"The Effect of Remittances on Labor Force Participation: An analysis based on Mexico's 2002 ENET"

Alejandra Cox-Edwards, CSULB
&
Eduardo Rodriguez-Oreggia, IIDSES, Universidad Iberoamericana

First Draft
January 2006

ABSTRACT

According to estimates based on the fourth quarter migration module of the 2002 Mexican National Employment Survey (2002 ENET), close to 2.5 million Mexicans (2.4% o the resident population) migrated to the USA between November of 1997 and the fourth quarter of 2002. This translates into 2.3 million households (7.6% of all households) being affected by international migration of at least one household member during that same period. In 2002, at the time of the survey, about 900 thousand of these migrants had returned to Mexico, suggesting that return migration is a significant part of the migration picture.

Based on the same survey, of the 2.5 million Mexicans that migrated to the USA between 1997 and 2002, 1.6 of them sent remittances to their families let behind, resulting in 1.4 million household receiving remittances and 1.2 million receiving them persistently. Among the many questions of interest that can be examined with these data we focused on the impact of persistent remittances on labor force participation among household members staying in Mexico, both including and excluding return migrants.

We use propensity score matching to find a comparison group for individuals in recipient households and find no evidence of labor force participation effects of persistent remittances.

1. Introduction

Migration is a phenomenon that has increased all around the world in the last decades, detonating a growing interest for research relating migration and development, not only at the individual and households levels, but also at the local and national level. However, the discussion and evidence has been mixed in uncovering the effects of migration, and remittances they send, on the many aspects of development in the sending countries. On the one hand, it may be that remittances migrants send are beneficial for the country and localities since they present investment opportunities, along with possible gains from the experience, networks, and transfer of experience that migrants could bring if back to the origin country. On the other hand, some argue that migration brings brain drain and remittances act as an insurance for households who are discouraged from starting other productive activities and used for consumption rather than investment.

Mexico offers a rich field for studying migration, not only the flows of migrant seems to be increased during the last years, especially to the US, but the flows of remittances are accounting for the second source of national income, only after oil, and surpassing now FDI and tourism. However, how this phenomenon has affected the country at its different levels is still blurred. The understanding of such relationship depends on comparable data, which only has started to be available recently. But also, determining the impact of the phenomenon on development is related to the methodology used. The type of methodology is clearly relevant in determining the precise impact and come to a relevant conclusion.

This paper contributes to the literature on migration and remittances by examining a specific survey applied to Mexican households in 2002 and applying a different methodology to previous studies. The goal of the analysis is to estimate the effect of remittances on the households that receive them. Among the many questions of interest that can be examined with this data set we focused on the impact of persistent remittances on labor force participation of household members staying in Mexico.

This is a relevant question for development. The labor market is the principal source of income for the Mexicans households and a tool for leaving poverty; if remittances are acting as a disincentive to participate in the labor market, we not only have to consider the productivity not achieved because of such waste of skills but also we should think of related problems such as the increasing burden in the future from the pensions schemes and costs of health services and the reduction of the tax income for governments.

The National Quarterly Employment Survey (ENET 2002) covered urban and rural areas and applied a special questionnaire geared at evaluating the size of migration flows and the specifics of the migration flows to the USA. The questionnaire establishes the usual demographic characteristics of all household members and the labor market status of household members above 12 years of age. Some of these household members are return migrants and their characteristics are recorded directly. If some household members have migrated to the USA between 1997 and 2002 and are still in the United States, the survey records some basic demographic variables such as their position relative to the head of household, their age and sex.

We employ a non-parametric estimator through a Propensity Score Matching method to calculate the average treatment effects on men and women of remittances in the households and stratifying according to blocks of states following the tendency to migrate in such area. Following this method, we compare individuals which are similar in terms of a set of observable characteristics. This method requires of a rich database, just as is the Mexican ENET. Results show that in general there is no effect from the receipt of remittances on labor force participation, which is opposed to the findings in other studies with different methodologies.

The paper is organized as follows. In Section 2 we present a brief review of the theoretical issues regarding the impact of remittances on the labor force participation, followed by a description of the data in Section 3 and the methodology in Section 4. The data analysis starts with observed differences in participation between recipient and non recipients using the full data set in Section 5, showing the same differences after matching recipients with the "adjusted" control group. Finally, some conclusions and considerations are drawn.

2. Theoretical Issues

In the neoclassical model of labor supply, individuals allocate time to market work and non-market activities maximizing utility subject to a budget constraint. This budget constraint is determined by the individual market wage, the individual time budget, and the individual's non-labor income. An important concept underlying the labor force participation decision is the notion of the reservation wage. This reservation wage indicates how much extra earnings the individual would require to be induced to give up one unit of leisure, when he or she is not working at all.

Given all other variables, an increase in the reservation wage, would reduce the probability that an individual participates in the labor force. One of the determinants of the reservation wage is non-labor income, which for an individual is a function of her own assets and the amount of income of other household members. The higher is the level of income of the rest of the household, the higher is the reservation wage of the individual, and the lower is the probability that he or she participates in the labor force. One can think of remittances as an increase in non-labor income that would lead to a reduction in labor force participation of recipient household members. According to this view, which we call "discouraged participation" – the presence of persistent remittances would result in a decline in the rate of labor force participation of recipient household members left behind

In an alternative model, remittances simply replace the income that the migrant worker would have contributed to the household if he/she had stayed in the country. It is

difficult to imagine a situation in which a household receives a steady flow of remittances from individuals that are not members of the household. This view, which we call "neutral participation" – predicts the following. If the emigrant worker is a member of the household, the presence of remittances income should not alter the labor force participation decision of members left behind, unless the amount remitted differs significantly from the income loss for the rest of the household associated to his emigration.

There is evidence, however, that suggests that the cross-household dispersion of remittances received is narrower than that of household income. To this extent, it is likely that remittances would lift poorer households up in the income distribution and in so doing; increase the reservation wage of the corresponding members, relative to non-recipients. This would lead researchers to expect little or no effect of remittances on labor force participation of high-income households, and perhaps some negative effect on poorer households.

The evidence trying to measure the effect of remittances has been mixed. Rodriguez and Tiongson (2001) and Funkhouser (1992), using data for Manila and Managua, respectively conclude that remittances reduce labor force participation. Funkhouser (2002) also finds an increase in self-employment, although both effects are small. Gubert (2002), with data from Mali, shows that remittances help with the adoption of technology for agricultural households but have no impact on production. She suggests that remittances act as insurance, which is not available otherwise, and that the availability of insurance reduces work effort.

Using aggregate data for 20 countries, Drinkwater, Levine and Lotti(2003) consider the hypothesis that remittances are seen as welfare payments and thus could lead to higher unemployment rates. Yet, they find that remittances income (measured as ratio to GDP) have a non-significant effect on unemployment.

According to Taylor and Mora (2006), the impact of remittances on the Mexican rural households is that of increasing investment and decreasing consumption as the amount of remittances increase and when compared with households without international migrants, they link such results to the propensity to invest in those households which must be higher.

Amuedo-Dorantes and Pozo (2005) study the case of Mexico, instrument remittances with information on the per capita count of Western Union offices in the state during the previous year, and find no clear evidence of employment reduction in response to remittances income. Airola (2005) uses the same data used by Amuedo and Pozo, but focuses on participation among heads of households, and does find a negative effect of remittances on hours worked. Hanson (2005) studies the regional labor market effect of Mexican out migration. He finds that higher migration states show a reduction in working age population between 1990 and 2000, and that wages in high migration states are higher in 2000 compared to those in lower migration states in a range between 6 and 9 percent.

