

In a first phase, the impact of NAFTA is likely to increase migration, an effect which Martin (1995) called "the migration hump". This is due to the fact that, in the short run, trade is likely to bankrupt activities which are not competitive with U.S. imports, particularly formerly protected small firms and the many smallholders in the large corn sector. This short run effect would lead to an increase in migration relative to a no-NAFTA scenario. In the longer run, however, as capital moves to Mexico creating new employment opportunities and as labor is reallocated from low-productivity farming to either labor intensive new crops with comparative advantage or non-farm employment created by international capital movements, employment should increase. The effect on rural areas will consequently depend importantly on the ability to decentralize the labor intensive activities that NAFTA should stimulate toward rural areas with a high density of smallholders.

2.4. New economics of migration: Market failures and household responses through migration

The "new economics of migration" (Stark and Bloom, 1985) emphasizes the motivation for households to gain remittances to relax local market failures, something outside the scope of traditional migration economics. The starting point is the analysis of the constraints on agricultural production created by the numerous market failures that characterize migrant sending regions. Remittances serve to diversify

income portfolios to reduce households' risk in a context where insurance markets are lacking. Migration is thus seen as a risk reducing strategy. Remittances also serve to relax constraints due to credit market failures when liquidity is needed to buy inputs and land. International migration thus stems from market failures that constrain the income generating capacity of households at the source. Seen in this perspective, migration is an effective strategy to reduce risk and overcome liquidity constraints (Stark, 1991) in support of agricultural activities pursued by households in Mexico. This is in contast to the traditional economics of migration where migration is seen as a substitute, not a complement, to agriculture in Mexico.

In this perspective, Stark (1978) viewed migration in the context of household economic relationships and by placing the household in the context of the imperfect credit and risk markets that characterize migrant-emitting communities. "Earlier research generally decoupled the determinants of migration from the effects of migration on sending areas; but in the new economics, migration is hypothesized to originate in the desire to overcome market failures that constrain local production" (Taylor et al., 1996, p.404). The approach "expounds migration's role as an intermediate investment that facilitates the transition from familial to commercial production" (Taylor et al., 1996 p. 404). Taylor (1992) found that remittances "loosen constraints on local production, once migrants become established abroad" (Taylor et al. 1996, p. 405). Stark and Levahari (1982) argue that migration is a means to spread risk rather than a manifestation of risk taking behavior.

3. Policies to prevent migration at its source

Many remittance-use studies have shown the detrimental effects of migration on local development. Remittance income often goes directly to consumption and housing and to speculative investments in land, leading to absenteeism and abandoned lands in the community. Furthermore, remittances undermine local investment and often create migration-income addiction and attitudes of "dependence" instead of promoting local entrepreneurship. Thus "ethnographers generally refer to Mexican emigration in starkly negative terms. Reichert (1981) calls Mexico-U.S. migration an 'illness' or 'syndrome' that undermines local development; Wiest (1979) calls it an 'addiction'; and Stuart and Kearney (1981) characterize it as a 'dangerous dependence'" (Taylor et al. 1996 p.401).

However, remittances can also be used positively for local development, both through direct effects as in the "new economics" and indirectly through multiplier effects on other activities as remittances raise community income by more than the value of the remittances themselves (Taylor 1992). Several studies show investment of remittances in income-producing assets (Massey et al., 1987; Trigueros and Rodríguez, 1988; Escobar and Martínez, 1990; Massey and Parrado, 1994). "Rather than concluding that migration inevitably leads to dependency and a lack of development, it is more appropriate to ask why productive investment occurs in some communities and not in others. In general, a perusal of ... communities suggests that the highest levels of business formation and investment occur in urban communities, rural communities with access to urban markets, or rural communities with favorable agricultural conditions" (Durand and Massey 1992 p.27). Poor public services and infrastructure and a lack of rural financial institutions are reasons why remittances are not used for productive purposes. Indeed, a key feature in the productive use of remittances is the local availability of financial services through which remittances can be channeled and made available for borrowing by other community members with investment plans.

Profitable investment of remittances in agriculture requires an adequate policy framework: public investment in infrastructure and decentralized public services, access to credit, and favorable macroeconomic policies to reduce risk (inflation, market fluctuations, policy uncertainties, and insecure property rights) and increase the profitability of agriculture. "Schemes to harness international migrant remittances for local development are destined to fail if governments do not create an economic environment that is conducive to

investment in productive activities at home. Land, housing, and other speculative investments, for which migrant families have been much criticized, are a rational response to the uncertain, inflationary environments created by misguided maroeconomic policies and sectoral polices that discriminate against small-scale production within the reach of migrant families" (Taylor et al. 1996 p. 411).

In order to reduce migration at its source, policy interventions must consequently seek to offer attractive investment opportunities in the emitting regions, promote increased access to credit through the development of financial services for community households and to insurance through flexible access to consumption credit and insurance schemes, and they must seek to decentralize access to public goods and services. "Rather than intervening directly in labor markets, governments that wish to reduce out-migration should attempt to correct failures in local capital and risk markets, thereby offering households credit and insurance alternatives to migration. In the new economic model, failures in credit and risk markets, not a low equilibrium wage in the migrants-sending labor market, are the fundamental cause of international migration" (Taylor et al. 1996 p. 405).

4. Some hypotheses about the role of environmental factors

This review of the literature on the determinants of migration stressed two contrasted channels through which migration occurs. The first is the "traditional" causal relation whereby migration responds to expected income gains and hence where higher poverty and unemployment in Mexico induce more migration. With large income gaps for unskilled labor between Mexico and the U.S., this is likely to be the major force behind illegal migration to the North. The second is based on the "new" role of migration in securing remittances which help overcome market failures for the emitting households, particularly regarding credit and insurance. This is particularly the case in the ejido where lack of collaterilizable land titles and decapitalization of the development banks that are supposed to service the social sector create systematic credit market failures. The significance of these two channels in explaining migration is mediated by the role of networks. At early stages of migration in a community, individual and household characteristics matter, particularly the level of income to finance the cost of migration and the level of education in explaining the potential gains from migration (through a non-linear relation). At advanced levels of community migration, the role of community networks overwhelms the role of individual and household characteristics, allowing those with little capital and little education as well as women and children to also participate in migration.

We can use these observed relations to formulate a hypothesis about the role of environmental factors on migration. Following the traditional channel, higher environmental degradation and greater population pressure on the land increase the level of poverty, which in turn increases the expected income gain from migration. The result is more migration, as long as individual characteristics permit (i.e., the individual can afford the cost of migration which itself declines with accumulation of community-level migration capital). Following the new channel, environmental degradation and greater population pressure on the land lower the profitability of agriculture, and hence also decrease the opportunity cost of capital and insurance market failures. If remittances are sought to overcome market failures, then migration is less necessary when the environment is more degraded. The relationship between environmental degradation and migration will be the net of these two effects, implying that both positive and negative relations are possible.

II. Migration among ejidatario households: descriptive statistics

2.1. Characteristics of households and importance of migration

The following information about migration from Mexico's rural areas to the United States is based on a 1994 nationwide survey of households in the ejido sector, excluding the State of Chiapas due to political reasons in that year.[2] In that survey, information was collected about four types of individuals:

- *The head of household.* In 1994, this person was a man in 96% of the cases (see Table 1).
- *The direct family.* This includes the household members who live in the household or study. Average direct family size, including the household head, was 5.1 persons in 1994.
- *The children of the household head who do not live at home.* In general these are adults who have left the household and have started their own family. The combination of the household heads, other family members who live in the household, and these children of the household head make up the biological family.
- *The siblings of the household head.* This information was gathered mostly to measure the social migration capital of each household and community. Adding these individuals to the direct family constitutes what we call the extended family.

The 1994 survey included information about 5,267 adults in direct families and 9,216 adults in extended families. Adults are defined as individuals more than 14 years old.

Migration is a widespread activity among ejidatarios. In the sample, 12.4 % of the households have current migrants, where current migration is defined as individuals who have migrated at least once to the U.S. during the last four years. 26.8% of the households have members who have participated at least once in their lifetime to migration to the North. Not only is migration an important source of income and liquidity for the households, but it also affects land use, technological choices, and investment in cattle raising.

In Table 1, migration is analyzed at the level of individuals, as opposed to households, in order to identify the characteristics of migrants. 14.5% of all adults in the direct family, 18.8% of all adults in the biological family (see Table 2), and 37.8% of the household heads have participated in migration during their lifetime, either to the U.S. or to other regions of Mexico. Of course, higher participation in migration of household heads is explained by their more advanced age. Their average age is 49 compared to 29 for the other adults in the family. Among the latter, only 5.0% have migrated. In their youth, many household heads participated in the Bracero program to work in U.S. agriculture (before the program was canceled in 1964). This is reflected in the relative age of adults and household heads who have migrated to the U.S. vis à vis those who have migrated within Mexico. Those who have gone to the U.S. are older: on average, adults who went to the U.S. are 47 years-old and household heads are 51. Adults who migrated somewhere else in Mexico are younger, with an average age of 42 for adults and 47 for household heads.

It is also interesting to analyze the difference in education between those who migrate and those who do not, as well as the difference in education between those who go to the U.S. and those who go to the rest of Mexico. The data from Table 1 show that those who did not migrate have more education, namely 5.0 years of instruction, compared to 3.9 years of instruction for those who did migrate. Nonetheless, the percentage of individuals who can read and write is higher for migrants than for those who do not migrate (88% of those who have migrated can read, compared to 86% of those who have not migrated). This observation suggests that better educated people are less likely to migrate. However, those who migrate do have a basic education; they know how to read and write. It can also be observed that those who migrate to

[2] For detailed results derived from this survey, see Alain de Janvry, Gustavo Gordillo, and Elisabeth Sadoulet, *Mexico's Second Agrarian Reform: Household and Community Responses.* U.C. San Diego: Center for U.S.-Mexican Studies, 1997.

the rest of Mexico have more years of education (4.2) than those who migrate to the U.S. (3.7). This pattern was already observed by Edward Taylor, who explained that education (at levels observed in rural areas) is more valuable in the Mexican labor-market than it is in the U.S. (Taylor 1984). Those who migrate to the rest of Mexico are at both extremes of the distribution of educational levels. Most of those with fewer than 3 years of education migrate nationally. Individuals with between 3 and 6 years of instruction, the category that is able to read and write, clearly migrate more to the U.S. In contrast, those with more than 6 years of education migrate more often nationally. This same pattern is observed among household heads. We thus conclude that international migration is more difficult for the least educated ejidatarios and is less desirable for those with the highest educational levels.

