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Evidence from Mexico**

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Land Certification and International Migration:

Evidence from Mexico

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Abstract

In this paper we ask whether there is a relationship between property rights and international migration. In order to identify the impact of property rights, we consider a country-wide land certification program, which took place in Mexico throughout the 1990s, and complemented the 1992 Agrarian Law. Our identification strategy exploits the timing of the program and the heterogeneity in farmers' eligibility into the program. We find that the change in de facto property rights is associated with a 9-16 percent increase in the likelihood of having a member abroad. The program explains a small but relevant share of the increase in migration to the United States which Mexico experienced throughout the 1990s. In this respect, we add to the current debate on the causes of Mexican migration (Hanson 2006, Hanson and McIntosh 2009, Hanson and McIntosh forthcoming).

Key words: International migration, property rights, land titling, land reform.

JEL Classification codes: F22, D23, Q15.

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1 Introduction

The aim of the paper is to identify the impact of a change in land property rights on migration behavior. The research questions are: is there a relationship between property rights in developing countries and international migration? If there is any, do better defined property rights slow down or speed up migration flows?

In order to identify the impact of property rights on migration behavior, we make use of a land certification program, called *Procede*, which took place in Mexico throughout the 1990s and the first part of this decade, and targeted all ejido land in the country. Ejidos are areas of land allocated in usufruct to groups of farmers, called ejidatarios, which include the poorest segment of rural population and about 60% of agricultural land in the country (de Janvry, Gordillo and Sadoulet 1997). *Procede* complemented the 1992 Agrarian Law, which required ejidos to define their external and internal borders, granted ejidatarios with various transmission rights over their individual plots and re-affirmed that only ejidatarios could have had access to common land. Ejido land was composed by a an urban area, individual plots and common land. *Procede* provided households with a certificate over their housing plot, one over their individuals plots and one for their right to use the common land. By providing certainty over their rights, these certificates may have led households to relocate their labor supply in favor of off-farm activities, like migration. In order to count for potential omitted variable bias, we exploit program timing and households's eligibility into the program. We find that the program is associated with a 9-16 percent increase in the probability of having a member currently abroad or having been abroad recently. This result sheds light on an important side effect of land titling programs and adds to the empirical literature on international migration.

We relate to two different literatures. The first is the literature on land titling programs. Land titling programs have been object of extensive research during the last decade (see Deininger and Feder 1998 and Pande and Udry 2006 for excellent surveys). Following Besley (1995), better defined property rights should increase investment through tenure security, gains-from-trade, credit access. Empirical investigations have confirmed only partially these predictions. In case of urban squatters, titling programs have increased investments through tenure security (Field 2005, Galiani and Schargrodsky 2007), but not through credit access (Field and Torero 2006, Galiani and Schargrodsky 2007). This may be due to the limited value of the registered plots. In rural areas results are more mixed: some authors find a positive effect (Feder and Onchan 1987, Alston, Libecap and Schneider 1996, Deininger and Chomorro 2003), others find a

positive effect limited to credit-unconstrained farmers (Carter and Olinto 2003), others do not find any impact (Migot-Adholla et al. 1991, Migot-Adholla et al. 1994, Place and Migot-Adholla 1998, Brasselle et al. 2002). This seems to be due to the underlying strength of informal tenure security (see last three authors), as well as severely constrained credit supply (Carter and Olinto 2003). Therefore, even when there is a significant impact on tenure security, increased incentives to invest are often limited to self-funded investments on the field instead of systematic crop diversification and technology adoption (Do and Iyer find a significant but not economically significant impact on crop diversification)¹. This literature has not considered the possibility that if the credit supply does not respond to changes in tenure security, households may send one or more members abroad to raise the capital necessary to finance their investments.

Authors have recently paid more and more attention to non land-related outcomes, like fertility (Field 2003, Galiani and Schargrotsky 2007), children's education (Galiani and Schargrotsky 2007), labor supply outside the house (Field 2007) and outside the farm (Do and Iyer 2008). The basic mechanism requires imperfect substitutability between household labor and wage labor either in the market for property protection (Field 2007, Galiani and Schargrotsky 2007) either in the household agricultural activity (Do and Iyer 2008). Weak property rights, joint with this labor market imperfection, constrain household members at home, children included, and provide incentives for a large household size. In turn, better defined property rights partially relaxes this joint constraint. This paper contributes to this literature by focussing on an previously neglected outcome with great policy relevance, international migration². The only papers somehow close to ours are Mullan et al. (2008) and de Braw and Mueller (2009). Mullan et al. (2008) test the hypothesis suggested by Yang (1997), according to which land property rights restrictions constrains rural-urban migration in China. Their measure of tenure security is the self-reported risk of re-allocation, while their measure of land transferability is a dummy capturing whether the local leader has a say on the decision to transfer land. They find that tenure security has a positive impact on migration, while land transferability has not. De Braw and Mueller test the impact of land transferability rights on internal migration in Ethiopia. Their measure of land transferability rights is the share of land which households report as transferable. They find that land

¹Moreover, empirical investigation is limited by the fact that the quality of program implementation remains unobserved, which leaves unclear whether the lack of impact is due to the economic mechanism or to limited administrative capacity (joint with poor political willingness).

²Also Bertocchi and Strozzi (2008) study the relationship on institutions and migration. However, their paper is different for type of approach (cross-country regressions) and for the focus on institutions in the country-of-destination rather than in the country-of-origin.

transferability rights have a positive impact on migration. Differently from these works, we focus on international migration and we use a land certification program to identify the impact of property rights. Certification programs provide a source of discontinuity in property rights across households which make it easier to separate them into treatment and control groups.

The second literature we refer to is on the determinants and impacts of international migration. This literature developed out of studies of rural-urban migration (Todaro 1969, Harris and Todaro 1970) and initially focussed on cross-country wage differentials (Borjas 1987). Individuals choose to migrate according to a simple cost-benefit analysis based on their earning ability. On the other hand, the New Economics of Labor Migration (NELM, Stark and Bloom 1985) approach adopted the entire household as decision-making unit and explained migration as a response to imperfections in the market for credit and in the market for insurance (Massey et al. 1993, Taylor 1999). Over time, researchers found evidence that migration affects positively the adoption of high-yielding agricultural production techniques (Mendola 2008)³, and that remittances improve households investments (Yang 2006) and provide insurance to families in the country-of-origin (Yang and Choi 2007)⁴. Higher future income constitutes ex-ante a powerful motivation to send some household members abroad. On the other hand, migration constitutes a loss of human capital for the household in the country-of-origin⁵ if, for example, there is imperfect substitutability between family labor and wage labor due to monitoring costs or fear of invasion. Households, who can cover the fixed costs of migration, weigh the marginal benefit of migration against the marginal cost in terms of lost household labor supply. Land titling may affect both marginal benefit and marginal cost of migration: by providing greater tenure security, it increases the marginal benefits, if investments on land are mainly capital-intensive (equipment, fertilizer, cattle), or increase the marginal costs, if investments are mainly labor-intensive (manure, land clearing, adoption of labor-intensive crops); by improving the transferability rights it reduces the opportunity cost of migration.

The major added value of the paper is the identification strategy. First, we use data from a survey carried out midway through the program, which let us compare

³Mesnard (2004) and Mesnard and Ravallion (2005) find that return migration is associated with greater likelihood of self-employment. Rozelle, Taylor and Gibson (1999) find that migration is associated with greater agricultural productivity.

⁴Imperfect credit markets explain also why the selection of migrants and migrant households relative to earning ability and wealth in the country-of-origin is positive-intermediate (Chiquiar and Hanson 2005) instead of being negative (Borjas 1987).

⁵There is a large empirical literature which tries to assess the net impact of migration (brain drain, see Docquier and Rapoport 2006 on this and related issues).

ejidatario households in areas reached by the program to households in areas not yet reached. These households were eligible for the program and were subject to the legal change associated with the 1992 Agrarian Law. Their comparison let us single out the de facto change in property rights associated with the certification program from the legal change per se. However, there could be several unobserved factors which may differ across the two groups. For example, program and non-program areas may also differ for the strength of their community migration networks (Winters et al. 2001). Therefore, a second crucial aspect is the use of panel data (before and after the program), which let us control for all time-invariant differences across households. Still, there could be some time-varying differences across program and non-program areas, other than the change in property rights, which could bias our comparison. For example, there is some evidence that the strength of community migration networks varies over time according to local conditions (Munshi 2003). Therefore, the third crucial aspect of the paper is the use of an additional control group, which is constituted by non-eligible households in program areas, which at least partially attenuate the potential bias provided by time-varying difference between program and non-program areas.

We find that the program is associated with an increase in the probability of having a member currently abroad or having been abroad recently of about 9-16 percent. This constitutes a relevant share of the dramatic changes in migration rates that Mexico experienced between 1994 and 1997 (about 21-38 percent in our sample)⁶. In his review of the literature on Mexican migration, Hanson (2006) suggests that changes in the land tenure system may have changed the distribution of the return to land and so the incentive to migrate. We provide evidence that the de facto change in land property rights provided by the certification program did affect US-Mexican migration.

The paper is structured as follows: section 2 provides a background description of ejidos before and after the 1992 Agrarian Law; section 3 discusses the theory linking *Procede* to household migration behavior; section 4 presents the data, the identification strategy and the regression specification; section 5 presents the results; section 6 concludes.

⁶Migrant households constitute about 16% in 1994, while they become about 35% in 1997.

2 Context: Procede in Mexican ejidos

2.1 Land institutions before the 1992 reform

Following the 1911 revolution, the Mexican government established that land could have been conceded to groups of farmers in usufruct (ejido), and that in no way they could have transferred the land further (art.27 of the 1917 Constitution). According to the 1971 Ley Federal de Reforma Agraria, ejidos chose whether to divide part or all the land into individual parcels (art.130, 134, 135). Each ejidatario would have received a plot of parcelled land and access to common land⁷. Ejidatarios could not sell their individual plots (art. 52, 85), could not rent them out (art. 55, 85), could not leave (or neglect) them for more than two years (art. 85), could not hire wage labor (art. 77)⁸. No ejidatario could own more than 20 hectares or 5% of ejido land. Restrictions on land transferability and on the use of wage labor would have prevented land concentration and laborers' exploitation. The restriction to bequeath the land only to one member would have avoided excessive fragmentation.

Throughout the decades ejidos (and communities) arrived to include an estimated 3.2 million ejidatarios in about 30000 ejidos and to constitute 56% of the national land usable for agriculture (World Bank 1999). Ejidos became characterized by levels of capital endowment significantly lower than the private sector (World Bank 2001) and by extreme poverty (Velez 1995). The restriction over the right to bequeath led to the multiplication of landless members (avecindados)⁹. Over time, ejidos experienced also the inflow of migrants, which were not even granted the status of ejido members¹⁰. Restrictions on land markets led avecindados with land and posesionarios (henceforth,

⁷Ejidos with all land held in common are called communities. They are more common in the South of the country, and are sometimes created as a form of restitution of land to the indigenous population, after expropriation in the 19th century. In the rest of the paper, we will treat communities as the same as ejidos unless otherwise stated.