A problem common in all studies based on micro data is that they estimate the effect of remittances, comparing the behavior of recipients with that of non-recipients. However, because remittances are not randomly assigned, confounding factors may bias the estimation of their effect on any outcome by direct comparison of recipient and non-recipients. Airola (2005) analysis suffers from even higher potential confoundedness as he compares work patterns of recipient and non-recipient heads of households using Mexican data. We know that households with remittances typically have members living abroad, and that migration of household members likely changes the role of various individuals within households, particularly the assigned head of household. Therefore, Airola (2005) measured differences in participation due to remittances are most likely confounding the positive correlation of headship and participation within non migrant households with a negative correlation between participation and migrant household member(i.e. remittances) among heads of households.

In this paper, we avoid a simple comparison of recipient and non-recipient by using a matching technique to find non-recipient individuals that –given their household and location characteristics -- are "equally likely" to have received remittances. We then compare labor force participation behavior of recipients with that of their appropriate comparison group.

3. Data

Our data comes from the Migration Module applied to the National Quarterly Employment Survey in the fourth quarter of 2002. This survey sampled urban and rural households, with national representation of the population living in private homes in the Mexican territory, and applied a special questionnaire geared to evaluate the size of migration flows and the specifics of the migration flows to the USA. The questionnaire establishes if a member of the household migrated to the US between 1997 and 2002; if these migrants went to the US for work purposes or non-work purposes; if they sent remittances; and if the remittances were persistent (once a month, once every three months, two or three times a year, or once a year) as opposed to sporadic (only once or other answers).

The survey records the usual demographic characteristics of all household members in 2002 (a total of 280,155 observations) and the labor market status of household members above 12 years of age. Some of these household members are return migrants and their characteristics are recorded directly. The survey also captures information from 3,589 individuals representing household members that migrated to the USA in the last five years (1997 to 2002), and are still in the United States. For them, the survey records some basic demographic variables such as their position relative to the head of household, their age and sex.

We use the full data set to characterize each household in terms of its location (state, and rural vs urban), its size including migrants, the incidence of migrants to the US between 1997 and 2002, and if they sent remittances to the household regularly or irregularly.

Any effects on the reservation wage of family members staying behind would be more likely, if the remittances received are persistent and recent. Therefore, we are particularly interested in the cases of households that have received persistent remittances from migrants to the US between 1997 and 2002. We then restrict our analysis to the population aged 12 to 65 and examine their labor force participation patterns in the fourth quarter of 2002, and in particular, the effect of remittances income on participation. The survey provides valuable information on aspects of migration and labor market status at the individual level, including hours of work and wages. This affords an estimation of household labor income. However, there is no information on the survey regarding non-labor income. Remittances are acknowledged and their source and persistence are established, however, their amount is not recorded.[1]

How spread out is the incidence of migration to and remittances from the US?
The survey asks a broad question about migration to the USA sometime in the past. According to that definition, 4 million Mexicans still considered part of Mexican households have migrated to the USA at some point. In this paper however, we focus on migration to the USA during the 1997-2002 period, and remittances resulting from that migration. The key reason for this choice is that we only know about the persistence of this type of remittances. According to this survey, close to 2.5 million Mexicans (2.4% o the resident population) crossed the border to migrate to the USA between 1997 and 2002 -- close to half a million per year. In 2002, at the time of the survey, about 900 thousand of these migrants had returned to Mexico.

Migration to the USA between 1997 and 2002 affected 2.3 million households directly (7.6% of all households, see Table 1), with some households sending more than one member. Of the 2.5 million USA migrants between 1997 and 2002, 1.6 million sent remittances.

[1] Estimates based on the 2002 ENNV as reported by Amuedo-Dorantes and Pozo (2005) indicates that average levels of non-labor income among remittances recipient households reach 941 pesos per month (just above a monthly minimum wage) , while average non-labor incomes among non recipient household reach 657 pesos per month. The same paper reports that average per capita remittances among 12-64 year olds in recipient households are 520 pesos per month (std = 710). Zarate-Hoyos (2004), uses ENIGH 89 to examine consumption patterns of recipient households vs non-recipient and reports an average amount of remittances for recipient households of $476 per month –the equivalent of a monthly minimum wage.

The survey also asks individuals in the working age population (12 and above) if they received remittances from the USA (from a person that may or may not be a member of the household). This answer tells that that 3 million individuals in that age group receive remittances from the USA.[2]

All individuals surveyed report their state of residency in November of 1997, and for those that are outside the country at the time of the survey but left between 1997 and 2002, the survey records their state of residency before they migrated. Based on these answers, about 56% of those that migrated to the US between 1997 and 2002 lived in urban areas and 5 out of every 10 lived in 6 states, principally Guanajuato, Jalisco, Michoacan, San Luis Potosi, Estado de Mexico, Zacatecas or outside Mexico (Table 2). Note that close to 7% of the migrants that left Mexico sometime between 1997 and 2002 were in the USA in November of 1997. As we pointed out earlier, there is a non-trivial fraction of return migration being captured in this survey.

Over sixty percent of the migrants to USA 97-02 send remittances to their families let behind, resulting in 1.4 million household receiving remittances and 1.2 million receiving them persistently (Table 3). Given the concentration of migrants origin in certain states, households that receive remittances are also more likely to be in certain states. We focus on the impact of persistent remittances on labor force participation among individuals in the working age population (Table 4). The sample is about 30% rural and equally divided between men and women. A small proportion of our sample is composed of return migrants and we make comparisons including and excluding this group.

4. Methodology

Ideally, one would have a longitudinal data set and observe the same household with and without remittances, or select a random set of households, expose them to remittances income, and measure differences in participation between these and the rest of

[2] A survey conducted by the IADB in 2003 concluded that 11million adults received remittances regularly from family living abroad. This number is well above the estimates from ENET 2002.

households. In these ideal scenarios, the reception of remittances is unrelated to the labor force participation behavior of household members. The reality of our data set is that is not longitudinal, and that recipient households are not a random sample of the Mexican population. We do not observe recipient households behaving in a situation in which they do not receive remittances. These data are missing. We do observe some households that receive remittances and other that do not, but a direct comparison of them leads to an identification problem because the presence of persistent remittances may be correlated with unobserved determinants of participation among these household members.

One possible way to deal with the selection problem is to perform propensity score matching (Rosenbaum and Rubin, 1983). The idea is to pair individuals that receive remittances with other individuals that are like them except for remittances. In the language of the methodology, one is to estimate the probability of receiving remittances as a function of individual and household characteristics, rank recipient and non recipient individuals by their propensity score, pair individual members of recipient households and non-recipients with similar propensity scores, and calculate the average difference in labor force participation across them. One can also estimate the effect of remittances on participation among a selected group of individuals considered equally likely to receive remittances, such as all households that have experienced migration of members abroad.

Following the notation used by Ichino, A., Mealli F., and Nannicini (2005), we are interested in comparing the labor force participation LFP0 of individuals exposed to no treatment $T = 0$ (no remittances) and LFP1, labor force participation of individuals exposed to treatment $T = 1$ (receives remittances). However, only one of these two outcomes is observed for each type of individual. We can estimate the average treatment on the treated (ATT), defined as:

$$E(\text{LFP1- LFP0}|T = 1) \qquad (1)$$

The selection into treatment can be represented as a process of utility maximization of the household:

$$V = f(Z, \varepsilon_v) \qquad T = I(V > 0) \tag{2}$$

where Z and ε_v are observed and unobserved characteristics of the household, respectively. Analogously, the two potential outcomes can be written as functions of observed (X) and unobserved (ε_y) pre-treatment individual variables:

$$LFP1 = g1(X, \varepsilon_y) \tag{3}$$

$$LFP0 = g0(X, \varepsilon_y) \tag{4}$$

The two sets of variables X and Z may coincide or overlap to a certain extent.
The evaluation aim is to identify and consistently estimate the ATT.
Problems may arise because of the potential association between some of the ε_y and the treatment indicator T, as determined by the observable and unobservable variables expressed in equation (2).