Looking at migration by gender, it can be seen that only 9% of the adults who have migrated were women, and among household heads who have migrated only 1% were women.

The destination of members of the direct family who migrated is also analyzed in Table 1. Of those who have migrated, 59% stayed within Mexico and 33% went to the U.S. Women who have migrated tended to stay in the country: 67% went elsewhere in Mexico and 9% went to the U.S. Men, in contrast, migrated within Mexico in 58% of the cases, and in 35% of the cases they went to the US.

It can also be seen in Table 1 how those who can and those who cannot read are distributed by migration destination. In both cases, there is a higher probability that a person who is not able to read or write has moved to someplace in Mexico, while a literate person is more likely to have moved to the U.S. For example, 70% of the migrants who could not write moved within Mexico; only 57% of the migrants who could write did the same. This difference in destination by literacy is also observed among household heads.

2.2. Migration by farm size

Migration is also related to farm size. The data in Table 2 show an interesting contrast across farm sizes between migration to any destination and migration to the U.S. Migration to all destinations does not vary with farm size, neither for adults in the extended family nor in the biological family. By contrast, migration to the U.S. is biased toward farms larger than 10 ha NRE, expectedly because these households can finance the costs and assume the risks of migration and satisfy the minimum literacy requirements for international migration. By difference, this indicates that households with the least land migrate more to destinations in Mexico. Smaller amounts of land are associated with a greater incidence of poverty and illiteracy.

For those who have migrated, there is a high incidence of migration to the U.S.—no less than 53% of them have been to the U.S. In the 5 to 10 ha class, where migration to the U.S. is most frequent, this percentage reaches 65%. This implies that in this farm class 14% of all adults have gone to the U.S. to work. International migration is evidently an important phenomenon in the economics and dynamics of the ejido sector.

2.3. Indigenous population and migration

Indigenous people are among the poorest groups in the rural sector. With relatively little access to land and advanced levels of land degradation in indigenous communities, migration has been a rapidly rising source of income for indigenous households.

At the ejido level, ejidatario households can be categorized into three groups according to the type of institution to which they belong (Table 3):

Ejidos with a majority of mestizo population:	78.0% of all households
Ejido with a majority of indigenous population:	12.5% of all households
Indigenous communities:	9.5% of all households.

This categorization allows us to identify household characteristics by ethnicity. For example, households in ejidos with a mestizo majority are principally located in the Center and North regions. Ejidos with an indigenous majority are principally found in the Gulf, Center, and South Pacific, while indigenous communities are overwhelmingly found in the South Pacific. The land area under individual control is larger in mestizo ejidos (7.9 ha NRE) and indigenous ejidos (7.5 ha NRE) when compared to indigenous communities (2.5 ha NRE). This last figure reflects the higher land fragmentation that exists in the indigenous communities, where land can be divided between heirs, a procedure that is legally forbidden in the ejido.[3] These data, however, underestimate access to land in the indigenous community because cultivable land in fallow and natural pastures reverts to common land in the community, while it is still part of individual plots in the ejido. This is significant when subsistence corn plots are in the slash and burn system. The differential is reflected in the larger total ejido area (in ha NRE) per household in the indigenous community relative to both the mestizo and the indigenous ejido: in 1994, there were 33 ha NRE per household in the indigenous community, compared to 21 in the mestizo ejido, and 22 in the indigenous ejido.

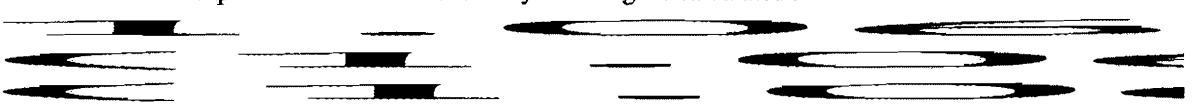
Nonetheless, there is clearly a higher incidence of poverty and marginalization among households in indigenous communities. Less land is planted in corn, both rainfed and irrigated, than in the ejidos. Production systems are more frequently intercropped, which is characteristic of subsistence farming. Members of indigenous communities cultivate fewer high value crops, such as monocropped corn in the fall-winter season and fruits and vegetables, crops that have higher technical requirements. These households have less access to public credit. They own fewer heads of cattle. A larger number of them do not sell corn but are self-sufficient or net buyers of corn. The level of educational capital for adults in these households is, in general, lower.[4] There is also less participation in the labor market as a primary activity: each indigenous community household on average has 0.20 adult members in this category, compared to 0.53 for mestizo ejidatarios. Indigenous families are consequently primarily dedicated to farming. However, more of them use the labor market as a secondary source of income, with 0.42 adults per family compared to 0.29 for mestizo ejidatarios. They also participate more in migration than households in indigenous ejidos. These indigenous community households are the types of families where the strategy of subsistence agriculture combined with migration dominates. Production is more oriented towards family self-sufficiency and, for those who have the capacity to capitalize, cattle raising through access to common land.

2.4. Migration by origin and destination

In Table 4, we analyze the 950 members of the direct and extended ejidatario families who have migrated to the United States. There is a strong concentration of the places of origin of these migrants: 10 states located in the Center, North Pacific, and North contribute 75% of migration to the United States. In

[3] The mechanisms of land redistribution among community members are described in Hinton (1972) and Cancian (1994).

[4] The indicator of educational capital for adults older than 14 years of age is calculated as follows:



The coefficients are taken from Schultz (1993).

some of these states, migration is a highly prevalent phenomenon. In Jalisco, Durango, Nayarit, and Michoacan more than 20% of adults have migrated to the United States; in Guanajuato, San Luis Potosí, Tamaulipas, and Zacatecas more than 15%. In some of these states the incidence of international migration is accelerating. To analyze the change over time in the importance of migration, a contrast is made between the migratory history of adults over and under 35 years of age. In the last column of Table 4, we observe that the region where migration has accelerated most is the South Pacific. In Guerrero, the percentage of adults who migrated increased by 86% between those under and those over 35 years of age. In Oaxaca this increase was 25%. These two states alone constitute 10.3% of total migration (Table 5), and this contribution is rapidly increasing, raising the ethnic component of international migration. Even in states with the highest levels of migration, migration is still accelerating, suggesting that the practice is far from reaching an equilibrium point. In Durango, Jalisco, Nayarit, Michoacan, and Tamaulipas, where the highest frequency of migration is observed, the incidence of migration for those under 35 years is higher than those over 35 years of age. With increasing participation of states in the South Pacific, the points of origin of migration are becoming more broadly distributed geographically. An extrapolation of these tendencies suggests simultaneously a deepening of migration in those states that are already more involved in migration and a diffusion of migration toward new states, even those that are far from the border and have little migratory tradition.

In Table 5, migration is organized by state of origin in Mexico and region of destination in the United States. It is observed that the destinations are even more concentrated than the points of origin: 56% of all migrants go to California and 23% go to Texas. The rest are dispersed, in decreasing order of importance, over the Midwest, South, Southwest, and Northwest. Interestingly, the states with the highest participation in migration are those with the most concentrated destinations. So Jalisco, Michoacan, Nayarit, Guerrero, and Oaxaca send nearly all of their migrants to California. By contrast, Tamaulipas, Durango, and Chihuahua, states with a lower participation in migration, have more dispersed destinations. This observation confirms the theory that strongly established social networks at the points of destination facilitate the migratory process by reducing its costs and risks and thus attract more migration in a cumulative process (Durand and Massey, 1992).

Comparing the migratory history of those below and above 35 years of age indicates that over time both the processes of concentration and geographical diffusion have increased. California increased its absorption of migrants from 48% for those over 35 years of age to 58% for those under 35. The concentration process is accompanied by a growing participation of migrants in non-agricultural activities, especially in the tertiary sector. By contrast, the relative absorption of migrants in Texas and the Southwest and Northwest declined. In Texas, this loss of relative importance was in part a result of the mechanization of agriculture. The diffusion process is observed in the increasing importance of more disperse destinations, especially to the Midwest and South.

We thus conclude that migration is a very important element in the ejido peasant economy. It is simultaneously deepening in the states that are already involved in migration and extending towards new states, especially in the South Pacific. This indicates that the peasant economy emerging in the ejido sector is strongly involved in the labor market and in international migration. Migration influences the organization of production in the ejido economy because it affects the availability of labor on ejido land. Migration also reduces the entrepreneurial capacity of the ejido and its potential for modernization since many of the more dynamic members of the ejido are away pursuing other activities. On the positive side, it serves as a source of liquidity for consumption, the purchase of inputs, and capitalization in cattle. And, as we shall see, migration is a fundamental source of income for ejido households.

III. Income, migration, and the environment

A household's income level is determined by its control over income generating assets, particularly agricultural assets (quality adjusted land area), human capital assets (combining number of working age adults and levels of education achieved), migration assets (the number of permanent migrants from the household and the extended family to whom a migrant has access), institutional and organizational assets (access to restricted sources of credit and existence of producers organizations in the region), and social assets (ethnicity). This is also conditioned by the contextual characteristics where the household is located, particularly geographical region, level of marginality in the municipality, level of environmental degradation.