⁸Recognized exceptions to provisions in article 55 are: woman with family, in case she is not able to take care of the land directly; ejido members below 16 years old who received land as inheritance; disabled; cultivations which the ejidatario can not carry on properly because of excessive extension of the land (art. 76).

⁹Avecindados are individuals of age with Mexican nationality, who have been living for one or more years in the ejido and whose status has been recognized by the ejido Assembly or by an Agrarian Court (art. 13 of the 1992 Agrarian Law). Ejidatarios and avecindados are ejido-members. Avecindados have no right to an individual plot, no right to access common land, no right to vote in the ejido Assembly.

¹⁰According to INEGI, posesionarios are "farmers having land, that is, occupying, farming and harvesting, ejido land, no matter if parcelled or common, and who have not been recognized as ejidatarios by the Assembly or by an Agrarian Court" (INEGI). Avecindados and posesionarios arrived to constitute 26.6% and 10.6% of agrarian subjects respectively (World Bank 2001:13-14).

non-ejidatarios) to take possession of empty plots. They also led to invasions and to the emergence of black markets. Over time the distinction between individual plots and common land became more and more unclear.

2.2 The 1992 Agrarian Reform and the certification program

In 1992 the Mexican government emitted an Agrarian Law amending the Constitution and the 1971 Federal Law. The aim of the law was the provision of tenure security, which in turn should have improved development and productivity¹¹. The 1992 Agrarian Law:

- transferred the property of the ejido land from the State to the ejido (art.9 and 23.VII);
- required the ejido Assembly to re-define the division of land into urban plots, individual plots and common land (art.44);
- confirmed the right of ejidatarios to exploit the common land (art. 56.III).
- granted ejidatarios with a variety of transmission rights over their individual plots: right to choose the heir (art. 17), right to rent (art. 79), right to sell to ejido members (art.80) and removed the restriction on the right to hire labor and the right to leave the plot for more than two years (art. 79);
- granted the ejido Assembly with the power to recognize posesionarios (art. 23.VIII) and to upgrade them to the status of ejidatarios (art. 23.II).

Ejidatarios (and posesionarios recognized by the Assembly) would have had full property rights on their housing plots (art.68), but not on their individual plots. Ejidatarios would not have been able to sell their plots to non-ejido members, nor would have they been able to use them as collateral to obtain credit¹². Acquisition of full property rights (dominio pleno) required an additional deliberation of the Assembly and an individual application of the ejidatario to the RAN (art.81-82). In practice very few Assemblies seem to have done so¹³. On the other hand, the right to exploit the common land would

¹¹Introductory note, 1993 Reglamento de la Ley Agraria en materia de Certificacion de Derechos Ejidales y Titulacion de Solares.

¹²The plot could have been used as collateral only with credit institutions which already had commercial relationships with the ejido, and, in case of default, the latter could have taken the plot only for the amount of time necessary to get the money (art. 46 Ley Agraria). So, we do not expect certificates to have increased access to credit.

¹³Only 6/248 ejidos in our sample have adopted dominio pleno.

have been reserved to ejidatarios only and would have remained non-transferable¹⁴. Unless the Assembly decided otherwise, each ejidatario had equal right to use the common land.

As a complement to the Agrarian Law, the Government launched a massive certification program, called PROCEDE (Programa de Certificacion de Derechos Ejidales y Titulacion de Solares). The program, which was totally free, would have documented ejidatarios' rights over land with certificates emitted by the National Agrarian Registry (art.56).

The program provided titles over housing plots, certificates over individual plots and certificates over the right to use the common land. Certificates over individual plots (certificado parcelarios) included name of the ejidatario, size and position of the plot, and the list of bordering neighbors. They would have substituted the old certificates (certificado de derechos agrarios), which included only name, ejido affiliation and way of acquisition of the plot. Certificates of right to common land use reported the ejidatario's name and the proportion of common land he/she had the right to exploit.

Mapping dimension and exact location of ejidatarios' plots practically implied mapping also the exact location of the plots of non-ejidatarios recognized by the ejido Assembly. Indeed, the 1993 Reglamento de la Ley Agraria en materia de Certificacion de Derechos Ejidales y Titulacion de Solares specifies that the ejido Assembly is required to create a list of recognized non-ejidatarios (art.17) and to provide them with certificates over their individual parcels (art.36) and over their housing plots. The certificates over non-ejidatarios' individual plots are the same as ejidatarios' ones but for the specification "poseionario" on the back. The program resulted in the "formal recognition of occupancy rights for more than 1 million households (avecindados and poseionarios)" (World Bank 2001:vii). Unless the ejido Assembly specified otherwise, these non-ejidatarios had the same rights on their individual parcels as ejidatarios, but no right to use the common land (art.37 and 40) and so to receive the corresponding certificate. The issuance of certificates was relatively successful: Procede resulted in the issuance of "certificates to more than 3 million households (world Bank 2001).

¹⁴Only the ejido Assembly, in case of majority of votes, has the right to transfer the common land. Such right is limited to the common land as a whole and to companies external to the ejido (art.75) and does not seem to have been used in practice.

3 Theoretical framework

Following the New Economics of Labor Migration (NELM, Stark and Bloom 1985) approach, we consider the household as the decision-making unit with respect to migration behavior. We assume that the relevant concept of household embraces members currently living at home and children of the household head currently living outside (biological family)¹⁵.

Households send one or more of their members abroad to increase their income level and reduce its volatility. A household is defined as migrant if at least one of their members is currently abroad or has been abroad within the previous 3 years. This definition is very similar to that in Winters et al. (2001) and seems appropriate given the purpose of evaluating recent policy changes¹⁶.

Ejidors' common land is a common pool resource. Before the 1992 Agrarian Law, the informal right to exploit may have been partly determined by the intensity of use. By excluding access to posesionarios and specifying the proportion of common land ejidatarios were entitled to exploit, the certificates over common land increased tenure security. This may have provided incentives to send one or more members abroad for two reasons. First, if part of the household labor supply was previously devoted to the maintenance of the right to exploit the common land, now it could be freed and devoted to more remunerative off-farm activities, like migration. Second, working on the common land may actually be remunerative, but it may also require substantial capital input. Indeed, cattle raising is the main activity common land is devoted to (together with forest exploitation). If credit markets are absent or highly imperfect, sending one or more members abroad would provide remittances which could fund the cumulation of cattle. This is what de Janvry et al. (1997) call the migration-subsistence strategy: households grow subsistence corn on their individual plots and cumulate capital through the migration-cattle raising mechanism.

¹⁵Since data on members currently living outside home are not as rich as those on members currently living at home, for some control variables we will rely on the latter only on members currently living at home, which we define as core household (core family).

¹⁶One assumption implicit in the definition is that siblings of the household head living outside home are not part of the household. On the other hand, we will consider them as family migration networks if they happen to be abroad, as in Winters et al. (2001).

4 Data and estimation method

4.1 Data

We consider the 1994 and 1997 ejido surveys. The 1994 ejido survey was realized by the Mexican Ministry of Agrarian Reform (Segreteria de Reforma Agraria, SRA) in collaboration with University of California Berkeley, and was based on a two-step design: first, the random draw of 275 ejidos out of the 1988 ejido census, then the stratification of these ejidos with respect to average area of agricultural land per household (above or below 5 ha), and the random draw of 1543 households¹⁷. The 1997 ejido survey was realized by the Ministry of Agrarian Reform with the World Bank on 286 ejidos, following the same survey design as in 1994. The total number of households interviewed is 1665, while the number of panel households is 1286¹⁸. In the rest of the paper we will focus on the sample of panel households¹⁹. The survey provides detailed information on members' demographic characteristics, past migration experiences, current migration experiences on children of the household head living outside the house, use of land, equipment, ejido characteristics²⁰.

4.2 Identification strategy

In this paper we exploit both the timing of the certification program and heterogeneity in farmers' status within ejidos to identify the impact of the program. The 1997 ejido survey contains detailed information on the implementation of the program. Ejidos which

¹⁷The survey is representative at the state level. Ejidos were selected from each state but Chiapas, where conflict prevented the beginning of the fieldwork. Details can be found in de Janvry, Gordillo and Sadoulet (1997).

¹⁸The total number of households is higher than in 1994 because of the intention to interview a minimum of 5 households for ejido. It is not clear whether enumerators tried to re-interview all 1548 1994 households and reached only 1287 (attrition around 16%) or tried to re-interview only a subset of them. Cord et al. (1999), which is the reference paper for the survey design, states that the baseline (1994) sample was just 1342 households, and so attrition is very low (55 households, around 3.5%).

¹⁹The program started between 1993 and 1994, that is, only few months before the 1994 survey, which took place during the summer. We exclude 14 hh as they belong to ejidos with missing information on the program, 64 households as they belong to ejidos which terminated the program before the 1994 survey, 12 households because they are private landowners, and 115 households because they had unclear status (to be specified later). The final sample has 1078 households in 248 ejidos.

²⁰These data have been used by several other authors for a variety of purposes: ejido reforms (World Bank 1999 and 2001; Munoz-Pina, de Janvry and Sadoulet 2003), migration (Winters, de Janvry and Sadoulet 2001; Winters and Davis 2001), off-farm activities (Sadoulet and de Janvry 2001) and cash-transfer programs (Sadoulet, de Janvry and Davis 2001).

report to have terminated the program before the 1997 survey are termed "program areas", whereas those which did not are termed "non-program areas". Since the 1997 survey was carried out midway through the program, the share of program areas is approximately the same as the share of non-program areas²¹. Households in non-program areas constitute our first control group. The 1997 ejido survey also includes information on the date of termination of the program. This will let us distinguish program areas in early (1994-1995) and late (1996-1997) program areas. This differentiation captures the fact that households in early program areas had more time to adjust their migration behavior.

Since the target of the program was the totality of ejidos in Mexico and the totality of ejidatarios within them, there is no program placement nor household self-selection at work. However, there could still be a program timing bias. Indeed, there is some evidence suggesting that program timing has been far from random (Cord et al. 1999, Deininger and Bresciani 2001). This may have been driven both by supply and demand factors. First, the Government made an effort to implement the program as quickly as possible. This may have led officials to favor implementation (program offer) according to ease of entry. Second, ejidos had to provide a document stating the absence of conflicts over external boundaries signed by neighboring ejidos or private landowners. Third, the decision to implement the program was left to the ejido Assembly (approval with three fourth of ejidatarios participating to the first Assembly, otherwise simple majority in case of second Assembly). According to Bailon (1995), by November 1995 more than 95% of Mexican ejidos had been contacted for the implementation of Procede, so awareness of the program should not be a concern. However, participation to the Assembly and achievement of an agreement may have suffered from collective action problems. In addition, the implementation of the program required the substantial resolution of internal land conflicts (between ejidatarios, and between ejidatarios and non-ejidatarios)²².

In table 1, columns (1)-(3), we compare some observable ejido characteristics across program and non-program areas. Program areas are smaller, have a smaller share of common land, have a lower number of ejidatarios, are closer to urban centers, have greater infrastructures (irrigation, access to a paved road, existence of an auditorium/assembly

²¹Since the 1997 survey was carried out midway through the program, program areas (114/248, or 46%), are about as many as non-program areas (134/348, or 54%).