One of the assumptions that allow the identification of the ATT is "unconfoundedness" (Rosenbaum and Rubin, 1983a). This assumption considers the whole *conditioning set* of pre-treatment variables $W = (X,Z)$ and assumes that

$$(LFP1, LFP0) \perp T|W \tag{5}$$

and

$$0 < Pr(T = 1|W) < 1 \tag{6}$$

This means that, conditioning on observed covariates W, treatment assignment is ($\perp$) independent of potential outcomes. In other words, the assignment to treatment is random within cells defined by the variables W. Although very strong, the plausibility of this assumption heavily relies on the quality and amount of information contained in W.

Under unconfoundedness, one can identify the average treatment effect on the treated as

$$E(LFP1 - LFP0|T = 1) = E(E(LFP1 - LFP0|T = 1, W)) = \tag{7}$$

$$= E(E(LFP1|T = 1, W) - E(LFP0|T = 0, W)|T = 1),$$

where the outer expectation is over the distribution of W in the sub-population of treated individuals.

Under unconfoundedness, several estimation strategies can serve this purpose (Imbens, 2004) including regression modeling. Using regression to "adjust" or "control for" pre-intervention covariates is, in principle, a good strategy, although it has some pitfalls. For instance, if there are many covariates, it may be difficult to find an appropriate specification. Moreover, regression modeling obscures information on the distribution of covariates in the two treatment groups. In principle, one would like to compare *individuals that have the same values of all covariates*. Unless there is a substantial overlap of the two distributions of covariates, with a regression model one has to rely heavily on model specification (i.e., on extrapolation) for the estimation of treatment effects. It is thus crucial to check how much the two distributions overlap and what is their "region of common support" (Black and Smith , 2003) . When the number of covariates is large, this task is not an easy one. A possible solution is to reduce the problem to a single dimension, by using Propensity Score matching techniques as discussed in the next section.

Matching estimators of the ATT based on the Propensity Score

The Propensity Score is the individual probability of receiving the treatment given the observed covariates: $p(W) = P(T = 1|W)$. Under unconfoundedness, the following results hold (Rosenbaum and Rubin, 1983a): T is independent of W given $p(W)$, and $LFP0$ and $LFP1$ are independent of T given $p(W)$.

A critical feature of this methodology is that the Propensity Score has to satisfy the "balancing property", i.e., observations with the same value of the Score must have the same distribution of observable characteristics irrespective of treatment status. This allows the use of the Propensity Score as a univariate summary of all W. As a result, if $p(W)$ is known, the ATT can be estimated as follows:

$$E(LFP1 - LFP0|T = 1) = \quad (8)$$

$$= E(E(LFP1 - LFP0|p(W),\ T = 1)) =$$

$$= E(E(LFP1|p(W),\ T = 1) - E(LFP0|p(W),\ T = 0)|T = 1)$$

where the outer expectation is over the distribution of $(p(W)|T = 1)$.

Any standard probability model can be used to estimate the Propensity Score. For example, $Pr(T = 1|W) = F(h(W))$, where $F(.)$ is the normal or the logistic cumulative distribution and $h(W)$ is a function of the covariates with linear and higher order terms. Inasmuch as the specification of $h(W)$ which satisfies the balancing property is more parsimonious than the full set of interactions needed to match treated and control units according to observable characteristics, the Propensity Score reduces the dimensionality problem of matching procedures based on the multidimensional vector W.

The estimation of the Propensity Score is not enough to estimate the ATT of interest using equation (8). In fact, the probability of observing two units with exactly the same value of the Score is in principle zero, since $p(W)$ is a continuous variable. Various methods have been proposed in the literature to overcome this problem. Here we concentrate on the Nearest Neighbor matching estimator, which sorts all records by the estimated propensity score and then searches forward and backward for the closest control unit(s). If for a treated unit forward and backward matches happen to be equally good, this program randomly draws either the forward or backward matches.

5. Characterizing the Working Age Population with and without persistent remittances

We focus on a sample of 196,375 men and women 12-65 year olds distributed across rural and urban areas as indicated in Table 4. Data quality plays a key role in robust estimation of treatment effects using matching methods. As reflected in Tables 4A to 4D there are ample differences in the incidence of remittances between rural and urban zones, and across states within urban or rural zones. There are locations, such as rural Guanajuato, where 44% of working age individuals live in households that had received persistent remittances between 1997 and 2002. On the other hand, in Baja California Sur

(urban or rural) less than 1% of individuals in the working age population were exposed to persistent remittances.

We estimated probit models for the probability of persistent remittances at the household level as a function of household characteristics and state dummies. We were able to reduce state dummies to a smaller set of 6 blocks of states in not equally defined in urban and rural areas respectively. We identified two additional *household characteristics* that are associated with persistent remittances, apart from location. These are household potential work force – measured by the numbers of members 12 or older (including migrants), and wealth- which we have proxied by the highest level of schooling in the household. As shown in Table 5, location, household size and household wealth are highly significant in contributing to the probability of receiving persistent remittances at the household level. Given location, each additional member aged 12 or older increases the probability of receiving remittances by 2 points. Household wealth, proxied by the maximum level of schooling in the household, reduces the probability of receiving remittances. A household located in rural Guanajuato has a probability of receiving remittances that is 54 points higher than that of a household located in rural block 6, after controlling for household wealth and size.

Since we are interested in the effect of persistent remittances on *individual's* labor force participation, in what follows, we use propensity score matching to pair recipient *individuals* with non recipient *individuals* that have the same observed characteritics (sex, age, schooling, marital status) and the same probability of being a member of a household that receives persistent remittances. There is some accumulated empirical evidence on how bias estimates of matching estimators depend on the choice of W in particular applications. For example, Heckman, Ishimura and Todd (1997), and Heckman Ishimura Smith and Todd (1998), Heckman and Smith (1999) and Lechner (2002) show that which variables are included in the estimation of the propensity score can make a substantial difference to the performance of the estimator. Using experimental data from the U.S. National JTPA Study combined with comparison group samples drawn from three sources; show that data quality is a crucial ingredient to any reliable estimation strategy.

Specifically, the estimators examined are only found to perform well in replicating the results of the experiment when they are applied to comparison group data satisfying the following criteria: (i) the same data sources (i.e., the same surveys or the same type of administrative data or both) are used for treated and non treated, so that their characteristics are measured in an analogous way, (ii) treated and non treated reside in the same local labor markets, and (iii) the data contain a rich set of variables that affect both the treatment and the outcome of interest.

For our case, it is reasonable to favor a comparison of individuals of the same gender and residing within urban or rural areas and use dummies for blocks of states as defined in Table 5. But, we further parceled the data in subsamples in search for an appropriate specification, ultimately subdividing urban and rural zones by blocks of states with similar average probability of treatment (persistent remittances). The analysis proceeds with the estimation of a common probit equation to obtain the propensity score. The set of covariates includes all of the key factors affecting both remittances and labor force participation. No mechanical algorithm exists that automatically chooses sets of variables W that satisfies the identification conditions.