Classifying households by income quintiles, the data in Table 6 show that income derived from agriculture and wages are the two main sources of income for both the lowest and highest income quintile. Thus, agriculture is key for the poor, not just off-farm income. And wage income is key for the rich, not just agricultural income. Livestock is also very important for the poor since they derive 27% of their income from this activity. It is the only source of income that acts as an equalizer. Migration plays a major role for the middle income groups, but is less important for both poor and rich. This shows that it is neither the poorest nor the richest who migrate most, an observation similar to that made regarding educational levels where it is neither the least nor the most educated who migrate most. It also implies that migration is not able to erase extreme poverty and that it is not the source of the highest incomes in the social sector. Income from microenterprises is not a source of income differentiation, remaining relatively constant as a share of total income across income quintiles. Altogether, non-farm income is most important for the middle income quintiles, while on-farm income is most important for the poorest and richest households.

Households in indigenous communities are disproportionately represented in the lowest income quintile: the share of indigenous community members falls from 15.2% in the lowest income quintile to 4.4% in the highest. By regions, households in the North and North Pacific are disproportionately represented in the highest income quintile, while households in the Gulf and South Pacific are most represented in the lowest quintile. The Center has households in all income quintiles, indicating a more equal pattern of income distribution than in the other regions. The age of the household head is higher in the highest income quintile, showing that income improves through the life cycle. Finally, households in the highest income quintile have more of all income-generating assets: they have higher land assets (quality adjusted hectares), higher labor-market assets (number of working adults and educational levels), and higher migration assets. This indicates that all three types of capital afford an escape from poverty, either in combination or as substitutes for one another. Success stories about emerging from poverty can thus be quite heterogenous, and they do not depend exclusively on access to agricultural assets.

Municipality characteristics vary systematically with income level. Households in the lowest income quintile are located in municipalities with the highest incidence of high marginality and higher marginality indices. Environmental characteristics are represented by five variables:

- The first is percentage of households located in the high degradation municipalities identified by SEMARNAP for priority interventions.
- The second is a variable that characterizes the percentage loss in forest cover in the municipality between 1980 and 1990. It was developed by Klaus Deininger at the World Bank using GIS data. Forested areas were measured in 1980 and 1990 from minimum resolution polygons. A zero implies that there has been no change in forest cover while a 100 implies that all the forested area observed in 1980 have disappeared in 1990.
- The third is the average level of rainfed corn yield observed in the municipality in the 1990 agricultural census, used as an indicator of soil quality.
- The last two are measures of population pressure on the land. The variable is constructed as the reciprocal of the product of the average farm size in the municipality (either in the private sector or in the

ejido sector) multiplied by the average corn yield in the municipality. These two variables are derived from the 1990 agricultural census. The product is the total corn output that the average farm could achieve in that municipality. Its inverse measures population pressure on the land, where farm size is adjusted for land quality.

These environmental stress variables show a systematic inverse relation with income level. In all cases, poverty is associated with high environmental degradation and high population pressure on the land. If poverty is an important determinant of migration, the environment would appear to have a role in influencing migration through its impact on poverty.

The differential characteristics of migrant and non-migrant households are analyzed in Table 7. Characteristics are classified between exogenous variables that can influence the decision to migrate and endogenous variables that are jointly affected by the migration outcome. Migrants have higher land assets (which in the ejido is largely exogenous), suggesting that it is not the poorest who migrate. They have larger household size and hence are able to send more members abroad. Population growth is thus a determinant of migration. They also have lower educational levels, suggesting that education can redirect migration toward destinations in Mexico. As expected, they are related to large migration networks, both through family and community. Indigenous populations participate less to migration. The level of marginality in the municipality pushes households to send migrants to the North. And, finally, population pressure on the land is also a push factor in migration, indicating that environmental conditions and availability of off-farm sources of employment can help reduce migration.

On the endogenous side, we see that migration is a factor that helps build livestock assets as well as the purchase of tractors and means of transportation. The income effect of migration is thus an important factor in the accumulation of these assets, both for production and precaution. Migrants also make greater use of fertilizers and chemicals in agriculture, suggesting that remittances help relax liquidity constraints, leading to greater technification of agriculture.

IV. Determinants of income and poverty

Since, according to the traditional theory of migration, income is an important determinant of migration, we analyze here what are the determinants of poverty among ejido sector households. A household's income position is fundamentally determined by its individual characteristics (family size and age) and by its asset position, where assets are defined in a broad sense to include not only land but also human capital assets (number of working adults and educational levels achieved), social assets (membership in an indigenous community), migration assets (family networks), institutional and organizational assets (use of non-Pronasol credit in the region and regional participation to organizations), and infrastructure assets (paved road and public transport in the ejido). We use this to explain both the income level achieved (Table 8), and the probability of being in poverty in year 1994 (Table 9).

In explaining household income (Table 8), the three major land categories all have positive and significant effects on income generation, with coefficients corresponding as expected to the quality of land. For example, a per capita increase of one quality adjusted hectare of irrigated land results in an increase of $1,250 for the average household, while an increase in rainfed and pasture land induce increases of $830 and $170, respectively. Not surprisingly, education and migration assets are significantly associated with increased incomes. Only the coefficient on primary education is not significant, suggesting that in terms of overall income generation, primary education serves primarily as a prerequisite for higher levels of education. Note, that the coefficients on the education variables also increase with the level of education.

This has strong implications for the importance of education in the generation of rural incomes. All three migration network variables have large coefficients as well.

Membership in an indigenous community is associated with lower per capita incomes, indicating the very important role of ethnicity in poverty. The regional availability of credit and of producers' organizations is associated with higher incomes, showing the importance of institutional and organizational assets for income generation among farm producers. Among individual characteristics, family size has a negative effect on per capita household incomes, indicating that population growth is related to poverty.

Table 9 gives the results of a probit analysis to identify the factors associated with the probability of living in poverty, using the INEGI poverty line for rural areas. The results show that, while greater access to land, particularly irrigated land, is an element to escape poverty, other assets are also important. Human capital assets are all significant. The share of adults for a given household size decreases poverty. All categories of education are significant to reduce poverty. Among educational assets, the size of the coefficients vary according to the level of education received, increasing with higher levels of education. All three migration assets variables make very large contributions to reducing the incidence of poverty. The availability of institutional assets (use of non-Pronasol credit in the region) as well as organizational assets (participation in producers' organizations in the region) also reduce the probability of having an income below the poverty line. Belonging to an indigenous community, a social asset, is strongly associated with increased probability of living in poverty. Geographical location is another important predictor of poverty, with the Central, Gulf, and South Pacific regions associated with a higher probability of poverty, relative to the Northern region. Poverty in Mexico thus has important ethnic and geographical roots. Infrastructure does not play a significant role, putting in doubt the effectiveness of traditional rural development programs in reducing poverty. Finally, in terms of household demographic characteristics, family size, and hence population growth, are significantly associated with increasing probability of living in poverty.

A test of the role of remittances in reducing market failures can be conducted by estimating the role of migration in enhancing the effect of per capita land availability on poverty. Selective results are as follows:

Determinants of household income	Coefficient	t-statistic	Significance
Total land assets per capita* number of permanent migrants to U.S. per capita	169	1.96	**
Total land assets * number of temporary migrants to Mexico per capita, pre-1994	-181	-1.44	
Total land assets * number of temporary migrants to U.S. per capita, pre-1994	-449	-1.90	*

Determinants of probability of being in poverty	Marginal effect	z-statistic	Significance
Total land assets * number of permanent migrants to U.S. per capita	0.032	2.55	**
Total land assets * number of temporary migrants to Mexico per capita, pre-1994	-0.001	-0.05	
Total land assets * number of temporary migrants to U.S. per capita, pre-1994	0.013	0.48	

These results indicate that migration to the U.S., both permanent and seasonal, has a role in increasing the income generation capacity of a given amount of land per capita. Permanent migration to the U.S. also has a role in helping a given amount of land reduce the probability of being in poverty. These two results are in support of the "new" migration economics that stresses the role of remittances in increasing the productivity of the productive assets held by the household.

V. Determinants of migration

In order to isolate the role of specific determinants of migration, we turn to a probit analysis, where the dependent variable is the probability that a household has one or more members who have migrated to the United States during the last four years. Determinants of migration can be categorized in four groups:

1. Household variables
    - General characteristics: household size.
    - Human capital assets: , gender composition, age of household head education level, literacy.
    - Land assets: land owned in quality adjusted hectare equivalent.
    - Institutional assets: availability in the region of registered and informal organizations.
2. Network variables
    - For historical migration before 1990
        - Family network
        - Community network
    - For current migration between 1990 and 1994
        - Family network
        - Community network
3. Community variables
    - General characteristics
        - Existence of formal organizations (organizational assets)
        - Community with majority indigenous population (social assets)
    - Infrastructure assets
        - Ejido with irrigated land
        - Ejido with paved road
    - Marginality index in 1970
4. Environmental stress
    - Percentage of deforestation in the municipality between 1980 and 1990.
    - Population pressure in the municipality: (-) average rainfed corn yield * average farm size in the private and social sectors.

Family networks are defined as the total number of migrants in the biological and the extended family minus one. They represent the amount of private information to which a migrant in this household has access. Community networks are defined as the sum of the family networks in the community divided by the total labor force in that community. They represent the amount of public information to which a migrant has access. An important question is whether information derived from family and community networks is substitute (i.e., of the same type) or complementary (i.e., of a different type that adds to information obtained from the family). If information from these two networks is substitute, then the interaction terms between these two networks is negative; if complement it is positive. If, as hypothesized,

the development of community networks overwhelms the role of individual characteristics in migration as networks mature, then the information derived from the two types of networks should be substitute.

