

# Remittance Income Volatility and Labor Supply in Mexico

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## **Abstract**

Using the 2000-2005 ENIGH, Mexico's income and expenditure survey, we estimate how the level and uncertainty of international remittance inflows impact the labor supply of men and women in remittance-receiving households. We find that both men and women increase labor supply when remittance inflows are less predictable, although the response of women to increases in remittance income uncertainty appears significantly larger than the labor supply response of men. Since men are more likely than women to be employed and to work full-time, women may be better suited than men to respond to higher remittance income uncertainty with increases in labor supply, either by stepping into the labor market or, if employed, by raising the number of hours worked.

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## I. Background and Significance

A significant body of academic and policy research currently analyzes the impact of international remittances (the earnings that emigrants send home) in economies around the globe. This research is being undertaken at both the microeconomic and macroeconomic levels. Studies have been carried out to ascertain the effect of remittances on country exchange rates, on household decisions concerning capital accumulation, on health and housing expenditures, on economic growth and economy-wide poverty rates, on income distribution and on labor supply (e.g. Amuedo-Dorantes and Pozo 2004, Adams 2005, Amuedo-Dorantes and Pozo 2006a, , Yang 2006, Cox-Edwards and Rodriguez-Oreggia 2009). Evidence of the impacts of remittances on the well-being of recipients and on economic progress is mixed. Some studies find that countries and households reap positive benefits from these resource transfers, while others find negative or ambiguous effects. An overall consensus on the impacts of remittances is unlikely to emerge for some time given the relative infancy and complexity of this research topic, not to mention the varying characteristics of countries under analysis.

We propose to contribute to this important debate using an expanded approach for assessing the effects of remittances on household behavior. Our contribution is to note that, while the *level* of resource transfers received by the household will influence household behavior, *uncertainty* in the stream of inflows is likely to play an important role too. To date, research detailing the impact of remittances on remittance-receiving households has tended to focus on how the *level* of remittance inflows affects household behavior and the use of these funds without considering the *uncertainty* surrounding these inflows.<sup>1</sup> We argue that such a strategy may be only partially informative of the true effects of remittances on household decision-making and, therefore, on remittance-receiving economies.

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<sup>1</sup> An exception is Amuedo-Dorantes and Pozo (2008).

In this study we investigate *how different remittance-receiving patterns influence the labor supply of recipient households*—a crucial dimension of how remittances impact remittance-receiving households and the economy. A limited number of studies have concluded that the receipt of remittances results in labor supply reductions. Rodriguez and Tiongson (2001) report that remittances lower employment in the Philippines, while Funkhouser (1992) estimates that remittances reduce the employment likelihood of Nicaraguan men and women by 2 and 5 percentage points, respectively. Using Mexican data, Cox-Edwards and Rodriguez-Oreggia (2009) conclude that persistent remittances have no impact on the labor supply of household members remaining in Mexico with the exception of urban women in traditionally low-migration states for whom labor supply is raised. Studies by Amuedo-Dorantes and Pozo (2006b) and by Hanson (2007) also find that the impact of remittances on the labor supply of Mexicans is conditioned on gender. However, they conclude that Mexican women reduce labor supply on account of remittance inflows, whereas men do not.

What might account for the different labor supply responses to remittance inflows? Are the various methodological approaches to estimation to blame for the diversity of results? Alternatively, are the various findings a result of geographic and cultural variations in the responsiveness of labor supply to remittances? Or is the responsiveness of labor supply to remittance flows nonlinear with respect to time—the longer one receives flows, the more likely one is to reduce labor supply? Surely all of these explanations are likely to matter to some degree. But a review of the results provides another clue. Studies that disaggregate by gender seem to find that men’s labor supply is less sensitive to remittance inflows relative to women’s labor supply. Could it be that the certainty surrounding remittance inflows vary systematically by gender, which in turn impacts labor supply decisions? For instance, are women more likely to

be the recipients of steady, periodic, easily forecasted remittance inflows, and men more likely to be the recipients of sporadic and less predictable flows? If so, analyses that have been undertaken to assess the impact of remittance on the labor supply patterns of their recipients have consistently omitted an important explanatory variable, i.e. the uncertainty in the flow of remittances,<sup>2</sup> thereby biasing the estimated impact of variations in the level of remittances on labor supply.

Finally, a few words about why we should care about how remittance income uncertainty may impact the labor supply of remittance-receiving households are worth mentioning. Remittances represent a large foreign exchange transfer from rich to poor nations. Aggregate remittances are reported to exceed world flows of official development assistance and, for a large fraction of the poorest nations, remittances exceed foreign direct investment inflows (Ratha and Mohapatra, 2007). Yet, we know very little about how a variety of policies (ranging from immigration to banking policies) influence the level and uncertainty of these flows and, therefore, about how remittances ultimately impact households and the nations that receive them. By showing how the uncertainty and predictability of remittances influence the labor supply behavior of recipient households, this study will enhance our current understanding of the channels by which remittances impact remittance-receiving economies and, in turn, inform on the effects of different policies concerning monetary transfers to developing nations.