The procedure we used due is to Becker and Ichino (2002), and estimates the propensity score (pscore) of the treatment on a list of covariates using a probit model and stratifies individuals in blocks according to the pscore; displays summary statistics of the pscore and of the stratification; checks that the balancing property is satisfied; and if not satisfied asks for a less parsimonious specification of the pscore. As indicated above, we started with four sub samples (urban males, urban females, rural males and rural females) using dummies for blocks of states, but we had to parcel the data even more so that we finally ended with 10 sub samples. We calculate separate propensity score for each of the 10 sub samples.[3]

[3] We report one set of these estimates in the Appendix.

Propensity Score sub samples*:* We divided the sample of 196,375 observations in 10 blocks of observations as follows.[4]

Urban Women in state blocks 1 and 2 includes a dummy for block 1

Urban Women state block 3

Urban Women state blocks 4, 5 and 6, no dummy for blocks

Urban Men state block 1

Urban Men state blocks 2, 3 and 4, no dummy for blocks

Urban Men in state blocks 5 and 6, no dummy for blocks

Rural Women in state blocks 1, 2 and 3, dummy for block 1 and dummy for block 2

Rural Women in state blocks 4, 5, and 6, dummy for block 4 and dummy for block 5

Rural Men in state blocks 1, 2 and 3, dummy for block 1 and dummy for block 2

Rural Men in state blocks 4, 5, and 6, dummy for block 5

Propensity Score Covariates

Age: Individual age in years

Age squared: Individual age squared

Schooling: Years of completed schooling

Marital Status: Dummy=1 if individual has never married

Number of Children less than six in the household

Number of individuals in the working age population in the household: Number of individuals aged 12 or older in the household. This number includes migrants even if they are still in the USA.

Household Schooling: Maximum years of schooling observed in the household (members include USA migrants for the 1997-2002 period)

Dummies for blocks of states within sub sample: There are 6 blocks in rural areas and six in urban areas. Some sub samples include more than 1 block and in such cases a dummy for the block is added.

[4] Number of observations and mean values of variables within each sub sample are reported in Tables 7 and 8.

We do not use household headship as an exogenous variable because we see it as endogenous to migration. Headship can reflect the change in the organization of the household induced by migration and remittances.

Estimates the average treatment effect on the treated (ATT): We use nearest neighbor matching with random draw after finding the correct propensity score specification, i.e., the one satisfying the balancing property and using a common support for treated and controls. The algorithm sorts all records by the estimated propensity score and then searches forward and backward for the closest control unit(s); if for a treated unit forward and backward matches happen to be equally good, the program randomly draws either the forward or backward matches. The ATT is computed by averaging over the unit-level treatment effects of the treated where the control(s) matched to a treated observation is/are those observations in the control group that have the closest propensity score; if there are multiple nearest neighbors, the average outcome of those controls is used .

In Table 6, we summarize key variables across *individuals in the working age population*. For this table, and just to simplify the presentation, we merge sub samples in four groups: rural women; rural men; urban woman; and urban men. We report means and standard deviations for labor force participation and the model covariates, using the full sample and the sample restricted to the individuals in recipient households and their corresponding near neighbors. The sample of "near neighbors" is significantly smaller than the overall sample. As shown, the number of observations falls from the order of 15,000 to 3,000 in rural areas, and from around 87,000 to 13,000 in urban areas. The program searches for one neighbor for each treated (recipient) so there should be no more than 50% of recipients in the "near neighbors" sample. However, in some cases there are several observations in the comparison group with the same pscore of that in the "treated" group. In this case, the program takes the mean outcome (labor force participation) of the observations with equal pscore. This is why a proportion of 0.485 treated, as in the rural samples, is within the expected range. In the case of urban areas, the proportion of "treated" within the sample of "near neighbors" is closer to 0.2, which indicates that there is one treated observation for every 4 near neighbors on average.

The sample means in Table 6 show that individuals in recipient households along with their chosen near neighbors are more concentrated in regions with high incidence of migration, belong to larger households (in terms of number of individuals 12 or older), they typically have more schooling, and they are younger and more likely to be single. It is interesting to note, that average labor force participation rates are often lower in the adjusted samples compared to their corresponding full samples.

6. Results

We turn to the effect of persistent remittances on labor force participation estimated separately for each of the 10 sub samples. We show in Table 7 the differences in mean labor force participation between individuals in households with and without persistent remittances. These comparisons are biased, but it is interesting to contrast them with the ATT calculations shown in Table 8. In 4 out of the 10 sub samples, differences in labor force participation are significant and negative. To be precise, individuals in recipient households show average participation rates between 4 and 6.5 points below that of the corresponding non-recipient group. This observation is consistent with the "discouraged participation" view, in which the presence of persistent remittances would result in a decline in the rate of labor force participation of recipient household members left behind.

However, if the comparison groups are reduced to match the characteristics of the treated observations, that is, if the individuals in recipient households are paired with non-recipient with otherwise similar propensity scores, the estimated effects of remittances are insignificant in all cases except for women in the urban areas of the state blocks 4, 5 and 6. These results, shown in Table 8, are more consistent with the "neutral participation" view, which sees remittances as replacement of the income flows that emigrant workers would have contributed to the household, and predicts that the presence of remittances income should not alter the labor force participation decision of members left behind.

The estimated effect for woman in the urban areas of states blocks 4, 5 and 6, is positive suggesting that women in these states (relatively low migration tradition) have higher rates of participation as a result of remittances. The estimated effect is a 5 points higher participation rate. This result merits further examination of this group in an attempt to shed light on what is driving this result. One possible explanation is that emigrant workers remit amounts that are significantly below the income loss for the rest of the household associated to his/her emigration.

We searched for the possibility of effects among individuals in poorer households. We found evidence of negative effects among rural men in poor households (HH_ye<6) in the states blocks 1, 2 and 3, the higher migration states. This effect is large in size, particularly if one excludes return migrants –close to 20 points. However, we run into small samples and the degree of significance of the estimated difference is rather low.

7. Final Comments

This paper contributes to the literature on migration and remittances by examining a specific survey applied to Mexican households in 2002, to study the impact of persistent remittances on labor force participation of household members staying in Mexico.

We do observe some households that receive remittances and other that do not, but a direct comparison of them leads to an identification problem because the presence of persistent remittances may be correlated with unobserved determinants of participation among these household members. We use propensity score matching to find a comparison group for individuals in recipient households and find no evidence of labor force participation effects of persistent remittances.

The evidence presented here is consistent with what we call “neutral participation” – which sees the emigrant worker as a member of the household who is remitting to replace his/her lost contribution to the household due to emigration. In this case, the presence of remittances income should not alter the labor force participation decision of members left

behind, unless the amount remitted differs significantly from the income loss for the rest of the household associated to his emigration.

There are three subgroups for which we find some difference in participation associated to remittances income. The estimated effect for woman in the urban areas of states blocks 4, 5 and 6, is positive suggesting that women in these states (relatively low migration tradition) have higher rates of participation as a result of remittances. The estimated effect is a 5 points higher participation rate. A possible explanation is that the amount remitted to these households is typically lower than the lost income, lowering women's reservation wages. Information on remittance amounts relative to emigrant net contribution to the household income before emigration would further inform this finding. An alternative explanation is that remittances to these households improve female household members labor market opportunities, possibly through the establishment of family enterprises.