We present in Table 10 the results for a probit analysis of the determinant of household migration. The main results are the following:

5.1 *Household variables*

The quantity of labor available to the household is positively related to the decision to migrate. If there are decreasing returns to family labor in agriculture, this is not surprising since the opportunity cost to the family of sending a migrant is lower for larger households. The age of the household head as well as the age squared are significant, implying an increasing, but diminishing influence of this variable on migration. The marginal effect of increasing age is positive up to age 70. Taylor (1986) showed that younger household members, particularly those under 33, are more likely to migrate. This result suggests a life-cycle pattern of household migration. When the household head is young, the household labor pool is small since children are still young. As more children become of working age, then the probability of migration increases. After their early thirties children are less likely to migrate and household migration diminishes. Test of joint significance shows the importance of general household characteristics on the migration decision.

Education and education squared are significant, as is household literacy. The signs of the coefficients suggest that education is negatively related to the migration decision, particularly at low levels of education. Literacy, however, is positively related to migration. That education is negative in international migration is not surprising. Realizing a high return to education in a foreign country may be difficult since information on education and skill is difficult to verify, and, if migration is illegal, jobs that match education are not accessible. Those with mid-level education are more likely to migrate internally where the return to education is higher (Taylor, 1986). Only those households with an average of 10 or more years of education are more likely to migrate. The coefficients on education and literacy jointly imply a nonlinear relationship between the decision to migrate and skill level. A certain minimum level of skill (literacy) is necessary for international migration, but the return to a limited level of education is low. All together, the human capital assets are strongly significant (joint test) in explaining the decision to migrate.

Land asset variables have positive coefficients on the linear term and negative coefficients on the squared term as expected if wealth has a positive and diminishing impact on migration. The signs of the terms support the argument that those with large levels of wealth, particular those with over 30 hectares of cropland, tend to migrate less. The institutional assets variables are not found to be individually or jointly significant for either regression.

5.2 *Network variables*

One issue discussed above is the nature of the relationship between family (private information) and community (public information) networks in the migration decision. To explore this relationship, an interactive term between the two network variables is included for both historical and current migration. Neither family nor community historical networks are found to significantly influence the migration decision. This result runs contrary to Massey and Garcia España (1987) who found that historical family and community migration significantly influence migration and to Taylor (1986) who found that individuals with previous migration experience tend to migrate again.

The coefficients on current migration variables are all significant, confirming the importance of migrant networks in the migration decision. Both family and community current networks have positive signs and the interactive term is negative, suggesting that these networks provide substitute information. Examining the marginal effect of current migration, when there are no current community networks, an increase in the current family network by one person increases the household's probability of migration by 3.9%. If the fraction of migrants in the current community network increases by 1%, and there is no current family network, a 0.7% increase in migration by members of that network is anticipated. However, since the sign of the interactive term is negative, if the current family network is equal to one, then a 1% increase in the size of the current community network leads to only a 0.2% increase in the probability of migration. This shows that the value of an increasing current community network is substantially less for households with a current family network.

5.3 *Community and environmental variables*

In this equation, none of the general community variables and infrastructure variables are significant. Although not conclusive, this result calls into question the policy prescription that increased rural development is sufficient to inhibit migration, or at least within the range of rural development efforts that are currently observed. Environmental stress variables are significant, showing that environmental pressures create an incentive to migrate. The rate of deforestation in the municipality during the last decade increases migration. Population pressure in the ejido also increases the likelihood of migration. While these variables undoubtedly have long term influences on migration, and hence are also partially included in the migrant network variables, they additionally have a direct role on migration. Policies to reduce environmental stress and population pressure on the land could thus play significant roles in reducing incentives to migrate to the North.

VI. Role of young versus mature migratory networks

The results we obtained show that migrant networks are important in providing information for the decision to migrate. This supports the hypothesis that access to information via private and public networks alters the distribution of returns to migration and therefore changes the migration decision. If the information which migrant networks provide sufficiently alters the distribution of returns to migration, then the model that governs the decision to migrate may differ for households with and without access to networks. In particular, we explore this possibility that, as migrant networks mature, individual characteristics that were important in explaining migration lose relevance.

Of the households surveyed, 18% have access to some form of family network. Based on the previous argument, households are separated into two groups: 1) those with no family network and 2) those with some historical and/or current family networks. The probit equation for the decision to migrate is estimated for each group with all the variables in Table 10 except the family network variables. Results are presented in Table 11. Differences in both the magnitude of marginal effects and the number of significant variables suggest that the models governing the decision to migrate for the two categories are indeed different. For households without family networks, a number of household variables including household size, age of household head, education, and household literacy are found to be significant. For households with access to family networks, age of household head and household literacy no longer matter. The community network variables are jointly significant for households without family networks and the current community network is strongly significant. The positive sign on current community networks show the positive relationship between these networks and the probability of migration. For households with access to a family network, community networks are not jointly significant. Among the community variables, three are significant for households with no family networks and only one, deforestation, is significant for

households with family networks. Collectively these results suggest that households with access to information via family networks are more likely to migrate regardless of the household or community characteristics while households without access to such information are strongly affected by these characteristics.

Moving to the role of community networks, note that the majority of households have access to some community networks. To divide the households by community networks, we want to isolate those with significant access to public information. This is assumed to be those with a notable level of both current and historical community migration, defined here as communities with current networks of more than 3 migrants per 100 household laborers and historical networks of more than 2 migrants per 100 household laborers.[5] Of the households surveyed, 28% fall into this category. The results are presented in Table 12. The role of the household variables is similar to those found for the family networks. These variables, in particular those representing human capital assets, are significant for households with small community networks and not for those with large community networks. This suggests that if a household has sufficient access to public information, then human capital becomes less of a factor in the migration decision. Not surprisingly, family networks are insignificant for households with large community networks. With the widespread public information that is available, private information is less useful. By contrast, current family networks are significant for households with small community networks. Private information is thus important for households without access to extensive public information.

For small community networks, the presence of formal organizations at the ejido level positively influences migration while the presence of a majority indigenous population negatively influences migration. With large community networks, the role of these variables disappear, showing that community networks erase not only the role of individual household variables but also of the community variables in influencing the decision or the ability to migrate.

VII. Conclusions

If the United States is interested in reducing migration from Mexico's rural areas to the North, much of which is illegal, results from the analysis of the determinants of migration reported above allow to propose the following recommendations for policy and programmatic interventions:

1. The development over time of strong migratory networks has a key role to play in inducing additional migration. The implication is that, once strong community networks are in place, migration is very hard to stop. Efforts at reducing migration by raising incomes in the emitting areas will consequently have a higher pay-off if targeted at the regions where migratory networks are not already well entrenched. Looking at the map (see Map 1) of migratory networks, this suggests that the strongest efforts at rural development should be targeted at the Southern and Western states such as Oaxaca, Puebla, Veracruz, Tabasco, Campeche, Yucatan, Quintana Roo, and Chiapas, where community migratory networks are not yet well developed.

2. Separating the effects of family and community networks shows that their roles in assisting migration are substitutes. Hence, as community networks develop, they replace the role formerly played by family networks, socializing in the community the information necessary to reduce the costs of migration and enhancing the chances of successful migration. The role of individual and community characteristics in determining successful migration decreases. This implies that participation to migration becomes more

[5] Since the average community current network is larger than the historical network, we intentionally chose the higher value for current networks.

widespread and that those with initially adverse characteristics (such as low literacy and low level of assets) benefit most from the consolidation of community networks. The differentiating effect of migration in the community is consequently diminished.

3. Helping channel remittances toward local investment is important in creating sources of employment in the emitting communities, and hence helping detain some migration. For this purpose, it is necessary to:

- Increase the profitability of investment in labor intensive agricultural activities, particularly fruits and vegetables. This in turn requires adequate public investment in infrastructure (particularly irrigation and roads), and organizational and institutional development of these areas so farmers can invest profitably in agriculture.
- Develop financial institutions with services on both sides of the border that can be used to channel remittances to the emitting areas and make migrants' saving available for borrowing by other community members with investment plans.

4. Rural development variables have surprisingly little effect in detaining migration. This may suggest that half-hearted rural development efforts are not effective, and may in fact be counterproductive by increasing migration as they help reduce transactions costs and finance the costs of migration. If a rural development effort is made to detain migration, it must be of a sufficiently significant magnitude as to effectively compete with the opportunity cost of migration, particularly if migratory networks are already well established.

5. Population pressure on natural resources--measured here by the rate of deforestation, the inverse of the average corn production capacity of a farm household, and location in an environmentally critical municipality--are important determinants of migration. Reducing this pressure should be part of efforts to detain migration at the source. Given the scarcity of good farmland in Mexico and the large size of the farm population, increasing the productivity of labor in farming offers a limited solution. More important is to focus on the development of decentralized non-farm activities. In particular, decentralization away from the border and the main cities of the benefits created by NAFTA in labor intensive manufacturing should be actively pursued. Industrial development in Campeche gives a good example of the merits of successful decentralized industrialization.

6. Deforestation is an important symptom of population pressure. Most Mexican forests are located in the ejido sector under the form of common property resources. In a majority of these communities, failure to cooperate in the management of these resources leads to overuse, the typical tragedy of the commons. More attention should thus be given to the issue of property rights in accessing these fragile resources and to enhancing the ability of rural communities to cooperate and effectively manage common property resources. Regulation of forest management and enforcement of rules should also be part of the solution.

7. We found that poverty seems to be a more important determinant of migration than the use of remittances to relax market failures in credit and insurance as proposed by the "new" migration economics. However, remittances do help enhance the role of land use in reducing poverty, suggesting a role for remittances in making up for institutional and public goods failures. In the context of the reforms that have led to shrinkage of the institutional services available to agriculture in general, and to the ejido sector most particularly (through Conasupo, Banrural, Inifap, etc.), the productivity of labor in farming is severely limited by institutional gaps. It is urgent to fill those institutional gaps, in order to protect the competitiveness of the ejido sector, particularly as titling is about to unleash a land market whereby inefficient smallholders would be displaced by the more competitive farmers. Key among the gaps that need to be filled are financial institutions accessible to smallholders, and producers' associations to reduce

transactions costs in accessing markets and information (for a detailed program, see de Janvry, Sadoulet, et al., 1995).