²²Indeed, this is confirmed by the path of implementation of the program (after 1997). It turns out that Procede was closed in december 2007 notwithstanding the fact that program implementation was not complete (another program opened up: programa de Fondo de Apoyo para los Nucleos Agrarios sin Regularizar, FANAR).

hall) and less external boundary problems. Their members seem to be wealthier: the percentage of dwellings with drinking water and drainage is greater. The differences suggest that program placement may have been directed to smaller and wealthier ejidos first, which is consistent with both supply and demand determinants. In columns (4)-(6) we compare program and non-program areas according to pre-program (1994) characteristics. Results confirm the previous comments.

In table 2, columns (1)-(3), we compare observable characteristics of households in program and non-program areas. Households in program areas do not seem to differ systematically from those in non-program areas. In columns (4)-(6) we repeat the comparison with pre-program (1994) data. Results confirm the previous comments.

Non-random program timing may be problematic if the determinants of program implementation are correlated with household migration behavior. In order to correct for this bias, we could control for ejido characteristics that we found to be correlated with program implementation (selection-in-observables). However, there would be no way for us to be sure to have included all relevant determinants. For example, we do not observe the strength of the community migration network (Winters et al. 2001).

In order to improve our identification strategy, we make use of non-beneficiary households as additional control group. If non-beneficiary households are present both in program and non-program areas, then we can compare the difference in migration behavior between beneficiaries and non-beneficiaries in program areas to the difference between beneficiaries and non-beneficiaries in non-program areas. This would allow us to control for all time-invariant differences across program and non-program areas. Our group of non-beneficiary households is constituted by non-ejidatarios (avecindados with land, posesionarios). As we discussed in section 2, while ejidatarios are the original founders of the ejido (or their direct heirs), non-ejidatarios are descendants who did not inherit land and migrants. Both avecindados and posesionarios came to possess land through occupation of empty land, illegal transactions and invasions. In order to identify beneficiary and non-beneficiary households, we make use of pre-program (1994) data on possession of an ejido certificate. Households with a pre-program ejido certificate are termed "ejidatarios", whereas those without are termed "non-ejidatarios"²³. An informal check of the quasi-random assignment of the program across ejidatarios and non-ejidatarios is to compare pre-program (1994) observable characteristics of ejidatarios and non-ejidatarios

²³According to the 1971 Federal Law of Agrarian Reform (art. 69), ejidatarios' rights are acknowledged by certification (certificado de derechos agrarios). Indeed, these certificates constitute the basis for the delivery of the new certificates (art. 4 Transitorios, Agrarian Law). Households without a certificate may still be ejidatarios if they have an appropriate sentence of an Agrarian Court (art. 16, Agrarian Law). We abstract from this possibility.

across program and non-program areas. Results (table 3) show lack of significant differences. Both visual inspection of the magnitudes and the difference in difference (column 10) suggest no systematic differences. In table 4 we repeat the comparison with 1997 observable characteristics. Overall, there does not seem to be systematic differences in demographic characteristics, while there seem to be some marginal or strongly significant differences in migration rates, capital inputs, livestock and land transactions associated to ejidatarios in program areas. Such differences do not contradict our identification strategy because they could be endogenous to program implementation.

Ejidatarios benefit from the program as they receive the certificate over their individual plots and over their access to common land. Pre-program certificate in non-program areas continues to be valid until the ejido is reached by the program (art.4 Transitorios, Agrarian Law). This means that ejidatarios in non-program areas maintain their status during the period under study and can formally take advantage of the provisions of the 1992 Agrarian Law. With respect to our identification strategy, it means that what we identify is the de facto change in property rights associated with the certification program and not the legal change associated with the Agrarian Law.

This is what can happen to non-ejidatarios and whether they benefit from the program. First, they may maintain their status. In this case, they benefit, if any, only indirectly from the program. Second, they may be recognized by the Assembly. In this case, they receive a certificate over their individual plots, but not the certificate over the access to common land. Third, they may be upgraded to ejidatarios. In this case, they receive both the certificate over their individual plots and the certificate over the access to common land.

For our identification strategy to be valid, we only need non-ejidatarios to benefit from the program on average less than ejidatarios. If ejidatarios and non-ejidatarios have the same initial conditions, then non-ejidatarios benefit less than ejidatarios as long as some non-ejidatarios are not upgraded. With respect to the initial conditions, Nuijten (2003) argues that informal tenure security was very strong before the program. In fact, pre-1992 land transactions were illegal but widely accepted within ejidos (Yates 1981:181, and NACLA 1976:18, cited in Heath 1990:34). This is confirmed by the level of pre-program transactions in table 3. With respect to the possibility of upgrading of non-ejidatarios to ejidatario status, notice that the share of ejidatarios in our sample (59%) is very similar to the share of ejidatarios 6 years later, as reported in the 2000 Censo Ejidal (World Bank 2001:16). When it did take place, upgrading was as likely in program areas as it was in non-program areas (Munoz-Pina, Sadoulet and de Janvry 2003)²⁴. According

²⁴More on this in section 5.4.

to the Deininger ad Bresciani (World Bank 2001) and Procuraduria Agraria (2009, 2010), the large majority of non-ejidatarios was recognized by the Assembly but not upgraded to ejidatario status. Indeed, our data suggest that 73,8% of non-ejidatarios in program areas have at least one plot certified (as opposed to 84,5% of ejidatarios), while 58,7% have all their plots certified (as opposed to 70,9% of ejidatarios)²⁵. The difference in certification rates across the two groups confirms that non-ejidatarios were less likely to access the program than ejidatarios.

If we want to capture the fact that households in early program areas (1994-1995) had more time to adjust their migration behavior than in late program areas (1996-1997), then it may also be appropriate to compare ejidatarios and non-ejidatarios across early and late program areas (table 5). In columns (1)-(3) we compare early to late program areas, while in columns (4)-(10) we compare ejidatarios and non-ejidatarios across early and late program areas. Member of ejidatario households are more likely to have had recent migration experiences than their counterparts in late program areas. Along the same lines, ejidatario households have a greater number of siblings of the household head abroad. These differences may be driven by small sample size or may signal real differences between households in early and late program areas. We will address this issue later in the paper.

By using non-ejidatario households as additional control group, we control for all time-invariant differences across program and non-program areas. Still, it could be that the difference between beneficiaries and non-beneficiaries in migration behavior varies across program and non-program areas due to factors other than the certification program. One way to relax this identification assumption is to control for household-level characteristics. In order to select them, we rely on the literature on migration. Table 6 shows hh-level descriptive statistics relative to migration status. Household heads belonging to migrant households are older and less educated (but equally literated). Migrant households' average schooling is low within the core family, but not within the biological family²⁶. Migrant households are bigger²⁷, are associated with a greater

²⁵Non certified plots have one of the following status: non-certified, communal land, private property, dominio pleno (which equals private property).

²⁶The absence of selection in terms of education is surprising with respect to the literature on Mexican migration. However, notice that average education is very low in our sample (3-4 years of schooling), even below the 6 years necessary to finish primary school. Complementary descriptive statistics (not reported) show that there is some heterogeneity of education with respect to wealth but is limited. Overall, only about 10% Mexican households in our sample has 4 or more years of education. On the contrary, Chiquiar and Hanson (2005) show that in 1990 73,9% Mexican residents had more than 4 years of education.

²⁷This may be due to greater amount of household labor supply. As noted by Winters et al. (2001), if we were to assume decreasing returns to labor in agricultural activities and imperfect agricultural labor

number of siblings of the household head abroad²⁸, are less likely to be indigenous²⁹, and are also associated with greater land assets³⁰ and dwelling characteristics (drinkable water in the house, existence toilette and spare room), which may suggest positive self-selection of households into migration status. Given recent findings on the role of wealth in the selection of migrant households in Mexico (Chiquiar and Hanson 2005, Winters et al. 2001 and de Janvry, Gordillo and Sadoulet 1997), we look at the distribution of migrant households per land category. Land assets constitute also a reliable proxy for wealth, both because they are often farmers' primary assets and because pre-1992 restrictions over land transactions should limit concerns of reverse causality relative to migration behavior (households could not invest remittances in land). Figure 1 shows that selection is positive-intermediate, which is consistent with the above-mentioned papers. The land certification program could have had a different impact on households depending on their land assets. Large farmers may have had a greater benefit in terms of tenure security if the extent to which one could exploit the common land was proportional to the size of the individual plots. It could have also be the case that, although even small landowners are involved in migration, large landowners more easily overcome the related credit constraints. In order to gain further insight on the impacts of the program on household migration behavior, we will repeat the split the sample of households relative to the size of their land assets: 0-3 ha, 3-12 ha, 12 < ha.

Still, there could be important time-varying unobserved differences across program and non-program areas. For example, there is some evidence that the strength of community migration networks varies over time (Munshi 2003). Another way to relax our identification assumption is to exploit the time-series dimension of our dataset. By doing so, the identification assumption is that the difference in migration behavior between ejidatarios and non-ejidatarios across program and non-program areas does not

market, then, for any given amount of land, the greater the household the greater should be the share of household labor supply allocated to migration (or off-farm activities in general). Another reason could be that individuals migrating abroad (mostly male) leave their spouses to their original households, thereby increasing both household size and proportion of females of migrant households.

²⁸The number of siblings of the household head abroad is a proxy for the strength of the household migration networks (Winters et al. 2001). Notice that the siblings of the household head may have been part of the household before migrating. Therefore, our measure of household migration assets in 1997 may be partly endogenous to the program. In order to avoid this possibility, we consider its pre-program (1994) value.

²⁹This is not surprising: indigenous households are mostly located in the Gulf and South-Eastern region. Thus, physical distance adds to cultural distance to typical migration destinations.

³⁰Land assets are computed in National Rainfed Equivalent hectares, as suggested by de Janvry et al. (1997). The idea is to compute a weighted average of irrigated and rainfed land, as well as natural pasture and forest land with weights varying across agro-ecological regions, so to count for humidity. Such weights are computed with respect to the following question: how much land is needed to produce a ton of corn?

vary over time due to factors other than the certification program. Therefore, we allow for a difference in migration behavior, but that must be constant over time.

4.3 Regression specification

We estimate 1997 household migration status with the following Linear Probability Model:

$$y_{ik} = \eta_1 + \alpha_1 w_i + \beta_1 (w_i * e_{ik}) + \gamma_1 e_{ik} + \Gamma'_{11} Z_{ik} + \Gamma'_{12} X_i + \varepsilon_{1ik}, \quad (1)$$

where $y_{ik} \in \{0, 1\}$ is the migration status of household k in ejido i , $w_i \in \{0, 1\}$ indicates whether ejido i has terminated the program before the 1997 survey, X_i is the vector of ejido-level controls, Z_{ik} is the vector of household-level controls, and ε_{1ik} is the error term. We choose to use the Linear Probability Model instead of a Probit/Logit model to maintain consistency with models exploiting the time-dimension of the dataset³¹. The hh-level controls (Z_{ik}) are the following:

- household composition: age of the household head, # adult members (above 15), fraction of females among adult members, average literacy³², average schooling among (members above 15);
- household assets: # HH siblings abroad (migration assets).

The ejido-level controls (X_i) are the following:

- land: ejido area (log), share common land with respect to common and parcelled land;
- pop composition: dummy for indigenous ejidos, membership to ejido union;
- infrastructure: access to paved road.