We found evidence of negative effects among rural men in poor households (HH_ye<6) in the states blocks 1, 2 and 3, the higher migration states. This effect is large in size, particularly if one excludes return migrants –close to 20 points. However, we run into small samples and the degree of significance of the estimated difference is rather low. A possible explanation for this negative effect is that the amount remitted to these households more than offsets the loss associated to the emigration of household members, raising the reservation wage of those left behind. In short, if there is "discouraged participation" due to remittances, it appears to be present among the poorer households in high migration rural areas.

Table 1: Migrants to USA between 1997 and 2002 by region and location in 2002

	Household Location in 2002		
Individual Location in 2002	Urban	Rural	Total
Abroad	852,833	739,071	1,591,904
Mexico	536,458	347,629	884,087
Total	1,389,291	1,086,700	2,475,991

Source ENET 2002

Table 2: Distribution of Migrants to the USA 97-02 by Origin (%)

Migrants Location in Nov 1997	Urban	Rural	All Mexico
Guanajuato	10.42	18.06	13.77
Jalisco	9.68	8.71	9.26
Michoacán de Ocampo	10.65	7.31	9.18
Outside Mexico	7.21	5.78	6.58
San Luis Potosí	3.85	6.97	5.22
Estado de México	4.91	4.32	4.65
Zacatecas	2.52	6.87	4.43
Rest of Mexico	50.76	41.98	51.34
Total	100	100	100
Absolute Number	1,389,291	1,086,700	2,475,991

Source: ENET 2002

Table 2A: Households with migrants to USA between 1997 and 2002 by region

	Urban	Rural	Total
No Emigration to USA	18,228,094	4,825,067	23,053,161
With Emigration to USA	1,097,822	786,886	1,884,708
% of Total	5.68	14.02	7.56
Total	19,325,916	5,611,953	24,937,869

Source ENET 2002

Table 2B: Remittances Recipients among Households with migrants to USA in 1997-02

	Urban	Rural	Total
# of Households	1,097,822	786,886	1,884,708
% receives remittances remittances	66	80.4	72
% receives remittances Persistently*	52.1	69.8	59.5

* If a household member sends remittances once a month, once every three months, once a year, or two to three times a year, we consider them to be persistent.

Table 4: Working Age Population in our Sample
Men and Women ages 12 to 65

	Urban	Rural	Total
Men	78,475	15,057	93,532
Women	87,113	15,730	102,843
Total	165,588	30,787	196,375

Source ENET 2002 (please see Tables 4A-4C for further detail)

TABLE 4A

RURAL WOMEN SAMPLE		% of 12-65 women within state in households		
State	# of observations	with migrant to USA	with migrant to USA 97-02	with persistent remittances 97-02
Guanajuato	460	71.3%	54.1%	47.2%
Zacatecas	605	57.0%	38.7%	32.6%
San Luis Potosí	617	32.7%	27.6%	22.4%
Durango	808	45.9%	32.3%	20.7%
Aguascalientes	505	37.8%	25.5%	19.0%
Jalisco	162	49.4%	30.9%	16.7%
Morelos	161	32.9%	22.4%	14.3%
Querétaro de Arteaga	697	22.5%	19.7%	14.2%
Michoacán de Ocampo	430	26.0%	18.1%	14.2%
Nayarit	607	32.9%	18.3%	12.5%
Sinaloa	483	29.4%	16.8%	11.4%
Hidalgo	907	14.9%	13.2%	10.7%
Chihuahua	441	25.2%	13.6%	8.6%
Oaxaca	686	12.1%	11.7%	8.5%
Baja California	317	41.6%	16.7%	8.2%
Puebla	476	11.8%	10.5%	7.6%
Sonora	367	19.9%	10.6%	6.0%
Campeche	741	8.1%	6.7%	5.7%
Tamaulipas	266	30.8%	10.9%	5.3%
Coahuila de Zaragoza	290	14.5%	7.6%	5.2%
Chiapas	556	6.1%	6.1%	4.5%
Guerrero	834	6.6%	5.0%	4.4%
México	558	11.8%	7.9%	4.1%
Tlaxcala	630	5.4%	4.1%	3.7%
Nuevo León	305	15.1%	9.5%	3.6%
Colima	353	22.7%	11.3%	3.4%
Veracruz	434	5.3%	5.3%	2.8%
Tabasco	807	3.2%	3.2%	1.7%
Quintana Roo	308	3.2%	2.6%	1.3%
Yucatán	416	1.7%	1.9%	1.2%
Baja California Sur	448	4.5%	0.9%	0.2%
Distrito Federal	55	1.8%	0.0%	0.0%
Total	15,730	21.3%	14.8%	10.6%

TABLE 4B

RURAL MEN SAMPLE		% of men 12-65 within state in households		
State	# of observations	with migrant to USA	with migrant to USA 97-02	with persistent remittances 97-02
Guanajuato	321	66.7%	45.2%	38.6%
Zacatecas	463	59.4%	38.9%	31.5%
San Luis Potosí	587	30.5%	24.4%	20.4%
Aguascalientes	471	41.2%	26.8%	19.1%
Durango	732	44.3%	27.5%	16.9%
Michoacán de Ocampo	414	27.5%	19.6%	13.8%
Nayarit	626	36.3%	17.7%	12.3%
Jalisco	138	39.9%	23.9%	11.6%
Morelos	138	26.1%	17.4%	11.6%
Sinaloa	504	34.3%	18.3%	11.1%
Querétaro de Arteaga	651	18.9%	15.5%	11.1%
Hidalgo	804	12.8%	11.4%	9.2%
Oaxaca	630	9.5%	9.0%	6.5%
Puebla	429	11.4%	9.1%	5.8%
Sonora	346	18.5%	10.1%	5.8%
Chihuahua	430	23.3%	10.7%	5.6%
Baja California	341	45.2%	16.1%	5.6%
Campeche	753	8.0%	6.2%	5.3%
Coahuila de Zaragoza	333	13.5%	6.6%	4.5%
Chiapas	547	5.3%	5.3%	3.7%
Guerrero	739	6.5%	4.6%	3.7%
Colima	358	23.5%	10.6%	3.4%
Tlaxcala	629	5.6%	4.0%	3.3%
México	542	9.6%	7.0%	2.8%
Nuevo León	330	13.9%	6.4%	2.4%
Tamaulipas	259	28.6%	6.9%	1.9%
Tabasco	820	2.4%	2.4%	1.2%
Veracruz	432	3.7%	3.7%	0.9%
Quintana Roo	305	2.0%	1.3%	0.7%
Yucatán	452	0.9%	1.1%	0.4%
Baja California Sur	478	2.9%	0.6%	0.2%
Distrito Federal	55	1.8%	0.0%	0.0%
Total	15,057	19.8%	12.5%	8.5%