8. The expected negative effect of NAFTA on the very large corn sector has not materialized since the peso has remained sharply depreciated, raising the domestic price of corn in spite of trade liberalization. With capital inflows into Mexico accelerating again, depreciation is unlikely to last for long. To avoid massive displacement of non-competitive smallholders who are presently net sellers of corn, it is important to: (1) Promote modernization of agriculture and crop diversification among these producers, for which infrastructure investments and institutional reconstruction are essential. (2) Use the Procampo transfers to support investment in agricultural modernization and diversification as opposed to sustaining household consumption. For this to happen, the transfer of financial resources must be timely relative to the liquidity needs for agricultural production and be accompanied by technical assistance. (3) Develop access to off-farm complementary sources of employment that can be accessed without abandoning a part-time farming activity.

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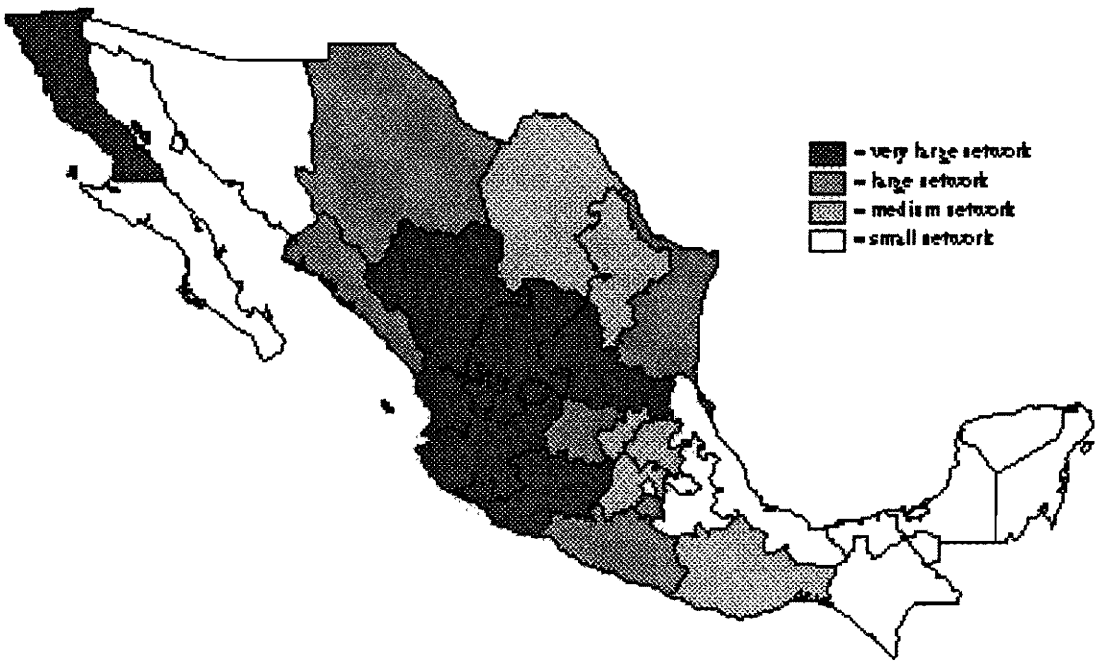
Map 1
Community Networks by State



Map 2
Migration by State

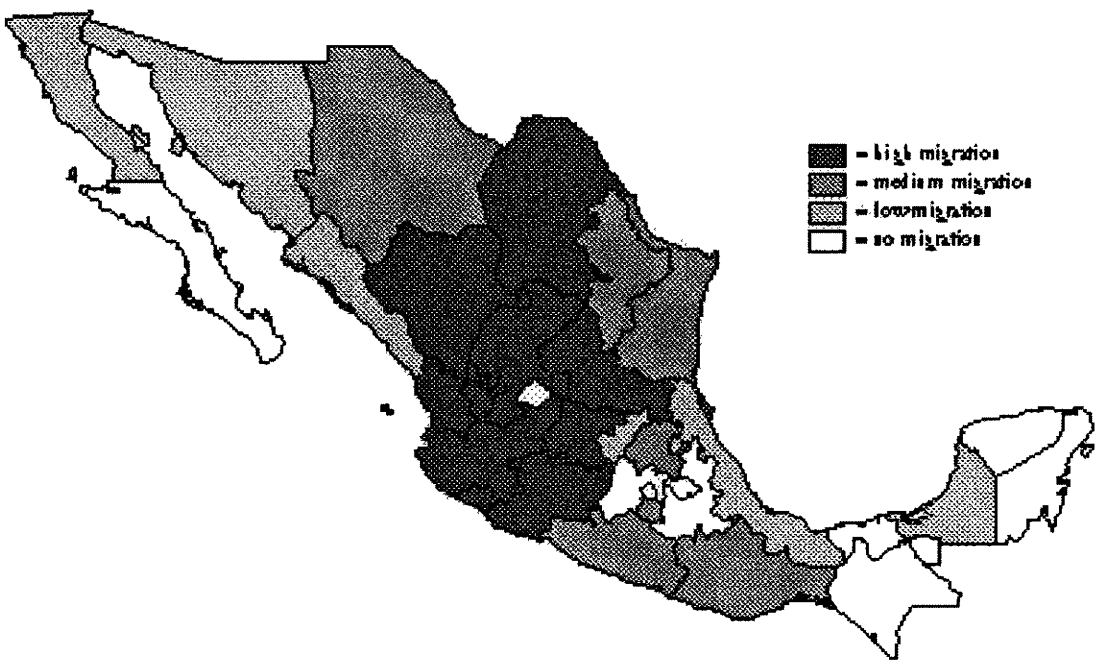


Table 1. Characteristics of individual migrants, 1994

	Have not migrated for work	*Have migrated for work*	*Test of difference*	*Migrated for work to Mexico*	*Migrated for work to US*	*Test of difference*
Adults in the direct family[b]						
All adults in direct family[b]	4569	772		453	292	
Percentage of migrants		14.5		8.5	5.5	
Age	34.3	43.8	++	42.0	47.2	++
Years of education	5.0	3.9	--	4.2	3.7	--
% with fewer than 3 years				36.0	30.2	
% with 3 to 6 years				28.3	40.3	++
% with more than 6 years				38.7	29.7	--
Know how to read (%)	85.6	87.9	+			
Know how to write (%)	85.3	87.7	+			
% Men	49.6	91.1	++			
% Women	50.4	8.9	--			
Heads of household	960	583		339	243	
Percentage of migrants		37.8		22.0	15.7	
Age	50.3	48.7		46.6	51.3	
Years of education	3.1	3.4		3.5	3.3	
% with fewer than 3 years				42.9	34.5	
% with 3 to 6 years				28.6	43.1	
% with more than 6 years				28.5	22.4	
Know how to read (%)	79.4	85.8	++			
Know how to write (%)	79.1	85.5	++			
% Men	94.3	98.8	++			
% Women	5.7	1.3	--			
Destination of those who migrated[a]						
Adults in direct family (%)				58.6	32.7	
% who cannot read				71.8	20.3	
% who can read				56.5	34.2	
Test of difference				--	++	
% who cannot write				70.2	22.1	
% who can write				56.7	34.0	
Test of difference of means				--	++	
Men (%)				57.6	34.8	
Women (%)				66.6	9.2	
Test of difference of means				++	--	
Heads of household (%)				58.3	41.7	
% who cannot read				76.6	21.5	
% who can read				54.7	38.1	
Test of difference				--	++	
% who cannot write				74.7	23.4	
% who can write				54.9	37.8	
Test of difference of means				--	++	

[a]The complement to 100 migrates to the US and Mexico or to unknown destinations.

Table 2. Migration by farm size, 1994

	% of ejidatarios who have migrated	*% of those who have migrated who have gone to the U.S.*
All adults in the extended family [a]		
Farm size (ha NRE)		
< 2	18.8	38.6
2–5	20.5	49.4
5–10	21.2	65.1
10–18	18.7	61.3
≥ 18	21.8	57.4
< 5	19.8	45.6
≥ 5	20.3	62.4
All farm sizes	20.1	53.1
All adults in the biological family		
Farm size (ha NRE)		
< 2	18.0	40.3
2–5	20.5	49.8
5–10	19.6	60.6
10–18	16.1	55.3
≥ 18	17.3	61.1
< 5	19.6	46.5
≥ 5	17.9	58.9
All farm sizes	18.8	51.4

[a] The extended family includes the absent children and the head of household's siblings.