³¹One of the main advantages of having a panel dataset is the inclusion of household fixed effects. The latter are distortionary if included in a Probit/Logit model though (see Wooldridge 2002). Therefore, their inclusion require the use of a Linear Probability Model as opposed to a Probit/Logit. To maintain comparability with later results, we adopt a Linear Probability Model even here.

³²This information is available for members currently living at home only.

The choice of the household-level variables is in line with the literature and our descriptive statistics. The choice of the ejido-level controls is determined by ejido characteristics which we found had some explanatory power relative to household migration decision and the adoption of the certification program.

The identification of the impact of Procede on ejidatarios (β_1) in (1) requires that there is no difference in migration behavior between ejidatarios and non-ejidatarios across program and non-program areas driven by factors other than the program and the set of controls we include. This specification let us control for all unobserved differences across program and non-program areas common to both ejidatarios and non-ejidatarios (α_1), like:

- distance from the border, which affects the cost of migration;
- historical community networks, which affects both the cost of migration and its expected return, to the extent they are constant over time;
- different implementation of the program, due for example to administrative capacity (or different prioritization of the program) of the Procuradoria Agraria across areas .

To address the possibility that the identification assumption does not hold, we exploit the time dimension of our dataset and estimate household migration status according to the following Pooled Linear Probability Model:

$$y_{ikt} = \alpha_{21}w_i + \alpha_{22}(w_i * 1997) + \gamma_{21}e_{ik} + \gamma_{22}(e_{ik} * 1997) + \gamma_{23}1997 + \beta_{21}(w_i * e_{ik}) + \beta_{22}(w_i * 1997 * e_{ik}) + \Pi'_{21}Z_{ikt} + \varepsilon_{2ikt}, \quad (2)$$

where y_{ikt} is the migration status of household k in ejido i at time t , w_i is the dummy for ejidos which received certificates in 1997. The identification of the impact of Procede on ejidatarios (β_{22}) requires that the difference in migration behavior between ejidatarios and non-ejidatarios across program and non-program areas, due to factors other than the program and the controls we include, is constant over time. This assumption is weaker than the previous one: we now allow for time-invariant differences between ejidatarios and non-ejidatarios across program and non-program areas common to both ejidatarios and non-ejidatarios (β_{21}); we also allow for community migration networks to have a

differential trend across program and non-program areas (α_{22}), which could be the case if migration networks vary over time depending on economic conditions (Munshi 2003).

5 Results

5.1 Impact of Procede on migration

Table 7 shows the results associated with the cross-section specification (1). The average impact of Procede on ejidatarios' household migration status is positive (magnitude 0.113, column 1) and marginally significant. Magnitude and significance decrease as we include ejido fixed effects (column 5) or we consider the sub-sample of ejidatarios alone (column 6). Splitting the sample with respect to land assets (0-3 ha, 3-12 ha, >12 ha; column 2-4) reveals that Procede had a strong and significant impact on ejidatarios in the intermediate category (0.226).

Table 8 shows the results associated with the panel specification (2). The average impact of Procede (column 1) is positive and significant. The magnitude is greater but still consistent with the cross-section counterpart (0.164 against 0.113) and corresponds to an increase in the probability of being a migrant household equal to 16.4%. When we consider the sub-sample of ejidatarios only (column 5), the coefficient of interest decreases in magnitude (0.095), but remains highly significant. Splitting the sample in land categories (columns 2-4) reveals that Procede had a strong and impact on the second (3-12 ha) and third (>12) categories, but not on the first one (0-3). This is consistent both with the idea that access to common land may be proportional to the individual plot (large landowners have right to greater exploitation), but also with the idea that small landowners are too poor to afford international migration anyway (although the descriptive statistics showed that they do migrate). A comparison of table 7 and 8 suggest that, by using two waves of data, we gained both in precision and magnitude of the coefficients of interest.

Table 9 shows the results associated with a modification of specification (2): we allow the program to affect early program areas (1994-1995) more than late ones (1996-1997). The average impact of Procede (column 1) is positive and significant. The magnitude is consistent with what previously found (0.115 for late program areas, 0.115*2 for early ones, 0.164 for the corresponding coefficient in table 8). Again, when we consider the sub-sample of ejidatarios only (column 5), the coefficient of interest decreases in magnitude

(0.065), although it remains highly significant. Splitting the sample in land categories (column 2-4) provides coefficients consistent with what previously found: Procede had an impact on the second (3-12 ha) and third (>12) categories, but not on the first one (0-3).

The direction, magnitude and significance of the coefficients associated with the control variables is quite consistent with the theory. The coefficient associated with land assets is positive and significant, although the magnitude is rather small: an increase of 10 ha is associated with an increase in likelihood of being a migrant household equal to 1-3%. This is consistent with the theory (positive-intermediate self-selection of migrant households), but also suggests that land assets have only a minor role in migration after controlling for the other factors. The coefficient associated with household size is always positive and significant across all specifications. Its magnitude is about 0.03 (3% increase in probability for each additional adult). This is consistent with the fact that the opportunity-cost of migration decreases with household size for any given level of land if agricultural activity is characterized by decreasing marginal returns of labor. The coefficient associated with family migration assets (number of siblings of the household head abroad) is generally positive, large and significant. The only ejido-level control consistently significant across the cross-section specifications is the dummy for indigenous ejidos. This is consistent with the cultural barriers and their geographical distance from the border with the United States.

5.2 Channels.

In section 3 we argued that the certificate of rights over common land use should increase ejidatarios' tenure security over common land. With respect to tenure security, there is no direct question in the household surveys on whether the household feels more secure on its own plots. The only question is an opinion by the household on whether tenure security in the entire ejido has improved, worsened or remained the same: 27.9% of households in program areas think it improved (against 65.8% for which it remained the same and 6.3% for which it worsened). There is no significant difference between ejidatarios (26.2%) and non-ejidatarios (30.8%).

We have also argued that the certificate increased incentives for invest in cattle and so, given the absence of credit markets, the incentive to send a household member abroad. So one way to check the consistency of our results is to look at the impact on remittances and cattle raising. The information on remittances is available only for the 1997 survey. The cross-section specification (results not reported) does not show any

impact. Differently from remittances, the information on cattle raising is available for both waves, but we fail to identify any impact (results not reported). Lack of impact on remittances and cattle raising is consistent with our results if we take into account the extremely short time span that we consider: the average time since reception of certificate is one year and a half. It may be the case that remittance flow, and so additional investments in cattle, require more time to take place.

5.3 Do differences in migration behavior reflect anticipatory responses to the program?

A crucial point of our identification strategy is the comparability of ejidatarios and non-ejidatarios' migration behavior across program and non-program areas. This concern motivated our descriptive statistics in tables 3 and 4. Comparison of pre-program characteristics (table 3) showed that ejidatarios had different percentages of access to tractors, pickups and machinery across program and non-program areas before the program took place. While part of this difference is due to the difference in common machineries between program and non-program areas (possession of a machinery includes borrowing and rental from friends or from the ejido), one may wonder whether it signals some systematic pre-program difference.

One way to deal with this concern is to run our 1997 cross-section specification with pre-program (1994) data. This should work as a falsification exercise: finding an impact of the program on migration behavior would cast some doubts on the goodness of our results. Indeed, table 10 shows that this is not the case: the average impact of *Procede* on ejidatarios before the program took place is negative, small and insignificant (column 1). This result is robust to the inclusion of ejido fixed effects (column 5) and to the restriction of the sample to ejidatarios only (column 6). Splitting the sample reveals no impact associated to the second (3-12 ha) and third (>12 ha) categories, and a negative and marginally significant impact associated with the first category (0-3). Of course, this falsification experiment does not constitute a definitive proof in favor of our identification assumption, but it is quite re-assuring.

5.4 Do non-ejidatarios benefit from the program?

There is another concern: our comparison of ejidatarios and non-ejidatarios over time across program and non-program areas was introduced to attenuate the potential omitted

variable bias due to selection of ejidos into the program. Whether and how this control group is affected by the program matters for the validity of the results and for their interpretation. If all non-ejidatarios were recognized by the Assembly (but not upgraded to ejidatario status) and we assumed that the certificates on individual plots had the same impact on ejidatarios and non-ejidatarios alike, then our interaction variable would identify the impact of the certificate over the right to use the common land. On the other hand, if none of the non-ejidatarios was recognized by the Assembly, then we would have identified the joint impact of the certificate on individual plots and the certificate on common land. As we explained in section 2, the Agrarian Law states that the Assembly has the power (but not the obligation) to recognize land which has been parcelled *de facto*, recognize the tenure of posesionarios and let the RAN send them the corresponding certificates. The extent to which this happened is not a legal but an empirical matter.

Our data suggest that 58,7% of non-ejidatarios in program areas have all their plots certified (as opposed to 70,9% of ejidatarios), while 73,8% have at least one plot certified (as opposed to 84,5% of ejidatarios)³³. The difference in certification rates across the two groups suggest that non-ejidatarios had relatively more problems to be recognized as such by the Assembly and the program officials. It also suggests that our results reflect mainly but not exclusively the certificate on common land.

On the other hand, it would be interesting to know which, among the two certificates, is driving our results. If the most important certificate is the one on individual plots, then we would expect to find an impact of *Procede* also on non-ejidatarios' migration behavior. This impact would approach that found for ejidatarios if recognized non-ejidatarios had also been upgraded to ejidatario status. This latter possibility does not seem a concern for our main results. If any, it would work as an attenuation bias. In addition, Munoz-Pina, Sadoulet and de Janvry (2003) provide evidence suggesting that *Procede* is not significantly associated with incorporation of ejidatarios³⁴. This said, finding no impact on non-ejidatarios' migration behavior would be re-assuring for the goodness of our identification strategy and would indicate that the certificate on common land is more important than the certificate on individual plots.

³³Non certified plots have one of the following status: non-certified, communal land, private property, *dominio pleno* (which equals private property).

³⁴See table 2 in their paper. They state: "What it means is that all the communities that wanted to implement these changes had already started the process on their own based on information that these changes were now legal and were to be ratified by *Procede* once they reached the ejido." (p.146). Notwithstanding the high number of ejidos which incorporated new ejidatarios over the period 1994-1997 (42% of ejidos in their sample, which is made of 181 ejidos with CPR in 1994), the number of posesionarios/ *avecindados* incorporated is rather limited. In ejidos which increased the number of ejidatarios over this period, the increase corresponds to about 13% of non-ejidatarios (author's tabulations).

In order to check the eventual impact on non-ejidatarios' migration behavior, we run our panel specification (2) with the sub-sample of non-ejidatarios only. If non-ejidatarios have not been affected by the program, then we should not observe any significant impact. Indeed, table 11 shows that this is the case. The average impact of *Procede* on non-ejidatario households is small, negative and insignificant (column 1). The same result holds when allowing the impact to be greater for early program areas (column 2), as well as when splitting the sample per land category (columns 3-5).