To date, the implicit assumption behind remittance policies seems to be that remittances benefit recipient households and nations and, hence, should be encouraged (Amuedo-Dorantes and Bansak 2006, Freund and Spatafora 2008). Consequently, policy-making has focused on lowering transactions fees and integrating immigrant populations into the formal financial

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<sup>2</sup> By only examining “persistent remittances” Cox-Edwards and Rodriguez-Oreggia partially eliminate this complication.

(banking) sector with the expectation that cheaper and more secure money transfer mechanisms will increase remittance flows. But the optimal design of remittance policies is not yet clear. Should policies that encourage regular periodic remittance transfers be implemented? Or is it more important to design policies that lower the cost of remitting even if remittances are sent on an irregular basis? A flat remitting fee, for example, could encourage larger and perhaps less regular remittance flows and, in turn, alter economic responses to the monetary inflows given their periodicity and forecastability. Understanding the role played by remittance income uncertainty on the behavior of recipient households can shed some light on the direction we might prefer to take in designing policies likely to harness the most out of these money flows.

## II. Theoretical Framework

A series of papers in labor economics has examined how individuals adjust their labor supply on account of unexpected changes in income. Yet, most of that literature has focused on how *wage* uncertainty affects labor supply (e.g. Eaton and Rosen 1980, Hartwick 2000, Low 2004, Parker et al. 2005, Flodén 2006, Coyte 1986). Only a few studies have examined the impact of *non-wage* income uncertainty on labor supply decisions. Among the latter, we find the pioneering work by Block and Heineke (1973), along with a few follow-up studies examining uncertainty in the receipt of some transfers (e.g. Graham 1990).

Following Block and Heineke (1973), we take the wage rate ( $w$ ) to be certain and assume that income ( $Y$ ) depends on the labor supply ( $L$ ) and a random component ( $e$ ) that represents autonomous or non-labor income. Therefore:

$$Y = wL + e \tag{1}$$

Individuals decide how many hours to work by maximizing their utility ( $U$ ), which depends on:

$$U(L, Y) \tag{2}$$

where: (i)  $U_Y > 0$  (i.e. income is a normal good), (ii)  $U_L < 0$  (i.e. labor is a discommodity), and (iii)  $U_{YY} < 0$  (i.e. individuals are risk averse). Additionally, we specify a coefficient of absolute risk aversion:  $R(Y, L) = -U_{YY}/U_Y$ , and assume that: (iv)  $R_Y < 0$  and (v)  $R_L = 0$ . The necessary condition for a relative maximum is thus given by:

$$EU_{L+w}EU_Y \leq 0, \text{ which reduces to: } MRS_{YL} \geq w \quad (3)$$

when the utility function is linear in income. The second order condition for a relative maximum is given by the Hessian:

$$H \equiv EU_{LL} + 2wEU_{YL} + w^2EU_{YY} < 0 \quad (4)$$

Using this framework, we obtain comparative static results specifying the impact of a mean-value shift (i.e. a change in the level of remittance income) and of an increase in the uncertainty of non-labor income (i.e. a change in remittance income uncertainty) on the labor supply of remittance-receiving individuals. The impact of a change in the level of remittance income on the labor supply of remittance-receiving individuals is obtained by replacing non-labor income ( $e$ ) with  $(e + \theta_1)$  in the first order condition, where  $\theta_1$  is the shift parameter. Differentiating the new first order condition with respect to  $\theta_1$  and evaluating the partial derivative at  $\theta_1=0$ , we get the prediction that a positive lump-sum income transfer decreases labor supply, i.e.

$$\partial L / \partial \theta_1 = -E(U_{LY} + wU_{YY}) / H < 0 \quad (5)$$

Therefore, our first testable hypothesis is that *increases in the level of remittance income reduce individuals' labor supply*.

In contrast, an increase in remittance income uncertainty appears to have the opposite effect on labor supply. As in Block and Heineke (1973), we follow Arrow (1965) and examine the impact of an increase in uncertainty as captured by a multiplicative parameter shift with an

additive shift that is mean preserving. That is, we replace  $(e)$  with  $(\gamma e + \theta_2)$  in the first order condition. Differentiating the first order condition with respect to  $\gamma$  and evaluating the partial derivative at  $\gamma=1$  and  $\theta_2=0$ , we get:

$$\partial L / \partial \gamma = -cov(e, U_{LY} + wU_{YY}) / H > 0.^3 \quad (6)$$

Equation (6) thus yields our second testable hypothesis, i.e. *individuals choose to increase their labor supply as remittance income uncertainty increases.*

### III. Data

The empirical analysis relies on data from the *Encuesta Nacional de Ingresos y Gastos de los Hogares* (ENIGH), a nationally representative survey carried out by the Mexican Statistical Institute (*Instituto Nacional de Estadística, Geografía e Informática* – INEGI at <http://www.inegi.gob.mx>) with the purpose of providing information on the size, structure, and distribution of Mexican households' income and expenditures. The first wave of the survey was administered in 1983-1984. Subsequent survey waves were completed in 1989 and, from 1992 onwards, biennially.