Table 3. Characteristics of the indigenous population, 1990 and 1994

	Ejido with mestizo majority	*Ejido with indigenous majority*	*Test of difference* [b]	*Indigenous community*	*Test of difference* [b]
Number of households	1204	193		146	
(percentage)	78.0	12.5		9.5	
Distribution by geographic region (%)					
North	28.5	11.1	--	2.3	--
North Pacific	10.8	1.7	--	7.6	++
Center	36.1	21.9	--	17	
Gulf	14.7	44.5	++	10.7	--
South Pacific	9.9	20.8	++	62.4	++
Area of ejido (ha NRE per household) [a]	20.7	22.4		32.7	++
Land in individual use (ha NRE)	7.87	7.47		2.91	--
Rainfed (ha)	5.27	4.84		2.68	--
Irrigated (ha)	1.16	0.15	--	0.03	--
Pasture (ha)	2.83	4.52	++	0.94	--
Forest (ha)	0.23	0.74	++	0.038	
Distribution by farm size (%)					
≤ 2 ha NRE	20.6	27.5	++	60.8	++
2–10 ha NRE	55.3	43.6	--	34.3	-
> 10 ha NRE	24.1	28.9		5	--
Land in corn (ha)					
Monocropped, rainfed	2.59	2.77		0.77	--
Monocropped, irrigated	0.5	0.03	--	0.01	
Intercropped, rainfed	0.4	0.45		0.63	
Intercropped, irrigated	0.02	0		0	
Producers of fruits and vegetables (%)	14.7	42.1	++	5.2	--
Producers of monocropped corn, fall-winter (%)	13.6	39.6	++	11.4	--
Balance of corn use					
% who buy	22.7	37.1	++	46.2	
% who neither buy nor sell	30.3	28.4		41.9	++
% who sell	32.3	22.3	--	8.9	--
% who buy and sell	14.7	12.2		2.9	--
Credit					
Public	27.5	16.3	--	10.4	
Private formal	2.2	1		0	
Other	4.7	1	--	3.3	
Animals (number)					
Cattle	6.4	4.1	--	2.9	
Pigs	1.84	2.7	++	1.1	--
Family					
Size of family	5.0	5		5.4	
Number of adults	3.6	3	--	3.2	
Age of head of the household	51.1	44.9	--	45	
Educational capital/adultc	1.42	1.38		1.35	
Employment - number of adults who					
Work at home	1.36	1.21	--	1.43	++
First job outside the farm	0.53	0.18	--	0.2	
Second job outside the farm	0.29	0.26		0.42	++
Wage labor	0.48	0.15	--	0.14	
Migrated	0.54	0.28	--	0.47	++

[a] Total area adjusted by the regional coefficient of rainfed corn.

[b] There are two tests of difference of means: (1) ejido with indigenous majority against ejido with mestizo majority and (2) indigenous community against indigenous majority.

Table 4. Migration by state of origin, 1994

	All adults [a]			*Adults > 35*			*Adults < 35*			
	% who have migrated	*% of migrants who have gone to the U.S.*	*% who have migrated to the U.S.*	*% who have migrated*	*% of migrants who have gone to the U.S.*	*% who have migrated to the U.S.*	*% who have migrated*	*% of migrants who have gone to the U.S.*	*% who have migrated to the U.S.*	*% who migrate to the U.S. (< 35 / > 35)*
Center										
Jalisco	27.1	86.0	23.3	25.0	80.3	20.1	28.9	90.3	26.1	130
Michoacán	27.5	77.9	21.4	27.3	75.9	20.7	27.6	79.8	22.0	106
Guanajuato	23.5	76.1	17.9	27.9	66.2	18.5	18.1	95.2	17.2	93
North Pacific										
Nayarit	25.6	84.2	21.6	23.6	83.1	19.6	27.4	85.1	23.3	119
Sinaloa	12.7	44.6	5.7	19.4	42.5	8.2	5.6	52.5	2.9	36
North			0.0						0.0	
Zacatecas	31.0	48.7	15.1	35.6	44.1	15.7	26.7	54.7	14.6	93
Tamaulipas	30.1	56.2	16.9	30.7	54.1	16.6	29.4	58.5	17.2	104
San Luis Poto	24.8	71.5	17.7	30.5	73.8	22.5	18.8	67.3	12.7	56
Durango	24.1	96.3	23.2	21.8	93.2	20.3	26.3	98.6	25.9	128
Chihuahua	18.1	58.4	10.6	24.9	67.8	16.9	12.4	42.7	5.3	31
South Pacific										
Guerrero	22.1	45.6	10.1	19.6	35.1	6.9	24.2	52.9	12.8	186
Oaxaca	15.7	32.1	5.0	14.9	29.6	4.4	16.3	33.9	5.5	125
Others	15.8	27.5	4.3	19.0	28.8	5.5	13.3	26.0	3.5	63

[a] Includes head of family, adults present in the family, children of head of family (present or absent), and head of family's siblings.

Table 5. Matrix of Mexico-U.S. migration, 1994

	California	*Texas*	*Southwest*	*Northwest*	*Midwest*	*South*	*Others*	*Total*
				All adults				
Central								
Jalisco	16.0	0.4	0.0	0.7	1.6	0.0	0.0	18.7
Michoacán	12.0	0.0	0.0	0.4	0.7	0.0	0.0	13.1
Guanajuato	0.6	4.0	0.0	0.3	0.0	2.8	0.4	8.1
North Pacific								
Nayarit	6.0	0.0	0.0	0.2	0.0	0.1	0.0	6.3
Sinaloa	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.9
North								
Zacatecas	1.5	1.7	0.0	0.0	0.4	0.0	0.0	3.6
Tamaulipas	1.3	2.0	0.0	0.0	0.0	2.5	0.3	6.1
San Luis Potos	0.9	4.7	0.5	0.0	0.9	0.6	0.0	7.6
Durango	4.6	0.0	1.5	0.0	2.3	0.0	0.2	8.6
Chihuahua	0.2	0.2	1.5	0.7	0.0	0.0	0.0	2.5
South Pacific								
Guerrero	4.7	0.2	0.0	0.4	0.0	0.2	0.2	5.7
Oaxaca	3.9	0.2	0.0	0.0	0.3	0.0	0.2	4.6
Others	3.1	9.3	0.0	0.0	0.4	0.3	1.1	14.2
Total	55.7	22.6	3.5	2.7	6.6	6.5	2.4	100
				Adults > 35 years				
Central								
Jalisco	15.7	1.1	0.0	0.5	0.0	0.0	0.0	17.3
Michoacán	10.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0
Guanajuato	2.1	8.0	0.0	1.3	0.0	1.3	0.0	12.7
North Pacific								
Nayarit	7.2	0.0	0.0	0.5	0.0	0.0	0.0	7.7
Sinaloa	1.7	0.0	0.0	0.0	0.0	0.0	0.0	1.7
North								
Zacatecas	0.8	1.6	0.0	0.0	0.0	0.0	0.0	2.4
Tamaulipas	1.2	3.2	0.0	0.0	0.0	1.2	0.0	5.6
San Luis Potos	0.5	8.6	0.0	0.0	2.1	0.0	0.0	11.2
Durango	4.8	0.0	1.6	0.0	0.0	0.0	0.0	6.4
Chihuahua	0.0	0.6	3.6	1.4	0.0	0.0	0.0	5.6
South Pacific								
Guerrero	0.8	0.0	0.0	0.0	0.0	0.9	0.0	1.7
Oaxaca	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.8
Others	1.9	10.4	0.0	0.0	1.6	1.2	2.1	17.2
Total	47.5	33.5	5.2	3.7	3.7	4.6	2.1	100
				Adults < 35 years				
Central								
Jalisco	16.1	0.2	0.0	0.8	2.2	0.0	0.0	19.3
Michoacán	12.7	0.0	0.0	0.5	0.9	0.0	0.0	14.1
Guanajuato	0.0	2.7	0.0	0.0	0.0	1.3	0.5	6.5
North Pacific								
Nayarit	5.6	0.0	0.0	0.1	0.0	0.2	0.0	5.9
Sinaloa	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.7
North								
Zacatecas	1.8	1.7	0.0	0.0	0.5	0.0	0.0	4.0
Tamaulipas	1.3	1.6	0.0	0.0	0.0	3.0	0.4	6.3
San Luis Potos	1.0	3.3	0.7	0.0	0.4	0.8	0.0	6.2
Durango	4.3	0.0	1.5	0.0	3.2	0.0	0.3	9.5

Chihuahua	0.2	0.0	0.7	0.5	0.0	0.0	0.0	1.4
South Pacific								
Guerrero	6.1	0.3	0.0	0.5	0.0	0.0	0.3	7.2
Oaxaca	4.9	0.3	0.0	0.0	0.5	0.0	0.3	6.0
Others	3.5	8.9	0.0	0.0	0.0	0.0	0.8	13.2
Total	58.4	19.0	2.9	2.4	7.7	7.3	2.6	100

Table 6. Household characteristics by income level

	Income quintile				
	1	*2*	*3*	*4*	*5*
Income levels by source (pesos)					
All sources	-853	3167	7315	14178	41596
Agriculture	-1673	844	1232	2762	14407
Livestock	438	862	1071	2013	4693
Wages	180	775	2323	4562	12890
Microenterprises	32	171	299	451	2638
Migration	103	296	2123	3813	6263
Other incomes	67	219	267	577	706
Income composition (% of total income)					
All sources		100	100	100	100
Agriculture		26.6	16.8	19.5	34.6
Livestock		27.2	14.6	14.2	11.3
Wages		24.5	31.8	32.2	31.0
Microenterprises		5.4	4.1	3.2	6.3
Migration		9.3	29.0	26.9	15.1
Other incomes		6.9	3.7	4.1	1.7
% of households with majority of income from nonfarm sources	57.8	38.6	71.1	71.2	62.0
Agricultural assets					
Land					
Total area used (ha NRE)	6.2	6.4	6.5	7.5	12.1
Rainfed area (ha)	5.4	4.6	4.2	5.4	6.5
Irrigated area (ha)	0.7	0.2	0.8	0.9	2.0
Natural pasture area (ha)	1.7	3.6	3.1	2.6	4.7
Ejido common lands (per ejidatario)	19.1	24.4	22.5	23.4	22.4
Animals (number)					
Cattle	2.3	4.6	4.3	8.5	12.3
Pigs and goats	6.2	9.7	8.5	13.7	17.7
Agricultural assets: % who own					
A tractor	7.1	3.3	5.1	8.9	11.0
Means of transportation	12.3	7.0	10.1	16.7	30.1
% of households with high agricultural assets [a]	41.2	48.7	41.6	53.2	70.3
Human capital assets					
Family (number)					
Family size	5.0	5.1	4.9	5.3	5.2
Number of adults	3.3	2.9	3.3	3.5	4.0
Age of household head (years)	49.6	44.6	49.4	50.0	52.7
Number of skilled workers	0.5	0.3	0.5	0.6	1.2
Education level (ave. in HH)	4.0	4.0	4.3	4.6	5.8
Household literacy (% literate in HH)	80.9	82.5	81.3	87.9	91.4
% of households with high labor market assets [b]	21.7	17.5	20.7	27.7	47.3
Migration assets	0.6	0.6	1.0	1.3	1.9
Family Networks					
Historical Migration	0.1	0.1	0.1	0.1	0.1
Current Migration	0.2	0.2	0.1	0.2	0.3
Community Networks					
Historical Migration	1.6	1.6	1.6	1.9	2.2
Current Migration	3.3	3.3	3.0	3.8	4.1
% of households with high migration assets [c]	20.7	18.3	26.6	39.6	48.7
Institutional and organizational assets					
Access to credit: % receiving credit from					
Public sources	22.3	19	22.2	26.7	27.3
Private sources	1.5	0	1.8	0.8	5.8
Other sources	4	2.6	3.1	5.2	8
Access to technical assistance	4.1	7.3	4.7	10.4	17.1
Registered organization	17.8	13.9	16.2	22.6	32.1
Unregistered organization	20.2	28.1	26.5	19.6	22.7