6 Conclusion

In this paper we asked whether there is a relationship between property rights and international migration. We identified the impact of a *de facto* change in property rights by using a country-wide certification program following the legal change associated with an Agrarian Law. We find that the change in *de facto* property rights is associated with a 9-16 percent increase in household's migration status. The result is important for two reasons. First, it constitutes a previously neglected side-effect land titling programs. Second, we add to the literature on international migration. Third, our sample is taken from a nationally representative survey for the ejido sector, which constitutes about 60% of the rural economy. Following Durand, Massey and Zenteno (2001), the Mexican rural economy constitutes one of the primary sources of migrants to the U.S. Although we find a large impact on migration behavior, period of study is characterized by a steep increase in migration: in our final sample, the average probability of being a migrant household passes from 14 percent in 1994, to 26 percent in 1997. Given that ejidatarios in program areas constitute about 28% of the sample, the impact of the certificates explains about 21-38 percent of the aggregate increase in migration. Given that the ejido sector is traditionally one of the primary sources of US-Mexican migration, this result may shed light on a small but relevant share of the rise in migration which Mexico experienced throughout the 1990s. In this respect, we contribute to the current debate on the drivers of the surge in Mexican migration in the 1990s (Hanson 2006, Hanson and McIntosh 2009, Hanson and McIntosh forthcoming).

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Table 1
Descriptive statistics at the ejido-level on Procede adoption, both surveys

	(1)	(2)	(3)	(4)	(5)	(6)
	1997			1994		
	Program	No Program	diff	Program	No Program	diff
	(N=114)	(N=134)		(N=114)	(N=134)	
log ejido area (ha)	6.99	7.19		6.86	7.22	**
% common to common and parcelled area	28.09	43.92	***	30.03	45.42	***
% urban to total area	2.75	2.25		3.43	3.30	
D, communal ejidos	0.09	0.14		0.04	0.05	
ratio #non-ejidatarios/#ejidatarios	0.70	0.94		2.18	0.64	*
#ejidatarios	102.25	120.17		86.74	121.31	***
common land per ejidatario (ha)	9.51	10.71		9.68	10.93	
average size parcelled land (ha)	14.49	11.12		13.05	11.25	
D, indigenous ejido	0.29	0.31		0.14	0.16	
inequality parcels (ratio max/min)	11.82	11.00		5.11	10.06	***
D, membership to Union de ejidos	0.24	0.25		0.31	0.39	
Distance from closest urban centre (km)	23.87	28.78			N/A	
#urban centres within a hour	1.74	1.32	**		N/A	
D, at least one obra para riego	0.43	0.29	**		N/A	
D, at least one storing facility	0.17	0.17			N/A	
D, access to paved road	0.71	0.56	**	0.32	0.21	**
% dwellings with electricity	84.30	80.10		81.45	72.11	**
% dwellings with drinking water	69.75	55.70	**	64.47	50.40	**
% dwellings with drainage	13.96	9.06		14.83	14.24	
D, public phone	0.61	0.50	*	0.54	0.45	
D, street lighting	0.75	0.70		0.71	0.65	
D, auditorium/assembly hall	0.65	0.39	***	0.62	0.46	**
Boundary problems with other ejidos	0.57	0.96	***	0.24	0.56	***
Boundary problems within the ejido	0.56	0.43		0.13	0.37	***
Boundary problems common land	0.22	0.20			N/A	
D, squatting common land	0.11	0.31	***		N/A	
D, kindergarden	0.81	0.83			N/A	
D, primary school	0.96	0.97		0.96	0.96	
D, secondary school	0.44	0.45			N/A	
D, at least one social program	0.56	0.53		0.57	0.47	
D, at least one environmental problem	0.43	0.51			N/A	

Raw sample means from the 1994 and 1997 ejido surveys. * significant at 10%; ** significant at 5%; *** significant at 1%. Columns (3) and (6) report t-statistics of the difference between columns (1) and (2), and (4) and (5). "Program" and "No Program" refer to whether ejido has terminated the certification program before the 1997 survey. Definition household (biological hh): includes both members currently living at home (core hh) and children of the household head living outside home. Definition (D, household migration status): binary indicator taking value 1 if either (D, current migration) either (D, past migration core hh, last 3 years) take value 1. schools: in 1994 only a generic dummy available. Definition indigenous ejido: dummy taking value 1 if there are some indigenous people (1997) or if the majority is indigenous (1994). Social programs: in 1994 only a dummy for the presence of Conasupo within the ejido. Boundary problems: in 1994 only a dummy for generic boundary problems and one for problems related to common land, in 1997 boundary problems (before Procede) are codified as categorical variable (no/si, parcialmente/si; with corresponding values 0,1,2) with respect to other ejidos, between ejidatarios about delimitation plots, between ejidatarios about assignment common land. In 1997 there is also a dummy in case some common land had been

Table 2
Descriptive statistics Procede certification at hh-level, both surveys

	1997			1994		
	Program (N=481)	No Program (N=597)	diff	Program (N=481)	No Program (N=597)	diff
D, past migration core hh	0.23	0.23	(0,011)	0.17	0.17	(0,037)
D, past migration core hh (last 3 years)	0.09	0.06	(1,545)	0.04	0.03	(0,607)
D, current migration HH children	0.21	0.22	(-0,291)	0.10	0.13	(-1,196)
D, migration status hh (last 3 years)	0.28	0.25	(0,504)	0.13	0.15	(-0,533)
#migrants abroad (last 3 years)	0.65	0.65	(0,062)	0.25	0.34	(-1,132)
HH age	52.89	51.65	(1,031)	50.08	48.59	(1,206)
HH sex	1.04	1.03	(0,787)	1.04	1.03	(0,446)
HH schooling	3.31	3.09	(0,967)	3.30	3.18	(0,515)
HH literacy	0.82	0.77	(1,797) *	0.81	0.78	(1,087)
#members below 5 years, core family	0.41	0.54	(-1,990) **	1.35	1.46	(-1,637)
#members above 15 years, core family	3.51	3.70	(-1,584)	3.36	3.48	(-0,995)
average literacy, core hh members above 15years	0.84	0.82	(0,976)	0.86	0.83	(1,081)
average schooling, core hh members above 15 years	4.68	4.49	(0,851)	4.61	4.46	(0,612)
#members bio hh, above 15 years	6.55	6.51	(0,157)	5.87	5.65	(0,769)
prop females among adults	0.38	0.37	(0,978)	0.45	0.44	(0,709)
#HH siblings abroad	0.35	0.36	(-0,124)	0.14	0.15	(-0,211)
land assets 1992	11.66	10.53	(0,835)	11.66	10.53	(0,835)
D, electricity	0.89	0.88	(0,446)	0.73	0.69	(0,700)
D, indigenous hh	0.16	0.20	(-0,740)		N/A	
average schooling, bio hh members above 15 years	5.56	5.25	(1,292)		N/A	
D, drinking water	0.81	0.76	(1,515)		N/A	
D, toilette	0.38	0.30	(1,479)		N/A	
D, access to drenage	0.19	0.12	(1,683) *		N/A	
D, telephone	0.07	0.04	(1,219)		N/A	
D, existence spare room	0.83	0.82	(0,594)		N/A	
D, land rental transaction (ongoing)	0.12	0.09	(1,689) *	0.10	0.07	(1,393)
D, land rented in (ongoing)	0.06	0.05	(0,847)	0.05	0.04	(0,893)
D, land rented out (ongoing)	0.06	0.04	(1,360)	0.04	0.03	(1,078)
D, land rental transaction (recent)	0.24	0.18	(2,086) **	0.12	0.08	(1,737) *
D, land rented in (recent)	0.09	0.09	(0,428)	0.06	0.05	(0,945)
D, land rented out (recent)	0.12	0.06	(2,243) **	0.06	0.03	(1,446)

* significant at 10%; ** significant at 5%; *** significant at 1%. Columns (3) and (6) report t-statistics of the difference between columns (1) and (2), and (4) and (5) counting for clustering at the ejido-level. "Program" and "No Program" refer to whether the ejido has terminated the certification program before the 1997 survey. Definition household (biological hh): includes both members currently living at home (core hh) and children of the household head living outside home. Definition (D, household migration status): binary indicator taking value 1 if either (D, current migration) either (D, past migration core hh, last 3 years) take

value 1. Land assets measured in National Rainfed Equivalent (NRE) hectares (de Janvry et al. 1997).
"Recent" transactions refers to the period 1997-94 (for 1997) and 1994-92 (for 1994).

Table 3

Descriptive statistics: 1994, Procede and land per capita

	ejidatarios (N=738)			posesionarios (N=340)			diff-in-diff	
	Procede (N=309)	no Procede (N=429)	diff	Procede (N=172)	no Procede (N=168)	diff		
D, past migration core hh	0.18	0.16	(0,612)	0.15	0.20	(-0,947)	(1,199)	
D, past migration core hh (last 3 years)	0.04	0.03	(1,190)	0.02	0.04	(-0,686)	(1,328)	
D, current migration HH children	0.09	0.14	(-1,565)	0.11	0.11	(-0,053)	(-0,815)	
D, migration status hh (last 3 years)	0.13	0.15	(-0,642)	0.13	0.14	(-0,057)	(-0,304)	
#migrants abroad (last 3 years)	0.25	0.35	(-1,068)	0.24	0.29	(-0,454)	(-0,355)	
HH age	50.93	49.03	(1,273)	48.56	47.49	(0,601)	(0,385)	
HH sex	1.03	1.04	(-0,618)	1.05	1.01	(1,739)	(-1,840)	*
HH schooling	3.26	3.14	(0,434)	3.37	3.28	(0,250)	(0,076)	
HH literacy	0.80	0.77	(0,784)	0.84	0.80	(0,785)	(-0,021)	
#members core hh, below 5 years	1.36	1.49	(-1,686)	1.35	1.37	(-0,279)	(-1,144)	
#members core hh, above 15 years	3.42	3.41	(0,088)	3.24	3.68	(-1,675)	(1,494)	*
average literacy, core hh members above 15years	0.85	0.82	(1,179)	0.87	0.88	(-0,157)	(1,045)	
average schooling, core hh members above 15 years	4.73	4.38	(1,214)	4.40	4.69	(-0,873)	(1,597)	
#members bio hh, above 15 years	6.09	5.68	(1,206)	5.47	5.58	(-0,282)	(1,027)	
fraction females, core hh members above 15 years	0.45	0.45	(0,042)	0.44	0.41	(1,575)	(-1,330)	
#HH siblings abroad	0.11	0.16	(-1,051)	0.19	0.11	(0,737)	(-1,165)	
1992 land assets (owned)	12.28	10.15	(1,452)	10.55	11.50	(-0,470)	(1,470)	
D, electricity	0.73	0.71	(0,352)	0.74	0.65	(0,974)	(-0,630)	
D, hired labor	0.41	0.37	(0,765)	0.33	0.29	(0,695)	(-0,054)	
D, tractor	0.54	0.38	(2,484)	0.47	0.33	(1,636)	(0,203)	**
D, pickup	0.37	0.24	(2,571)	0.26	0.31	(-0,685)	(2,188)	**
D, machinery (any)	0.64	0.48	(2,803)	0.58	0.50	(1,032)	(0,960)	**
D, cattle	0.45	0.45	(-0,084)	0.42	0.49	(-0,871)	(0,701)	
D, horses	0.27	0.19	(2,081)	0.27	0.18	(1,611)	(-0,106)	**
D, livestock	0.65	0.64	(0,072)	0.70	0.70	(0,114)	(-0,041)	
D, work animal	0.50	0.62	(-1,898)	0.51	0.64	(-1,466)	(0,155)	*
D, land rental transaction (ongoing)	0.10	0.07	(0,909)	0.09	0.05	(1,483)	(-0,389)	
D, land rented in (ongoing)	0.05	0.04	(0,201)	0.06	0.04	(1,328)	(-0,923)	