TABLE 4C

URBAN WOMEN SAMPLE		% of 12-65 women within state in households		
State	# of observations	with migrant to USA	with migrant to USA 97-02	with persistent remittances 97-02
Michoacán de Ocampo	2,853	22.4%	14.7%	9.8%
Guanajuato	3,110	18.5%	12.3%	7.8%
San Luis Potosí	2,634	18.0%	12.0%	7.1%
Aguascalientes	2,870	17.1%	12.5%	6.9%
Morelos	3,079	11.2%	8.2%	6.3%
Durango	2,517	15.9%	11.7%	5.8%
Nayarit	2,385	19.2%	11.7%	5.8%
Zacatecas	2,704	15.7%	9.6%	5.7%
Querétaro de Arteaga	2,938	11.3%	7.2%	4.4%
Guerrero	2,286	8.8%	6.9%	4.2%
Hidalgo	2,310	8.7%	7.4%	4.2%
Oaxaca	2,563	8.0%	6.9%	3.9%
Jalisco	3,366	19.1%	7.9%	3.5%
Puebla	2,859	5.8%	4.4%	3.1%
Chihuahua	2,386	14.4%	6.4%	2.9%
Tlaxcala	2,989	8.6%	6.2%	2.8%
Coahuila de Zaragoza	2,944	7.0%	4.9%	2.7%
Sonora	2,716	12.9%	7.3%	2.5%
Veracruz	2,366	6.0%	4.5%	2.1%
Sinaloa	2,882	11.8%	5.2%	2.1%
Tamaulipas	2,530	11.2%	5.0%	2.0%
Colima	2,764	15.9%	5.0%	2.0%
Chiapas	2,847	2.6%	2.5%	1.9%
Baja California	2,582	21.0%	5.1%	1.8%
Nuevo León	3,016	7.1%	3.9%	1.3%
México	2,976	3.7%	1.8%	0.9%
Yucatán	2,663	2.6%	1.5%	0.9%
Distrito Federal	3,094	3.3%	2.1%	0.8%
Quintana Roo	2,222	1.3%	0.8%	0.5%
Baja California Sur	2,620	3.2%	1.5%	0.4%
Tabasco	2,657	0.8%	0.6%	0.1%
Campeche	2,385	0.7%	0.2%	0.1%
Total	87,113	10.5%	6.2%	3.4%

TABLE 4D

URBAN MEN
SAMPLE

State	# of observations	% of 12-65 men within state in households with migrant to USA	with migrant to USA 97-02	with persistent remittances 97-02
Michoacán de Ocampo	2,392	21.8%	12.8%	8.4%
San Luis Potosí	2,223	17.5%	11.2%	6.8%
Guanajuato	2,805	17.0%	10.8%	6.6%
Aguascalientes	2,505	17.0%	12.1%	6.1%
Durango	2,204	15.9%	10.6%	5.6%
Zacatecas	2,364	16.5%	9.0%	5.2%
Nayarit	2,060	20.2%	10.7%	5.2%
Morelos	2,728	10.3%	7.1%	5.1%
Guerrero	1,936	8.4%	6.1%	3.9%
Querétaro de Arteaga	2,741	11.5%	6.6%	3.8%
Oaxaca	2,085	7.8%	6.9%	3.8%
Hidalgo	1,948	7.9%	6.2%	3.6%
Jalisco	3,055	19.1%	7.4%	2.7%
Puebla	2,621	5.2%	4.0%	2.7%
Sinaloa	2,664	12.5%	5.9%	2.6%
de Ignacio de la Llave	1,895	6.6%	5.3%	2.5%
Chihuahua	2,235	14.0%	5.3%	2.4%
Coahuila de Zaragoza	2,735	7.2%	4.8%	2.2%
Tlaxcala	2,648	7.6%	5.4%	2.1%
Sonora	2,495	12.3%	5.7%	2.0%
Colima	2,452	16.5%	4.3%	1.7%
Tamaulipas	2,436	11.6%	4.9%	1.5%
Chiapas	2,488	2.1%	2.0%	1.3%
Baja California	2,513	23.8%	4.6%	1.3%
Nuevo León	2,829	7.8%	3.9%	1.1%
Distrito Federal	2,766	3.3%	2.2%	0.8%
México	2,747	3.3%	1.4%	0.6%
Yucatán	2,448	2.5%	1.1%	0.5%
Baja California Sur	2,595	3.6%	1.4%	0.4%
Quintana Roo	2,294	1.2%	0.8%	0.3%
Tabasco	2,367	0.6%	0.4%	0.1%
Campeche	2,201	0.7%	0.1%	0.0%
Total	78,475	10.4%	5.6%	2.9%

TABLE 5: Probit Regressions: Dependent Variable “Probability of Receiving Persistent Remittances”

EQ1: URBAN HOUSEHOLDS

Probit estimates — Number of obs = 51398
LR chi2(7) =1719.80
Prob > chi2 = 0.0000
Log likelihood = -5817.2758 — Pseudo R2 = 0.1288

TREAT_rp	dF/dx	Std. Err.	z	P>|z|	x-bar	[95% C.I.]	
t_may12	.0075733	.000331	25.71	0.000	3.0829	.006925	.008222
HH_ye	-.002481	.0001426	-18.02	0.000	11.2334	-.00276	-.002201
urb_1*	.192387	.0218126	16.19	0.000	.030274	.149635	.235139
urb_2*	.1047769	.0100547	16.30	0.000	.214969	.08507	.124484
urb_3*	.0822389	.0109121	12.10	0.000	.11265	.060852	.103626
urb_4*	.0428623	.0052949	10.26	0.000	.319993	.032484	.05324
urb_5*	.0236385	.0057313	5.28	0.000	.169442	.012405	.034872
obs. P	.0286198						
pred. P	.0158823	(at x-bar)					

(*) dF/dx is for discrete change of dummy variable from 0 to 1
z and P>|z| are the test of the underlying coefficient being 0

URB_1: Michoacan
URB_2: Guanajuato, San Luis, Aguascalientes, Morelos, Durango, Nayarit, Zacatecas
URB_3: Queretaro, Guerrero, Oaxaca, Hidalgo
URB_4: Jalisco, Puebla, Tlaxcala, Coahuila, Sonora, Veracruz, Sinaloa, Sonora, Tamaulipas, Colima
URB_5 Chiapas, Baja California Norte, Nuevo Leon, Distrito, Mexico
URB_6 Baja California Sur, Quintana Roo, Tabasco, Campeche, Yucatan.

Table 5: (cont)

EQ 2: RURAL HOUSEHOLDS

Probit estimates — Number of obs = 8660; LR chi2(7) = 860.14; Prob > chi2 = 0.0000; Log likelihood = -2209.7522; Pseudo R2 = 0.1629

TREAT_rp	dF/dx	Std. Err.	z	P>|z|	x-bar	[95% C.I.]	
t_may12	.0199437	.0014626	13.71	0.000	3.36813	.017077	.02281
HH_ye	-.0029245	.0008356	-3.49	0.000	7.84221	-.004562	-.001287
rur_1*	.5377088	.0384921	17.43	0.000	.023557	.462266	.613152
rur_2*	.4277201	.034454	16.69	0.000	.035335	.360192	.495249
rur_3*	.2030021	.0159913	16.03	0.000	.193418	.17166	.234344
rur_4*	.1496574	.0175012	11.07	0.000	.135219	.115356	.183959
rur_5*	.0663844	.011024	6.76	0.000	.274365	.044778	.087991
obs. P	.0909931						
pred. P	.0607103	(at x-bar)					

(*) dF/dx is for discrete change of dummy variable from 0 to 1
z and P>|z| are the test of the underlying coefficient being 0

RUR_1: Guanajuato
RUR_2: Zacatecas
RUR_3: San Luis, Aguascalientes, Durango, Michoacan, Morelos, Nayarit
RUR_4: Jalisco, Queretaro, Sinaloa, Hidalgo
RUR_5: Oaxaca, Chihuahua, Baja California Norte, Puebla, Sonora, Campeche, Coahuila, Guerrero
RUR_6: Tamaulipas, Tlaxcala, Mexico, Colima, Nuevo Leon, Veracruz, Tabasco, Quintana Roo, Yucatan, Baja California Sur, Chiapas (Distrito not included)

TABLE 6 : Characteristics of the Working-Age Population Sample and "Near Neighbors" Samples by Sex and Rural-Urban region.