Table 6. Household characteristics by income level

	Income quintile				
	1	*2*	*3*	*4*	*5*
(Continued)					
Social assets					
% of households belonging to indigenous communities	15.8	16.5	14.8	10.8	6.5
Behavioral patterns					
Land use (ha)					
Monocropped corn, rainfed	2.6	2.6	2.3	3.2	2.4
Monocropped corn, irrigated	0.3	0.1	0.3	0.5	0.9
Technology: % who use					
Improved seeds	10.6	11.6	13.7	19.8	39
Fertilizers	56.2	45.3	55.7	57.6	63
Chemical products	45.1	41.3	45.1	46.5	57.7
Corn balance					
% who buy	32.9	28.6	25.5	25.4	22.3
% who neither sell nor buy	33.8	31	31.8	25.3	31
% who sell	20.7	29.7	28.8	36.1	32.8
% who sell and buy	12.5	10.7	14	13.3	13.9
Labor balance					
% who sell	3.6	16.9	37.9	30.7	22.6
% who neither sell nor hire	57.7	52.7	29.3	30.3	29.9
% who hire	34.7	22.8	21	21.3	30.3
% who sell and hire	4	7.6	11.8	17.8	17.3
Family labor allocation: # of adults who work					
In agriculture at home	1.67	1.31	1.50	1.49	1.48
In non-agriculture at home	0.01	0.01	0.03	0.05	0.10
For a wage in agriculture	0.02	0.04	0.21	0.20	0.18
Work for a wage in non-agriculture	0.03	0.05	0.13	0.30	0.59
% distribution of households by region					
North	19.1	21.6	22.3	28.2	28.0
North Pacific	2.6	5.7	4.2	9.4	19.9
Center	31.4	25.5	34.3	35.3	32.0
Gulf	26.8	26.5	22.0	15.2	6.1
South Pacific	20.2	20.7	17.3	11.9	14.0
Community characteristics					
Ejido with paved road	25.1	16.1	26.8	21.3	37.6
Level of marginality in the municipality (CONAPO)					
High marginality muncipality (1990) (%)	61.0	61.9	54.1	46.9	33.5
Marginality index in municipality (1990)	0.03	0.02	-0.14	-0.26	-0.56
Marginality index in municipality (1970)	1.60	-0.11	0.06	-1.20	-3.19
Environmental stress					
High degradation muncipality (SEMARNAP) (%)	16.8	15.5	10.8	12.7	7.5
Rate of deforestation in municipality, 1980-90 (%)	31.0	29.0	23.3	25.3	23.8
Average rainfed corn yield in municipality (tons/ha)	1.03	1.10	1.12	1.29	1.50
Population pressure in the municipality, ejido sector[d]	7.8	3.9	4.6	4.1	3.1
Population pressure in the municipality, private sector[d]	4.2	2.7	2.0	1.4	1.1

[a]High agricultural assets is more than 4 ha of rainfed equivalent.

[b]High labor force (education) assets is more than 6 unskilled equivalent adult.

[c]High migration assets is at least one US migrant from extended family.

[d]Equal to 100/(Average farm size * average rainfed corn yield)

Table 7. Characteristics of migrant and non-migrant households[a]

	non-migrant	*migrant*	*test of difference*
Exogenous variables			
Land assets			
Individual land			
Total area used (ha NRE)	7.08	9.41	++
Land owned (ha NRE)	4.94	6.27	++
Rainfed area (ha)	4.75	6.63	++
Irrigated area (ha)	0.94	0.87	
Natural pasture area (ha)	2.72	3.90	+
Area of the ejido (ha NRE' per ejidatariob)	21.88	23.10	
Human capital assets			
Household size	4.23	7.10	++
Gender composition	0.57	0.57	
Number of adults	3.44	3.59	
Age of household head	48.63	58.10	++
Education level (ave. in HH)	4.63	3.96	--
Household literacy (% literate in HH)	85.10	83.60	
Social capital assets			
Majority indigenous (% of households in indigenous communities)	13.6	4.7	--
Migration assets			
% of households with high migration assets [d]	12.9	100.0	++
Family Networks			
Historical Migration	0.083	0.152	++
Current Migration	0.168	0.308	++
Community Networks			
Historical Migration	1.621	2.729	++
Current Migration	3.241	5.406	++
Organizational and institutional assets			
Access to credit: % receiving credit from			
Public sources	24.4	25.3	
Private sources	1.8	1.8	
Other sources	3.8	6.2	
Access to technical assistance	8.8	7.2	
Registered organization	20.5	23.3	
Unregistered organization	23.5	16.7	-
% distribution of households by region			
North	22.9	30.7	++
North Pacific	9.9	5.5	
Center	30.9	45.3	++
Gulf	20.1	2.6	--
South Pacific	16.3	15.9	
Community characteristics			
Ejido with paved road	26.6	31.4	
Level of marginality in the municipality			
Marginality index in the municipality (1990)	-0.17	-0.37	--
Marginality index in the municipality (1970)	-0.58	-0.74	
Environmental Stress			
High degredation municipality (SEMARNAP)	13.0	7.5	-
Deforested area in municipality, 1980–1990 (%)	26.1	26.4	
Population pressure in the private sector = 100/(average farm * average corn yield)	1.78	2.36	
Population pressure in the ejido sector = 100/(average farm * average corn yield)	4.10	4.88	

Table 7. Characteristics of migrant and non-migrant households[a]

	non-migrant	*migrant*	*test of difference*
(Continued)			
Endogenous variables			
Income levels by source (pesos)			
All sources	11612	23420	++
Agriculture	3370	4561	
Livestock	1693	2678	++
Wages	4190	3858	
Migration	1356	10648	++
Microenterprises	684	961	
Other incomes	319	714	
Income composition (% of total income)			
All sources	100	100	
Agriculture	29.0	19.5	
Livestock	14.6	11.4	
Wages	36.1	16.5	
Microenterprises	5.9	4.1	
Migration	5.9	45.5	
Other incomes	2.7	3.0	
Other agricultural assets			
Animals (#)			
Cattle	5.27	10.91	++
Pigs and goats	4.02	6.30	++
Agricultural assets: % who own			
A tractor	6.8	9.5	++
Means of transportation	13.8	20.5	++
Behavioral patterns			
Land use (ha)			
Monocropped corn, rainfed	2.35	3.14	++
Monocropped corn, irrigated	0.40	0.35	
Intercropped corn, rainfed	0.41	0.59	+
Technology: % who use			
Improved seeds	18.7	18.5	
Fertilizers	54.7	58.4	
Chemical products	44.9	54.1	++
Corn balance			
% who buy	27.5	25.7	
% who neither sell nor buy	31.3	31.3	
% who sell	28.0	31.0	
% who sell and buy	13.2	12.1	
Labor balance			
% who sell	24.2	16.8	-
% who neither sell nor hire	37.6	33.6	
% who hire	23.6	38.2	++
% who sell and hire	14.6	11.5	
Family members in residence			
Family size	5.13	4.75	-
Number of skilled workers	0.67	0.55	--
Family labor allocation: Number of adults who work			
In agriculture at home	1.45	1.53	
In non-agriculture at home	0.04	0.04	
For a wage in agriculture	0.14	0.14	
Work for a wage in non-agriculture	0.29	0.13	--

[a] A migrant household is defined as having at least one person in the immediate family who has migrated to the US since 1990 or a son or daugther living abroad in the US.

[b] High agricultural assets is more than 4 ha of rainfed equivalent.

[c] High labor force (education) assets is more than 6 unskilled equivalent adult.

[d] High migration asset is at least one permanent or seasonal US migrant from extended family.

Table 8. Determinants of household income

Regression analysis

	Regression coefficients	Test of significance t-statistic		Explanatory importance Beta coeff.
Household characteristics				
Family size	-162	-1.88	*	-0.05
Age of household head	-15	-0.99		-0.03
Land assets				
Irrigated land, per capita (RFE)†	1250	8.29	**	0.22
Rainfed land, per capita (RFE)	830	9.81	**	0.26
Natural pasture land, per capita (RFE)	170	3.18	**	0.08
Forest land, per capita (RFE)	-582	-1.04		-0.02
Ejido common lands (per ejidatario)	-3	-0.53		-0.01
Human capital assets				
Family composition				
Share of adults	1187	1.25		0.04
Educational level				
Completed primary, per capita	-162	-0.22		-0.01
Completed secondary, per capita	1952	1.83	*	0.04
Completed preparatory, per capita	4882	2.79	**	0.07
Completed university, per capita	12985	5.25	**	0.12
Social assets				
Indigenous community	-993	-1.67	*	-0.04
Migration assets				
# migrants per capita, permanent USA	4371	7.56	**	0.18
# migrants per capita, pre 94 temporary Mexico	4021	3.40	**	0.08
# migrants per capita, pre 94, temporary USA	5543	3.57	**	0.08
Institutional and organizational assets				
DDR credit average (non-Pronasol)°	3417	2.93	**	0.09
DDR organization participation average	1712	2.74	**	0.07
Infrastructure assets				
Ejido has paved road	-118	-0.29		-0.01
Ejido has public transport	-101	-0.27		-0.01
Regional effects				
Pacific North	-345	-0.47		-0.02
Central	-1010	-2.03	**	-0.06
Gulf	-1424	-2.41	**	-0.07
Pacific South	-581	-1.05		-0.03
Goodness-of-fit				
Number of observations	1342			
R2	0.35			

† RFE = Rainfed equivalent hectare.