D, land rented out (ongoing)	0.05	0.03	(1,019)	0.03	0.02	(0,683)	(0,400)
D, land rental transaction (1992-94)	0.12	0.09	(1,171)	0.12	0.07	(1,557)	(-0,399)
D, land rented in (1992-94)	0.06	0.05	(0,208)	0.08	0.05	(1,317)	(-0,971)
D, land rented out (1992-94)	0.06	0.03	(1,337)	0.04	0.02	(0,815)	(0,434)

Raw sample means from the 1997 and 1994 ejido surveys. * significant at 10%; ** significant at 5%; *** significant at 1%. Columns (3) and (6) report t-statistics of the difference between columns (1) and (2), and (4) and (5), where standard errors have been clustered at the ejido-level. Column (7) reports the t-statistic of the difference in difference (column(3) - column(6)), where standard errors have been clustered at the ejido-level. "Program" and "No Program" refer to whether ejido has terminated the certification program before the 1997 survey. Definition household (biological hh): includes both members currently living at home (core hh) and children of the household head living outside home. Definition (D, household migration status): binary indicator taking value 1 if either (D, current migration) either (D, past migration core hh, last 3 years) take value 1. Land assets measured in National Rainfed Equivalent (NRE) hectares. For a description of the procedure see de Janvry et al. (1997).

Table 4
Descriptive statistics: 1997, Procede and land per capita

	ejidatarios (N=738)			posesionarios (N=340)			diff-in-diff	
	Procede (N=309)	no Procede (N=429)	diff	Procede (N=172)	no Procede (N=168)	diff		
D, past migration core hh	0.25	0.23	(0,456)	0.20	0.24	(-0,699)	(0,904)	
D, past migration core hh (last 3 years)	0.10	0.06	(1,855)	* 0.07	0.07	(-0,055)	(1,276)	
D, current migration HH children	0.23	0.20	(0,559)	0.18	0.27	(-1,433)	(1,672)	*
D, migration status hh (last 3 years)	0.30	0.23	(1,357)	0.23	0.31	(-1,165)	(1,938)	*
#migrants abroad (last 3 years)	0.72	0.59	(0,893)	0.53	0.80	(-1,331)	(1,804)	*
remittances from some HHchild abroad now	0.16	0.16	(0,002)	0.10	0.18	(-1,519)	(1,355)	
remittances from some HHchild living outside home now	0.30	0.28	(0,334)	0.29	0.29	(-0,017)	(0,221)	
HH age	53.57	51.87	(1,160)	51.66	51.07	(0,336)	(0,511)	
HH sex	1.03	1.03	(-0,021)	1.04	1.01	(1,531)	(-1,253)	
HH schooling	3.28	3.13	(0,551)	3.38	2.99	(1,060)	(-0,554)	
HH literacy	0.82	0.76	(1,417)	0.84	0.79	(1,148)	(0,032)	
#members core hh, below 5 years	0.36	0.55	(-2,341)	** 0.50	0.53	(-0,306)	(-1,393)	
#members core hh, above 15 years	3.53	3.72	(-1,284)	3.47	3.63	(-0,892)	(-0,127)	
average literacy, core hh members above 15years	0.84	0.81	(0,873)	0.85	0.84	(0,403)	(0,245)	
average schooling, core hh members above 15 years	4.66	4.48	(0,716)	4.70	4.51	(0,571)	(-0,021)	
#members bio hh, above 15 years	6.62	6.45	(0,521)	6.41	6.64	(-0,538)	(0,768)	
fraction females, core hh members above 15 years	0.38	0.36	(0,806)	0.38	0.37	(0,603)	(0,038)	
#HH siblings abroad	0.33	0.33	(0,027)	0.38	0.44	(-0,330)	(0,329)	
1992 land assets (owned)	12.28	10.15	(1,452)	10.55	11.50	(-0,470)	(1,470)	
D, electricity	0.90	0.91	(-0,144)	0.87	0.79	(1,262)	(-1,322)	
D, indigenous hh	0.12	0.23	(-1,688)	* 0.23	0.13	(1,420)	(-2,407)	**
average schooling, bio hh members above 15 years	5.69	5.22	(1,696)	* 5.33	5.32	(0,016)	(1,226)	
D, drinking water	0.84	0.77	(1,472)	0.77	0.71	(0,936)	(0,129)	
D, toilette	0.40	0.31	(1,477)	0.34	0.28	(0,750)	(0,362)	
D, access to drenage	0.21	0.12	(1,782)	* 0.15	0.11	(0,652)	(0,621)	
D, telephone	0.06	0.05	(0,613)	0.09	0.04	(1,269)	(-0,872)	
D, existence spare room	0.82	0.81	(0,226)	0.86	0.83	(0,573)	(-0,381)	
D, hired labor	0.43	0.47	(-0,982)	0.44	0.40	(0,483)	(-1,004)	

D, tractor	0.54	0.33	(3,419)	***	0.46	0.39	(0,868)	(1,459)	
D, pickup	0.28	0.13	(3,892)	***	0.22	0.24	(-0,339)	(2,314)	**
D, machinery (any)	0.69	0.43	(4,251)	***	0.62	0.51	(1,286)	(1,648)	*
D, cattle	0.42	0.47	(-1,087)		0.39	0.51	(-1,624)	(0,771)	
D, horses	0.30	0.28	(0,517)		0.23	0.33	(-1,682)	(1,731)	*
D, livestock	0.58	0.62	(-0,854)		0.59	0.63	(-0,543)	(-0,052)	
D, work animal	0.47	0.62	(-2,743)	***	0.52	0.57	(-0,578)	(-1,174)	
D, land rental transaction (ongoing)	0.13	0.08	(1,722)	*	0.11	0.10	(0,494)	(0,733)	
D, land rented in (ongoing)	0.06	0.05	(0,528)		0.08	0.06	(0,575)	(-0,204)	
D, land rented out (ongoing)	0.07	0.03	(1,686)	*	0.03	0.04	(-0,041)	(1,372)	
D, land rental transaction (1994-97)	0.28	0.18	(2,685)	***	0.16	0.17	(-0,219)	(1,939)	*
D, land rented in (1994-97)	0.11	0.08	(1,286)		0.06	0.10	(-1,106)	(1,641)	
D, land rented out (1995-97)	0.14	0.07	(2,217)	**	0.07	0.04	(1,242)	(0,872)	

Raw sample means from the 1997 and 1994 ejido surveys. * significant at 10%; ** significant at 5%; *** significant at 1%. Columns (3) and (6) report t-statistics of the difference between columns (1) and (2), and (4) and (5), where standard errors have been clustered at the ejido-level. Column (7) reports the t-statistic of the difference in difference (column(3) - column(6)), where standard errors have been clustered at the ejido-level. "Program" and "No Program" refer to whether ejido has terminated the certification program before the 1997 survey. Definition household (biological hh): includes both members currently living at home (core hh) and children of the household head living outside home. Definition (D, household migration status): binary indicator taking value 1 if either (D, current migration) either (D, past migration core hh, last 3 years) take value 1. Land assets measured in National Rainfed Equivalent (NRE) hectares. For a description of the procedure see de Janvry et al. (1997).

Table 5
Descriptive statistics: 1994, early vs late program areas, by farmer's status (N=410)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Early	Late	diff	ejidatarios (N=254)			posesionarios (N=156)			diff-in-diff
	(N=229)	(N=181)		Early	Late	diff	Early	Late	diff	
				(N=147)	(N=107)		(N=82)	(N=74)		
D, past migration core hh	0.19	0.15	(0,580)	0.20	0.18	(0,253)	0.17	0.12	(0,693)	(-0,300)
D, past migration core hh (last 3 years)	0.06	0.02	(2,276) **	0.07	0.02	(2,086) **	0.04	0.01	(0,966)	(0,806)
D, current migration HH children	0.09	0.08	(0,370)	0.07	0.07	(0,067)	0.13	0.09	(0,532)	(-0,461)
D, migration status hh (last 3 years)	0.15	0.09	(1,230)	0.14	0.08	(1,096)	0.17	0.11	(0,759)	(-0,116)
#migrants abroad (last 3 years)	0.27	0.20	(0,681)	0.27	0.17	(0,933)	0.26	0.24	(0,075)	(0,456)
HH age	49.69	49.48	(0,112)	50.24	50.56	(-0,127)	48.72	47.92	(0,292)	(-0,307)
HH sex	1.05	1.02	(1,319)	1.03	1.03	(-0,042)	1.09	1.01	(1,919) *	(-1,840) *
HH schooling	3.19	3.77	(-1,584)	3.10	3.93	(-1,881) *	3.35	3.54	(-0,350)	(-1,040)
HH literacy	0.81	0.87	(-1,581)	0.81	0.85	(-0,795)	0.80	0.89	(-1,595)	(0,611)
#members core adult members	1.39	1.35	(0,469)	1.40	1.35	(0,423)	1.38	1.35	(0,273)	(0,199)
#members core adult members	3.13	3.52	(-1,827) *	3.25	3.35	(-0,410)	2.90	3.77	(-2,220) **	(1,712) *
average literacy, core adult members	0.85	0.90	(-2,245) **	0.85	0.89	(-1,363)	0.85	0.92	(-2,022) **	(0,601)
average schooling, core adult members	4.48	4.88	(-1,122)	4.68	4.94	(-0,610)	4.12	4.79	(-1,406)	(0,709)
#members bio adult members	5.64	5.94	(-0,703)	5.89	5.98	(-0,166)	5.20	5.89	(-1,161)	(0,809)
fraction females, core adult members	0.45	0.45	(0,140)	0.44	0.46	(-0,773)	0.48	0.43	(1,238)	(-1,555)
#HH siblings abroad	0.21	0.06	(1,846) *	0.15	0.04	(1,904) *	0.32	0.08	(1,216)	(-0,628)
1992 land assets (owned)	10.31	13.04	(-1,292)	11.35	13.23	(-0,770)	8.46	12.77	(-1,679) *	(0,879)
D, electricity	0.65	0.75	(-1,043)	0.63	0.75	(-1,084)	0.70	0.76	(-0,474)	(-0,488)
D, tractor	0.57	0.42	(1,713) *	0.60	0.40	(2,055) **	0.51	0.45	(0,504)	(0,895)
D, pickup	0.33	0.33	(-0,058)	0.35	0.38	(-0,336)	0.28	0.26	(0,266)	(-0,476)
D, machinery	0.66	0.58	(0,999)	0.69	0.57	(1,255)	0.61	0.59	(0,128)	(0,738)
D, cattle	0.41	0.48	(-0,947)	0.39	0.52	(-1,405)	0.43	0.42	(0,077)	(-1,197)
D, horses	0.29	0.27	(0,301)	0.24	0.35	(-1,413)	0.37	0.16	(2,852) ***	(-3,358) ***
D, livestock	0.64	0.66	(-0,309)	0.59	0.66	(-0,838)	0.73	0.66	(0,827)	(-1,348)
D, work animal	0.60	0.40	(2,441) **	0.59	0.42	(1,692) *	0.61	0.38	(2,226) **	(-0,460)