Woman – Rural Areas

	Full Sample # of obs = 15,730				Near Neighbors Sample # of 0bs = 3,446			
Variable	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
% in the labor force	0.296	0.457	0	1	0.294	0.456	0	1
% recipients	0.106	0.308	0	1	0.485	0.500	0	1
rur_1	0.029	0.168	0	1	0.087	0.282	0	1
rur_2	0.038	0.192	0	1	0.100	0.301	0	1
rur_3	0.199	0.399	0	1	0.372	0.483	0	1
rur_4	0.143	0.350	0	1	0.172	0.377	0	1
rur_5	0.264	0.441	0	1	0.177	0.381	0	1
rur_6	0.590	0.492	0	1	0.269	0.444	0	1
hhd members 12 or older	4.155	1.855	1	15	4.790	1.974	1	13
individual schooling	5.580	3.620	0	23	5.853	3.329	0	16
age	32.088	15.009	12	65	30.451	14.862	12	65
% single	0.370	0.483	0	1	0.413	0.492	0	1
hhd children less than 6	0.468	0.816	0	5	0.449	0.782	0	5
hhd schooling	8.310	3.214	0	23	8.135	2.744	0	16

Men – Rural Areas

	Full Sample # of obs = 15,057				Near Neighbors Sample # of 0bs = 2,884			
Variable	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
% in the labor force	0.811	0.392	0	1	0.744	0.436	0	1
% recipients	0.085	0.279	0	1	0.445	0.497	0	1
urb_1	0.021	0.144	0	1	0.058	0.234	0	1
urb_2	0.031	0.173	0	1	0.085	0.279	0	1
urb_3	0.197	0.398	0	1	0.379	0.485	0	1
urb_4	0.139	0.346	0	1	0.135	0.341	0	1
urb_5	0.266	0.442	0	1	0.156	0.363	0	1
urb_6	0.612	0.487	0	1	0.343	0.475	0	1
hhd members 12 or older	4.200	1.850	1	15	4.906	1.906	1	13
individual schooling	5.851	3.535	0	23	6.181	3.156	0	16
age	31.692	15.435	12	65	28.464	15.914	12	65
% single	0.458	0.498	0	1	0.566	0.496	0	1
hhd children less than 6	0.471	0.819	0	5	0.408	0.729	0	4
hhd schooling	8.269	3.165	0	23	8.314	2.636	0	16

TABLE 6 (cont) : Characteristics of the Working-Age Population Sample and "Near Neighbors Sample"

Women – Urban Areas

	Full Sample # of obs = 87,113				Near Neighbors Sample # of 0bs = 13,048			
Variable	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
% in the labor force	0.405	0.491	0	1	0.361	0.480	0	1
% recipients	0.034	0.180	0	1	0.224	0.417	0	1
urb_1	0.033	0.178	0	1	0.042	0.201	0	1
urb_2	0.222	0.415	0	1	0.334	0.472	0	1
urb_3	0.116	0.320	0	1	0.086	0.281	0	1
urb_4	0.319	0.466	0	1	0.292	0.455	0	1
urb_5	0.167	0.373	0	1	0.137	0.344	0	1
urb_6	0.144	0.351	0	1	0.109	0.311	0	1
hhd members 12 or older	3.775	1.642	1	16	4.138	1.686	1	15
individual schooling	8.756	4.117	0	23	8.829	3.653	0	20
age	32.471	14.093	12	65	28.132	12.735	12	65
% single	0.390	0.488	0	1	0.467	0.499	0	1
hhd children less than 6	0.331	0.653	0	5	0.350	0.640	0	5
hhd schooling	11.515	3.509	0	23	10.819	3.114	0	20

Men – Urban Areas

	Full Sample # of obs = 78,475				Near Neighbors Sample # of 0bs = 12,883			
Variable	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
% in the labor force	0.751	0.432	0	1	0.659	0.474	0	1
% recipients	0.029	0.167	0	1	0.174	0.379	0	1
urb_1	0.030	0.172	0	1	0.031	0.172	0	1
urb_2	0.215	0.411	0	1	0.326	0.469	0	1
urb_3	0.111	0.314	0	1	0.157	0.364	0	1
urb_4	0.322	0.467	0	1	0.433	0.496	0	1
urb_5	0.170	0.376	0	1	0.032	0.175	0	1
urb_6	0.152	0.359	0	1	0.021	0.144	0	1
hhd members 12 or older	3.827	1.655	1	16	4.242	1.601	1	15
individual schooling	9.144	4.089	0	23	9.167	3.505	0	20
age	31.825	14.220	12	65	26.539	12.890	12	65
% single	0.438	0.496	0	1	0.590	0.492	0	1
hhd children less than 6	0.341	0.660	0	5	0.309	0.608	0	5
hhd schooling	11.488	3.488	0	23	11.045	3.071	0	20

Table 7: Labor Force Participation Rates by **Sub Sample BEFORE MATCHING ADJUSTMENT:**

Remittances are associated with lower participation

Propensity Score Sub Sample	# obs	Total Sample w persistent Remittances	Total Sample w/o persistent remittances	LFP, Difference in Means, and ttest w remit.	w/o remit	diff	Ttest*
Urban Women states blocks 1 and 2	22,152	1,538	20,614	.3511	.4076	-.0565	-4.360
Urban Women states block 3	10,099	423	9,676	.3901	.4169	-.0268	-1.096
Urban Women states blocks 4, 5 and 6	54,862	959	53,903	.4129	.4029	-.0100	-0.627
Urban Men states block 1	2,392	202	2,190	.7475	.7507	-.0032	-0.099
Urban Men States blocks 2, 3 and 4	50,839	2,877	48,962	.7112	.7509	-.0397	-3.895
Urban Men states blocks 5 and 6	25,244	163	25,081	.7055	.7551	-.0496	-1.467
Rural Women states blocks 1, 2 and 3	4,193	975	3,218	.3005	.2958	.0047	0.279
Rural Women states blocks 4, 5 and 6	11,537	696	10,841	.3032	.2954	.0078	0.437
Rural Men states blocks 1, 2 and 3	3,752	754	2,998	.7612	.8262	-.0649	-4.098
Rural Men states blocks 4, 5 and 6	11,305	529	10,776	.7486	.8133	-.0647	-3.708
Total	196,375	9,116	188,259				

Note: For definitions of blocks of states, see Table 5.

*Two-sample t test with equal variances

Table 8: Estimated Effects of Persistent Remittances on Individual Labor Force Participation Rates using Propensity Score Matching

	Total Sample			Common Support Comparison Group				
Propensity Score Sub Sample	# obs	w persistent remittances	w/o persistent remittances	treatment	controls	ATT**	Std. Err.	t
Urban Women states blocks 1 and 2	22,152	1,538	20,614	1,538	3,365	0.001	0.017	0.078
Urban Women states block 3	10,099	423	9,676	423	703	0.023	0.033	0.695
Urban Women states blocks 4, 5 and 6	54,862	959	53,903	959	6,060	0.046	0.02	2.359
Urban Men states block 1	2,392	202	2,190	202	191	-0.008	0.048	-0.171
Urban Men States blocks 2, 3 and 4	50,839	2,877	48,962	1,877	9,931	-0.003	0.014	-0.227
Urban Men states blocks 5 and 6	25,244	163	25,081	163	519	-0.025	0.047	-0.534
Rural Women states blocks 1, 2 and 3	4,193	975	3,218	975	865	-0.021	0.024	-0.877
Rural Women states blocks 4, 5 and 6	11,537	696	10,841	696	823	-0.009	0.025	-0.370
Rural Men states blocks 1, 2 and 3	3,752	754	2,998	754	704	-0.019	0.025	-0.781
Rural Men states blocks 4, 5 and 6	11,305	529	10,776	529	849	-0.026	0.027	-0.947
Rural Men states blocks 1, 2 and 3 and HH_ye<6	443	50	393	50	47	-0.12	0.077	-1.566
Rural Men states blocks 1, 2 and 3 excludes migrants and HH_ye<6	418	31	418	31	27	-0.194	0.117	-1.658

Note: For definitions of blocks of states, see Table 5.
ATT means average treatment effect on the treated

References

Airola, J. (2005): Labor Supply in Response to Remittances Income: The Case of Mexico Defense Resources Management Institute Working Paper Series 2005/09

Amuedo-Dorantes, C. and S. Pozo (2005) International Remittances and their Employment Implications in Receiving Areas, Presented at SOLE Meetings 2005.