° DDR = Rural development district.

** Significant at the 95% confidence level.

* Significant at the 90% confidence level.

Table 9. Determinants of probability of being in poverty
Probit analysis

	Marginal effects	Test of significance z-statistic	
Household characteristics			
Family size	0.030	3.85	**
Age of household head	0.000	-0.24	
Land assets			
Irrigated land, per capita (RFE)†	-0.033	-1.67	*
Rainfed land, per capita (RFE)	-0.013	-1.58	
Natural pasture land, per capita (RFE)	-0.005	-0.80	
Forest land, per capita (RFE)	-0.059	-1.30	
Ejido common lands (per ejidatario)	0.000	0.16	
Human capital assets			
Family composition			
Share of adults	-0.271	-3.22	**
Educational level			
Completed primary, per capita	-0.166	-2.47	**
Completed secondary, per capita	-0.475	-4.61	**
Completed preparatory, per capita	-0.658	-3.24	**
Completed university, per capita	-0.896	-2.11	**
Social assets			
Indigenous community	0.218	3.75	**
Migration assets			
# migrants per capita, perm USA	-0.849	-5.81	**
# migrants per capita, pre 94 temp Mexico	-0.481	-3.67	**
# migrants per capita, pre 94, temp USA	-0.436	-2.49	**
Institutional and organizational assets			
DDR credit average (non-Pronasol)	-0.308	-2.81	**
DDR organization participation average	-0.175	-3.07	**
Infrastructure assets			
Ejido has paved road	0.053	1.43	
Ejido has public transport	-0.046	-1.37	
Regional effects			
Pacific North	-0.016	-0.24	
Central	0.141	3.12	**
Gulf	0.239	4.45	**
Pacific South	0.127	2.50	**

Goodness-of-fit	Actual non-poor	Actual poor
Predicted non-poor	575	178
Predicted poor	170	419
Percentage correctly predicted	77%	70%

RFE = rainfed equivalent hectare.

** Significant at the 95% confidence level

* Significant at the 90% confidence level

Table 10. Determinants of migration: Probit analysis

	Marginal effects	*Test of significance: Individual z-statistic*		*Joint chi-square*	
Household Variables					
General Characteristics					
Household size	0.021	9.65	***		
Human capital assets				30.25	***
Gender composition	0.018	0.65			
Age of head	0.009	2.52	**		
Age of head squared	-0.0001	-2.28	**		
Education level	-0.022	-3.42	***		
Education squared	0.001	2.28	**		
Household literacy	0.071	2.61	***		
Land assets				3.89	
Land owned	0.003	1.86	*		
Land owned squared	-0.00004	-1.34			
Institutional and organizational assets				1.30	
Registered organization+	-0.012	-1.05			
Unregistered organization+	-0.007	-0.51			
Network Variables					
Historical Migration (before 1990)				3.22	
Family Network	0.035	1.49			
Community Network	-0.001	-0.36			
Family*Community	-0.004	-0.69			
Current Migration (since 1990)				29.86	***
Family Network	0.039	3.54	***		
Community Network	0.007	4.82	***		
Family*Community	-0.005	-2.96	***		
Community and environmental variables					
General				4.21	
Formal organization+	0.018	1.61			
Majority indigenous+	-0.023	-1.20			
Marginality index for the municipality	0.0005	0.68			
Infrastructure				1.27	
Irrigated land	-0.019	-0.96			
Paved road+	-0.006	-0.55			
Environmental stress				9.19	**
Population pressure in the municipality (-)	0.0004	2.21	**		
Deforestation in the municipality, 1980-90	0.001	1.77	*		
Regions				15.89	***
Region 1	-0.003	-0.20			
Region 2	-0.027	-1.42			
Region 3	0.013	0.83			
Region 4	-0.056	-3.09	***		

Goodness of fit

	Predicted Non-migrant	Predicted Migrant
Actual non-migrant	1290	56
Predicted migrant	125	67
Percentage correctly predicted	91	54

*= significant at 90%, **= significant at 95%, ***=significant at 99% .

Dummy variables designated with +.

Table 11. Role of family networks in migration decision: Probit analysis

	No Family Network					*Some Family Network*				
		Test of significance					*Test of significance*			
	Marginal effects	*Individual z-statistic*		*Joint chi-square*		*Marginal effects*	*Individual z-statistic*		*Joint chi-square*	
Household Variables										
General Characteristics										
Household size	0.017	8.37	***			0.042	4.84	***		
Human capital assets				15.18	**				23.87	***
Gender composition	0.021	0.78				0.062	0.61			
Age of head	0.005	1.67	*			0.027	1.57			
Age of head squared	-0.00004	-1.41				-0.0003	-1.53			
Education level	-0.014	-2.14	**			-0.063	-2.67	*		
Education squared	0.001	1.47				0.003	1.57			
Household literacy	0.062	2.37	**			-0.023	-0.21			
Land assets				2.45					3.25	
Land owned	0.002	1.52				0.006	0.89			
Land owned squared	-0.00003	-1.17				-0.00001	-0.08			
Institutional and organizational assets				0.69					10.85	***
Registered organization+	0.008	0.67				-0.123	-3.29	**		
Unregistered organization+	-0.006	-0.44				-0.008	-0.15			
Migration capital assets				19.98	***				3.56	
Historical Migration										
Community Network	-0.001	-0.26				-0.018	-1.67	*		
Current migration										
Community Network	0.006	4.25	***			0.008	1.43			
Community and environmental variables										
General				2.99					1.93	
Formal organization+	0.015	1.39				0.042	1.06			
Majority indigenous+	-0.019	-1.09				0.151	0.93			
Marginality index	0.0001	0.08				0.002	0.42			
Infrastructure				3.58					3.49	
Population pressure (-)	0.016	0.77				0.007	0.11			
Paved road+	-0.018	-1.71	*			0.084	1.85			
Environmental stress				8.41	**				3.69	
Population pressure (-)	0.0004	2.53	**			0.000	0.10			
Deforestation	0.0003	1.00				0.002	1.92	**		
Regions				15.58	***				0.21	
Region 1	-0.003	-0.16				0.022	0.37			
Region 2	-0.025	-1.36				0.0016	0.02			
Region 3	0.015	0.95				0.0158	0.26			
Region 4	-0.053	-2.97	***			-0.022	-0.16			

Goodness of fit

	Predicted Non-migrant	Predicted Migrant		Predicted Non-migrant	Predicted Migrant
Actual non-migrant	1088	37	Actual non-migrant	204	17
Predicted migrant	89	53	Predicted migrant	23	27
Percentage correct	92	59	Percentage correct	90	61

Table 12. Role of community networks in migration decisions

	Small Community Networks					*Large Community Networks*				
		Test of significance					*Test of significance*			
	Marginal effects	*Individual z-statistic*		*Joint chi-square*		*Marginal effects*	*Individual z-statistic*		*Joint chi-square*	
Household Variables										
General Characteristics										
Household size	0.013	6.89	***			0.046	6.4	***		
Human capital assets				25.08	***				6.06	
Gender composition	0.014	0.59				0.080	0.87			
Age of head	0.007	2.17	**			0.024	2.04	**		
Age of head squared	-0.0001	-1.88	*			-0.0002	-2.05	**		
Education level	-0.015	2.65	***			-0.016	-0.74			
Education squared	0.001	1.58				0.001	0.55			
Household literacy	0.048	2.12	**			0.033	0.38			
Land assets				2.30					0.68	
Land owned	0.001	1.26				0.005	0.79			
Land owned squared	-0.00002	-0.75				-0.0002	-0.82			
Institutional and organizational assets				1.14					1.25	
Registered organization+	-0.010	-1.03				-0.034	-0.91			
Unregistered organization+	-0.004	-0.39				-0.029	-0.64			
Migration capital assets										
Historical Migration				7.56	**				1.37	
Family Network	0.001	0.08				0.042	1.09			
Current migration										
Family Network	0.014	2.62	***			-0.011	-0.56			
Community and environmental variables										
General				11.14	**				0.10	
Formal organization+	0.028	2.71	***			-0.004	-0.1			
Majority indigenous+	-0.022	-1.79	*			0.026	0.19			
Marginality index	0.001	1.28				-0.001	-0.26			
Infrastructure				2.56					4.53	
Irrigated land	-0.002	-0.15				-0.115	-1.49			
Paved road+	-0.015	-1.53				0.048	1.21			
Environmental stress				2.41					1.49	
Population pressure on land	-0.00001	-0.09				-0.001	-1.1			
Deforestation	0.0004	1.45				0.0004	0.56			
Regions				15.29	***				12.25	***
Region 1	0.024	1.49				-0.093	-1.79	*		
Region 2	-0.016	-1.00				-0.060	-0.88			
Region 3	-0.006	-0.50				0.066	1.19			
Region 4	-0.041	-2.90	***			N.A.				

Goodness of fit

	Predicted Non-migrant	Predicted Migrant		Predicted Non-migrant	Predicted Migrant
Actual non-migrant	973	27	Actual non-migrant	320	26
Predicted migrant	73	32	Predicted migrant	43	44
Percentage correct	93	54	Percentage correct	88	63