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. Columns (3), (6) and (9) report t-statistics of the difference between columns (1) and (2), (4) and (5), and (7) and (8) where standard errors have been clustered at the ejdo-level. Column (10) report the t-statistic of the difference in

difference (column(6)-column(9)), where standard errors have been clustered at the ejido-level. "Early" and "Late" refer to whether ejido has terminated the certification during the period 1994-1995 or during the period 1996-1997 respectively. Definition household (biological hh): includes both members currently living at home (core hh) and children of the household head living outside home. Definition (D, household migration status): binary indicator taking value 1 if either (D, current migration) either (D, past migration core hh, last 3 years) take value 1. Land assets measured in

Table 6
Descriptive statistics by hh migrant status, both surveys

	(1)	(2)	(3)	(4)	(5)	(6)
	1997			1994		
	migrant	non-migrant	diff	migrant	non-migrant	diff
	(N=285)	(N=793)		(N=151)	(N=927)	
HH age	58.23	50.03	(7,837) ***	55.62	48.22	(6,178) ***
HH gender	1.03	1.03	(-0,315)	1.04	1.03	(0,402)
HH schooling	2.41	3.47	(-5,675) ***	2.42	3.36	(-3,942) ***
HH literacy	0.78	0.80	(-0,593)	0.77	0.80	(-0,529)
# young members core hh (<5)	0.46	0.49	(-0,570)	1.20	1.44	(-4,323) ***
# adult members core hh (>=15)	3.78	3.55	(1,720) *	3.79	3.37	(2,651) ***
average literacy core hh	0.82	0.84	(-0,745)	0.85	0.84	(0,268)
average schooling core hh	4.15	4.72	(-3,193) ***	4.36	4.56	(-0,788)
average schooling bio hh	5.37	5.39	(-0,105)		N/A	
# adult members	8.48	5.82	(10,586) ***	7.91	5.40	(8,486) ***
fraction females (adults)	0.41	0.36	(4,066) ***	0.46	0.44	(0,988)
#HHherma in EEUU	0.69	0.24	(4,265) ***	0.32	0.11	(1,987) **
land assets 1992	12.75	10.42	(2,092) **	11.37	10.98	(0,315)
D, alumbrado	0.87	0.89	(-0,472)	0.76	0.70	(1,076)
D, indigenous	0.04	0.23	(-5,393) ***		N/A	
D, drinkable water	0.82	0.77	(1,533)		N/A	
D, toilette	0.45	0.30	(3,762) ***		N/A	
D, drenage	0.19	0.13	(1,658) *		N/A	
D, telephone	0.05	0.06	(-0,546)		N/A	
D, existence spare room	0.87	0.80	(2,654) ***		N/A	
D, hired labor	0.46	0.44	(0,652)	0.45	0.35	(2,288) **
D, tractor	0.56	0.37	(4,203) ***	0.56	0.41	(2,972) ***
D, pickup	0.27	0.18	(2,502) **	0.42	0.27	(3,002) ***
D, machinery	0.64	0.51	(2,842) ***	0.68	0.52	(3,129) ***
D, cattle	0.58	0.40	(4,516) ***	0.66	0.42	(5,478) ***
D, horses	0.42	0.24	(5,053) ***	0.23	0.22	(0,201)
D, livestock	0.68	0.58	(2,585) ***	0.81	0.64	(4,781) ***
D, work animals	0.61	0.53	(1,898) *	0.67	0.55	(2,581) ***

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. Columns (3) and (6) report t-statistics of the difference between columns (1) and (2), and (4) and (5), where standard errors have been clustered at the ejdo-level. "Migrant" and "Non-Migrant" refer to the status of the household, whether it has at least one child of the household head living outside home is currently abroad (D, current migration) or at least one member living at home has been abroad within the previous 3 years (D, past migration core hh, last 3 years). Definition household (biological hh): includes both members currently living at home (core hh) and children of the household head living outside home. Land assets measured in National Rainfed Equivalent (NRE) hectares. For a description of the procedure see de Janvry et al. (1997).

Table 7
OLS, 1997 wave
Average impact of Program on ejidatarios (ATE)

	(1)	(2)	(3)	(4)	(5)	(6)
	ATE	ATE(0-3)	ATE(3-12)	ATE(12<)	ATE	ATE
	coef/t	coef/t	coef/t	coef/t	coef/t	coef/t
Program	-0,066 (-1,189)	-0,117 (-1,031)	-0,105 (-1,479)	0,010 (0,080)		
ejidatarios	0,097 (0,586)	-0,090 (-0,316)	0,103 (0,454)	0,131 (0,294)	0,038 (0,190)	
Program*ejidatarios	0,113* (1,760)	-0,025 (-0,200)	0,226*** (2,694)	0,031 (0,202)	0,061 (0,874)	0,042 (0,906)
Household-level controls						
land assets 1994	0,000 (0,060)				-0,005* (-1,809)	0,004** (2,431)
HH age	0,005* (1,876)	0,002 (0,348)	0,006* (1,787)	0,002 (0,306)	0,002 (0,599)	0,000 (0,225)
average literacy adult members core hh	0,035 (0,296)	-0,157 (-0,661)	0,023 (0,158)	0,126 (0,660)	0,076 (0,603)	-0,017 (-0,223)
average schooling adult members bio hh	-0,003 (-0,299)	0,008 (0,290)	-0,008 (-0,577)	0,005 (0,269)	-0,007 (-0,579)	-0,011 (-1,507)
prop females among adult members	-0,251 (-1,392)	-0,062 (-0,204)	-0,269 (-1,145)	-0,379 (-0,964)	-0,181 (-1,138)	-0,086 (-0,864)
household size	0,029*** (2,695)	0,026 (1,081)	0,027** (2,131)	0,048* (1,923)	0,034*** (2,831)	0,037*** (5,734)
migration assets (# siblings of household head abroad)	0,087 (1,586)	-0,087 (-1,374)	0,088 (1,408)	0,135*** (2,862)	0,007 (0,106)	0,054 (1,546)
Ejido-level controls						
log ejido area (ha)	-0,008 (-0,405)	-0,015 (-0,555)	0,003 (0,126)	0,066 (1,099)		-0,004 (-0,183)
% common land relative to agricultural land, nfe (ha)	-0,001 (-1,407)	-0,002*** (-2,731)	-0,000 (-0,294)	-0,000 (-0,228)		-0,001 (-1,144)
# ejidatarios	-0,000 (-0,240)	-0,000 (-0,709)	-0,000 (-0,290)	-0,000 (-1,092)		-0,000 (-0,104)
D, indigenous ejido	-0,133*** (-3,373)	-0,055 (-0,917)	-0,183*** (-3,792)	-0,119 (-1,346)		-0,160*** (-3,949)
D, membership to ejido union	0,010 (0,231)	-0,048 (-0,704)	0,049 (0,885)	-0,025 (-0,264)		0,088* (1,653)
D, access to paved road	-0,074* (-1,791)	-0,038 (-0,665)	-0,023 (-0,442)	-0,187* (-1,938)		-0,048 (-0,999)
constant	0,091 (0,409)	0,419 (1,182)	-0,019 (-0,068)	-0,451 (-0,829)		0,161 (0,861)
ejido fixed effects						
Number of observations	1 050	259	581	210	1 078	722
Adjusted R2	0,156	0,177	0,134	0,142	0,578	0,165

Notes: OLS regressions, dependent variable is Household migration status. Definition (D, household migration status): binary indicator taking value 1 if either (D, current migration) either (D, past migration core hh, last 3 years) take value 1. Column 1: all sample. Column 2: farmers with 0-3 ha land. Column 3: farmers with 3-12 ha land. Column 4: farmers with >12 ha land. Column 5: all sample, specification with ejido fixed effects. Column 6: sub-sample (ejidatarios only). "Program" refers to whether ejido has terminated the certification program before the 1997 survey. "Ejidatarios" refers to whether the household

has a pre-program (1994) ejido certificate. Definition household (biological hh): includes both members currently living at home (core hh) and children of the household head living outside home. Average literacy is computed over members living at home only (core household). Land assets measured in National Rainfed Equivalent (NRE) hectares. For a description of the procedure see de Janvry et al. (1997). * significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors clustered at the ejido-level.

Table 8
Pooled OLS
Average impact of Program on ejidatarios

	(1)	(2)	(3)	(4)	(5)
	ATE	ATE(0-3)	ATE(3-12)	ATE(12<)	ATE
	coef/t	coef/t	coef/t	coef/t	coef/t
Program	-0,011 (-0,243)	-0,024 (-0,252)	-0,025 (-0,503)	-0,003 (-0,031)	
Ejidatarios	0,034 (0,285)	-0,085 (-0,352)	0,032 (0,205)	0,380 (1,348)	-0,036 (-1,139)
Program*ejidatarios	-0,025 (-0,473)	-0,078 (-0,770)	0,051 (0,786)	-0,120 (-1,014)	
1 997	0,132*** (3,151)	0,037 (0,469)	0,168*** (3,388)	0,090 (1,320)	0,058*** (2,683)
Program*1997	-0,069 (-1,371)	-0,022 (-0,230)	-0,095 (-1,467)	-0,033 (-0,387)	
Program*1997*ejidatarios	0,164*** (2,798)	0,026 (0,265)	0,197** (2,468)	0,158 (1,387)	0,095** (2,550)
Ejidatarios*1997	-0,074* (-1,727)	-0,005 (-0,054)	-0,101* (-1,919)	-0,023 (-0,263)	
Household-level controls					
land assets 1994	0,001 (0,498)				0,003** (2,529)
HH age	0,003* (1,699)	0,002 (0,543)	0,003 (1,455)	0,007 (1,381)	0,001 (1,192)
average literacy adult members core hh	0,034 (0,404)	-0,198 (-1,139)	0,085 (0,817)	0,141 (0,897)	0,114** (2,110)
average schooling adult members core hh	-0,005 (-0,670)	0,026* (1,796)	-0,012 (-1,152)	-0,006 (-0,563)	-0,016*** (-2,713)
prop females among adult members	-0,009 (-0,098)	-0,126 (-0,601)	-0,021 (-0,204)	0,094 (0,503)	0,033 (0,577)
household size	0,028*** (3,778)	0,039** (2,116)	0,026*** (2,883)	0,027 (1,491)	0,032*** (6,418)
migration assets (# siblings of household head abroad)	0,137*** (4,944)	-0,073 (-1,589)	0,173*** (5,580)	0,104** (2,545)	0,062*** (2,597)
constant	-0,190* (-1,779)	-0,011 (-0,046)	-0,192 (-1,468)	-0,456* (-1,749)	-0,157*** (-2,722)
N	2 153	524	1 201	428	1 474
Adjusted R-squared	0,138	0,136	0,135	0,154	0,131

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors clustered at the ejido-level. OLS regressions, dependent variable is Household migration status. Definition (D, household migration status): binary indicator taking value 1 if either (D, current migration) either (D, past migration core hh, last 3 years) take value 1. Column 1: all sample. Column 2: farmers with 0-3 ha land. Column 3: farmers with 3-12 ha land. Column 4: farmers with >12 ha land. Column 5: sub-sample (ejidatarios only). "Program" refers to whether ejido has terminated the certification program before the 1997 survey. "Ejidatarios" refers to whether the household has a pre-program (1994) ejido certificate. Definition household (biological hh): includes both members currently living at home (core hh) and children of the household head living outside home. Average literacy is computed over members living at home only (core household). Land assets measured in National Rainfed Equivalent (NRE) hectares. For a description of the procedure see de Janvry et al. (1997).