Becker, S. and A. Ichino (2002) "Estimation of average treatment effects based on propensity scores", The Stata Journal, Vol.2, No.4, pp. 358-377.

Black, Dan A. and Jeffrey Smith (2003) How Robust is the Evidence on the of College Quality? Evidence from Matching. Department of Economics Social Science Centre The University of Western Ontario. London, Ontario, N6A 5C2 Canada

Drinkwater, S., Levine, P., and Lotti, E. (2003). The labour market effect of remittances. Hamburg Institute of International Economics, FLOWENLA Discussion paper 6.

Funkhouser, Edward. "Migration from Nicaragua: Some Recent Evidence" *World Development*, 20 (8), 1992, pp. 1209-18.

Gubert, F. (2002). Do migrants insure those who stay behind? Evidence from the Kayes Areas (Western Mali). Oxford Development Studies, 30(3), 267-287.

Hanson, G. (2005) Emigration, Labor Supply and Earnings in Mexico *National Bureau of Economic Research Working Paper # 11412*

Heckman, J., Ichimura, H., Smith, J., Todd, P. 1998. Characterizing selection bias using experimental data. Econometrica 66(5), 1017-1098.

Heckman, J., Ichimura, H., Todd, P. 1997. Matching as an econometric evaluation estimator: Evidence from evaluating a job training programme," Review of Economic Studies 64(4), 605-654.

IADB (2003). Receptores de remesas en México, encuesta de opinión pública. IADB, Washington.

Ichino, A., Mealli F., and Nannicini T. (2005) "Sensitivity of matching estimators to unconfoundedness. An application to the effect of temporary work on future employment." (unpublished manuscript) – European University Institute

Imbens, Guido W. (2004). “Nonparametric Estimation of Average Treatment Effects under Exogeneity: A Review. *The Review of Economics and Statistics* MIT Press, vol. 86(1), pages 4-29.

Lechner, M. 2002. Some practical issues in the evaluation of heterogeneous labour market programmes by matching methods. *Journal of the Royal Statistical Society,* Series A 165(Part 1), 59-82.

Rodriguez, Edgard R. and Erwin R. Tiongson (2001). “Temporary Migration Overseas and Household Labor Supply: Evidence from Urban Philippines” *International Migration Review*, 35(3), pp. 708-725

Rosenbaum, P. R. and D. B. Rubin. 1983. The central role of the propensity score in observational studies for causal effects. Biometrika 70(1): 41-55.

Rosenbaum, P. R. and D.B. Rubin. 1984. Reducing bias in observational studies using subclassification on the propensity score. Journal of the American Statistical Association 79: 516-524.

Smith, Jeffrey, and Petra Todd (2003) Does Matching Overcome Lalonde's Critique of Nonexperimental Estimators? Department of Economics Social Science Centre The University of Western Ontario. London, Ontario, N6A 5C2 Canada Working Paper 2003-5

Taylor, E. and Mora, J. (2006) Does migration reshape expenditures in the rural households? Evidence from Mexico. World Bank Policy Research Working Paper 3842. World Bank, Washington.

Zarate-Hoyos, German A. (2004) “Consumption and Remittances in Migrant Hpsueholds: Toward a productive Use of Remittances” *Contemporary Economic Policy 22 #4*: 555-65

APPENDIX

```
pscore TREAT_rp  rur_5 t_may12 escolaridad eda eda2 soltero nchildl6 HH_ye if
HH_rur==1 & woman==0 & ( rur_4 | rur_5==1 | rur_6==1), pscore(myscore) comsup


**************************************************
Algorithm to estimate the propensity score
**************************************************

The treatment is TREAT_rp

   TREAT_rp |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |     10,776       95.32       95.32
          1 |        529        4.68      100.00
------------+-----------------------------------
      Total |     11,305      100.00


Estimation of the propensity score

Iteration 0:   log likelihood = -2136.2298
Iteration 1:   log likelihood = -2030.8794
Iteration 2:   log likelihood = -2028.0476
Iteration 3:   log likelihood = -2028.0447

Probit estimates                                  Number of obs   =      11305
                                                  LR chi2(8)      =     216.37
                                                  Prob > chi2     =     0.0000
Log likelihood = -2028.0447                       Pseudo R2       =     0.0506

------------------------------------------------------------------------------
    TREAT_rp |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       rur_5 |   .1086275   .0433646     2.50   0.012     .0236344    .1936205
     t_may12 |   .1525986   .0116317    13.12   0.000     .1298009    .1753963
 escolaridad |   .0244016   .0087836     2.78   0.005      .007186    .0416171
         eda |  -.0302831   .0086514    -3.50   0.000    -.0472395   -.0133266
        eda2 |   .0004476   .0001102     4.06   0.000     .0002317    .0006635
     soltero |  -.1352654   .0724938    -1.87   0.062    -.2773506    .0068199
    nchildl6 |  -.0615251   .0307968    -2.00   0.046    -.1218858   -.0011645
       HH_ye |  -.0369014   .0091814    -4.02   0.000    -.0548966   -.0189061
       _cons |  -1.763621   .1880509    -9.38   0.000    -2.132194   -1.395048
------------------------------------------------------------------------------


Note: the common support option has been selected
The region of common support is [.01061955, .25028135]
```

Description of the estimated propensity score
in region of common support

Estimated propensity score

Percentiles		Smallest		
1%	.0121027	.0106196		
5%	.0150738	.0106226		
10%	.0178383	.0106413	Obs	11197
25%	.0258245	.0106702	Sum of Wgt.	11197
50%	.0387016		Mean	.0466452
		Largest	Std. Dev.	.0308943
75%	.057538	.2421146		
90%	.083072	.2430011	Variance	.0009545
95%	.1082092	.2502077	Skewness	2.109856
99%	.163466	.2502813	Kurtosis	9.499475

****
Step 1: Identification of the optimal number of blocks
Use option detail if you want more detailed output
****

The final number of blocks is 7

This number of blocks ensures that the mean propensity score
is not different for treated and controls in each blocks

****
Step 2: Test of balancing property of the propensity score
Use option detail if you want more detailed output
****

The balancing property is satisfied

This table shows the inferior bound, the number of treated
and the number of controls for each block

Inferior of block of pscore	TREAT_rp 0	1	Total
.0106196	2,551	50	2,601
.025	2,651	69	2,720
.0375	2,084	100	2,184
.05	2,116	141	2,257
.075	667	72	739
.1	563	85	648
.2	36	12	48
Total	10,668	529	11,197

Note: the common support option has been selected

****
End of the algorithm to estimate the pscore
****