Table 9
Pooled OLS
Average impact of Program Timing on ejidatarios

	(1)	(2)	(3)	(4)	(5)
	ATE	ATE(0-3)	ATE(3-12)	ATE(12<)	ATE
	coef/t	coef/t	coef/t	coef/t	coef/t
Timing	0,005 (0,155)	0,004 (0,067)	-0,012 (-0,390)	0,051 (0,818)	
Ejidatarios	-0,001 (-0,012)	-0,101 (-0,398)	-0,016 (-0,096)	0,357 (1,163)	-0,018 (-0,860)
Timing*ejidatarios	-0,022 (-0,638)	-0,061 (-1,077)	0,031 (0,720)	-0,110 (-1,520)	
1 997	0,129*** (3,291)	0,032 (0,427)	0,158*** (3,367)	0,106* (1,674)	0,063*** (2,903)
Timing*1997	-0,051 (-1,609)	-0,046 (-0,820)	-0,052 (-1,276)	-0,061 (-1,354)	
Timing*1997*ejidatarios	0,115*** (3,009)	0,057 (0,932)	0,113** (2,152)	0,170*** (2,831)	0,065*** (2,767)
Ejidatarios*1997	-0,066 (-1,635)	-0,001 (-0,009)	-0,089* (-1,762)	-0,017 (-0,207)	
Household-level controls					
land assets 1994	0,001 (0,427)				0,003** (2,474)
HH age	0,003 (1,638)	0,002 (0,559)	0,003 (1,322)	0,008* (1,658)	0,001 (1,003)
average literacy adult members core hh	0,025 (0,274)	-0,223 (-1,177)	0,079 (0,699)	0,165 (1,087)	0,141*** (2,640)
average schooling adult members core hh	-0,004 (-0,616)	0,027* (1,790)	-0,014 (-1,323)	0,001 (0,078)	-0,015** (-2,449)
prop females among adult members	-0,035 (-0,370)	-0,219 (-1,038)	-0,034 (-0,337)	0,031 (0,166)	0,066 (1,172)
household size	0,030*** (3,909)	0,045*** (2,961)	0,026*** (2,889)	0,032* (1,703)	0,032*** (5,989)
migration assets (# siblings of household head abroad)	0,139*** (4,972)	-0,074* (-1,725)	0,178*** (5,650)	0,098** (2,242)	0,059** (2,303)
constant	-0,192* (-1,707)	0,007 (0,028)	-0,177 (-1,284)	-0,615** (-2,249)	-0,193*** (-3,304)
N	2 012	500	1 142	370	1 364
Adjusted R-squared	0,141	0,149	0,131	0,176	0,131

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors clustered at the ejido-level. OLS regressions, dependent variable is Household migration status. Definition (D, household migration status): binary indicator taking value 1 if either (D, current migration) either (D, past migration core hh, last 3 years) take value 1. Column 1: all sample. Column 2: farmers with 0-3 ha land. Column 3: farmers with 3-12 ha. Column 4: farmers with >12 ha. Column 5: sub-sample (ejidatarios only). "Timing" takes value 2 if the ejido has terminated the program in 1994-1995, takes value 1 if it terminated the program in 1996-1997 (before the 1997 survey), takes value 0 otherwise. "Ejidatarios" refers to whether the household has a pre-program (1994) ejido certificate. Definition household (biological hh): includes both members currently living at home (core hh) and children of the household head living outside home. Average literacy is computed over members living at home only (core household). Land assets measured in National Rainfed Equivalent (NRE) hectares (see de Janvry et al. 1997).

Table 10
OLS, 1994 wave

Falsification experiment: Average impact of Program on ejidatarios in 1994

	(1)	(2)	(3)	(4)	(5)	(6)
	ATE	ATE(0-3)	ATE(3-12)	ATE(12<)	ATE	ATE
	coef/t	coef/t	coef/t	coef/t	coef/t	coef/t
Program	0,002 (0,040)	-0,080 (-0,943)	0,000 (0,007)	-0,028 (-0,264)		
ejidatarios	-0,012 (-0,101)	-0,031 (-0,125)	-0,146 (-0,903)	0,126 (0,387)	-0,111 (-0,646)	
Program*ejidatarios	-0,040 (-0,703)	-0,050 (-0,554)	0,034 (0,503)	-0,042 (-0,316)	-0,021 (-0,300)	-0,020 (-0,572)
Household-level controls						
land assets 1994	0,001 (0,371)				-0,005*** (-2,787)	0,001 (1,131)
HH age	-0,001 (-0,388)	0,000 (0,103)	-0,002 (-0,992)	0,009* (1,809)	-0,000 (-0,107)	0,000 (0,160)
average literacy adult members core hh	0,051 (0,668)	-0,056 (-0,335)	0,115 (1,293)	-0,163 (-0,766)	-0,080 (-0,957)	0,060 (1,086)
average schooling adult members bio hh	-0,010 (-1,376)	0,017 (1,007)	-0,014 (-1,231)	-0,008 (-0,494)	0,004 (0,441)	-0,012* (-1,816)
prop females among adult members	0,055 (0,741)	-0,226 (-1,482)	0,010 (0,125)	0,372 (1,600)	-0,029 (-0,320)	0,013 (0,238)
household size	0,027*** (3,558)	0,037* (1,837)	0,023*** (2,642)	0,005 (0,238)	0,020** (2,536)	0,022*** (4,195)
migration assets (# siblings of household head abroad)	0,162*** (5,246)	-0,092 (-1,351)	0,205*** (5,483)	0,107*** (2,604)	0,107 (1,605)	0,039* (1,794)
Ejido-level controls						
log ejido area (ha)	0,001 (0,080)	-0,021 (-1,201)	0,019 (1,061)	-0,025 (-0,703)		0,013 (0,784)
% common land relative to agricultural land, nfe (ha)	-0,000 (-0,906)	-0,001** (-2,321)	-0,000 (-0,451)	0,002 (1,230)		-0,000 (-0,484)
# ejidatarios	-0,000 (-0,590)	-0,000 (-0,251)	-0,000 (-0,702)	0,000 (0,605)		-0,000 (-0,123)
D, indigenous ejido	-0,105*** (-4,946)	-0,048* (-1,673)	-0,150*** (-4,954)	-0,129** (-2,421)		-0,119*** (-4,296)
D, membership to ejido union	0,022 (0,676)	-0,016 (-0,454)	0,016 (0,406)	0,060 (0,746)		0,083** (2,191)
D, access to paved road	-0,019 (-0,555)	-0,093*** (-2,661)	-0,001 (-0,026)	0,040 (0,529)		-0,026 (-0,689)
constant	-0,018 (-0,120)	0,310 (1,246)	-0,100 (-0,548)	-0,151 (-0,449)		-0,077 (-0,657)
ejido fixed effects						
Number of observations	1 012	258	560	194	1 075	810
Adjusted R2	0,095	0,153	0,102	0,111	0,438	0,083

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors clustered at the ejido-level. OLS regressions, dependent variable is Household migration status. Definition (D, household migration status): binary indicator taking value 1 if either (D, current migration) either (D, past migration core hh, last 3 years) take value 1. Column 1: all sample. Column 2: farmers with 0-3 ha land. Column 3: farmers with 3-12 ha land. Column 4: farmers with >12 ha land. Column 5: all sample,

specification with ejido fixed effects. Column 6: sub-sample (ejidatarios only). "Program" refers to whether ejido has terminated the certification program before the 1997 survey. "Ejidatarios" refers to whether the household has a pre-program (1994) ejido certificate. Definition household (biological hh): includes both members currently living at home (core hh) and children of the household head living outside home. Average literacy is computed over members living at home only (core household). Land assets measured in National Rainfed Equivalent (NRE) hectares (de Janvry et al. 1997 for the procedure).

Table 11
Pooled OLS
Average impact of Program on non-ejidatarios

	(1)	(2)	(3)	(4)	(5)
	ATE	ATE	ATE(0-3)	ATE(3-12)	ATE(12<)
	coef/t	coef/t	coef/t	coef/t	coef/t
Program	-0,011 (-0,242)				
Timing		0,005 (0,155)	0,006 (0,114)	0,013 (0,360)	0,070 (1,117)
1 997	0,132*** (3,138)	0,129*** (3,278)	0,032 (0,414)	0,160*** (3,424)	0,110* (1,691)
Program*1997	-0,069 (-1,366)				
Timing*1997		-0,051 (-1,603)	-0,046 (-0,804)	-0,054 (-1,304)	-0,065 (-1,387)
Household-level controls					
hh_land94_use	0,001 (0,496)	0,001 (0,426)			
HH age	0,003* (1,692)	0,003 (1,632)	0,003 (0,631)	0,002 (0,842)	0,010* (1,957)
average literacy adult members core hh	0,034 (0,402)	0,025 (0,273)	-0,219 (-1,149)	0,041 (0,334)	0,233 (1,500)
average schooling adult members core hh	-0,005 (-0,667)	-0,004 (-0,613)	0,028* (1,794)	-0,009 (-0,775)	-0,002 (-0,166)
prop females among adult members	-0,009 (-0,098)	-0,035 (-0,368)	-0,219 (-1,020)	-0,039 (-0,368)	0,088 (0,444)
household size	0,028*** (3,763)	0,030*** (3,893)	0,045*** (2,925)	0,027*** (3,060)	0,029 (1,426)
migration assets (# siblings of household head abroad)	0,137*** (4,924)	0,139*** (4,952)			
constant	-0,190* (-1,772)	-0,192* (-1,700)	-0,013 (-0,057)	-0,114 (-0,749)	-0,733*** (-2,632)
N	679	648	134	392	122
Adjusted R-squared	0,157	0,163	0,139	0,098	0,166

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors clustered at the ejido-level. OLS regressions, dependent variable is Household migration status. Definition (D, household migration status): binary indicator taking value 1 if either (D, current migration) either (D, past migration core hh, last 3 years) take value 1. Columns 1-2: non-ejidatarios. Column 3: non-ejidatarios with 0-3 ha land. Column 4: non-ejidatarios with 3-12 ha land. Column 5: non-ejidatarios with >12 ha land. "Program" refers to whether ejido has terminated the certification program before the 1997 survey. "Timing" takes value 2 if the ejido has terminated the program in 1994-1995, takes value 1 if it terminated the program in 1996-1997 (before the 1997 survey), takes value 0 otherwise. "Ejidatarios" refers to whether the household has a pre-program (1994) ejido certificate. Definition household (biological hh): includes both members currently living at home (core hh) and children of the household head living outside home. Average literacy is computed over members living at home only (core household). Land assets measured