We use data from the more recent and, more importantly, harmonized 2000, 2002, 2004 and 2005 waves of the ENIGH. The ENIGH collects thorough information on all monthly income inflows received by the household for each of the past six months, including international money transfers, earnings from employment and self-employment, asset income, and income from domestic transfer programs. Unique to the ENIGH is the six-month history of income receipts. Other Mexican surveys containing nationally representative information on household income and expenditures, such as the Mexican Life Family Survey or the Mexican census, do not contain detailed month to month income and remittance information required to

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<sup>3</sup> This expression is equivalent to:  $-E(U_{LY} + wU_{YY})(e - \delta) / H$ , with the advantage that one can sign the covariance as according to our assumptions (iii)-(v):  $(U_{LY} + wU_{YY})$  as increasing in  $Y$ .



construct measures of income uncertainty. In addition, the Mexican Life Family Survey does not distinguish domestic from international remittances.

By asking respondents about their receipt of remittances over each of the six months prior to the interview, the ENIGH allows us to derive measures of remittance income variability that serve as proxies for uncertainty in remittance receipts. The ENIGH also collects detailed information on the employment situation of all household members (12 years of age and older) during the month preceding the interview. Of particular interest to us is the information on the number of hours worked. Labor supply decisions are examined at the individual level given the crucial role of individual level characteristics (e.g. age, gender, or educational attainment) in shaping labor supply choices. However, the analysis also controls for pertinent information on the level and uncertainty of other sources of household non-labor income (excluding remittance receipts), along with other relevant household level characteristics.

There are close to 179,000 working-age individuals (i.e. between 16 and 64 years old) in the four waves of the ENIGH that we analyze. Since we conduct our analysis separately for men and women, Table 1 provides us with simple descriptive statistics for the sample by gender. About 47 percent of the Mexican working-age population is male, the imbalance presumably partially due to the significant levels of emigration by working-age Mexican men. The distribution of Mexican men and women by educational attainment is fairly typical, with men displaying slightly higher levels of education on average. As would be expected, men are more likely to be currently working. Eighty-three percent of men claim to work relative to 44 percent of women. Furthermore, men work significantly more hours per month than women. Also worth noting is the fact that men are more likely than women to reside in traditional households (with at least one adult man and one adult woman) and the percentage of men and women

residing in single female headed households is significantly greater than the percentage living in single male headed households. Additionally, women seem more likely to reside in households with more children and elderly members than men. However, rural residency (defined as living in an area with less than 2,500 inhabitants) tends to be slightly more likely among men. Finally, while women seem to enjoy greater housing quality than men, the difference is not statistically significant.

#### **IV. Some Descriptive Statistics on Remittances and Labor Supply**

Before proceeding any further, it is important to review the remittance-receiving and labor supply patterns of individuals in our sample. Table 2 informs on remittance-receiving patterns of individuals in our sample. As expected, we find that 5.7 percent of women reside in remittance-receiving households, while only 3.9 percent of men do. Additionally, conditional on receiving remittances, working-age men and women report household remittance receipts averaging about 1,932 and 2,166 pesos per month, respectively.<sup>4</sup> These figures correspond to, approximately, \$177 and \$199 U.S. dollars using the average 2005 exchange rate of 10.9 Mexican pesos per U.S. dollar. These are relatively large sums considering that average non-labor household income excluding remittances is, respectively, 1,988 and 2,072 pesos per month.<sup>5</sup>

Next, the figures in Table 2 inform on the *frequency* of remittance receipts over the past 6 months. We categorize individuals depending on whether they reside in a household that receives remittances: i) each and every month, ii) at least once in the past 6 months, but not every month (we call these “sporadic” recipients, and iii) never during the past 6 months. While

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<sup>4</sup> All income sources are in 1999-2000 pesos after being deflated using the Mexican consumer price index.

<sup>5</sup> Non-labor income includes other non-remittance transfers, capital rents and property rents. Because capital and property rents are fairly uncommon among poorer remittance-receiving households, it is not surprising to find that average remittance amounts are similar in magnitude to the household’s non-labor income excluding remittances.

remittance receiving men are about as likely to receive remittances every month (2 percent) as they are to receive remittances less frequently (1.9 percent), the data indicate that women receive remittances on a more frequent basis. Three percent of females receive remittances monthly and 2.5 percent receive them sporadically.

In addition to examining the frequency of remittance receipts, Table 2 informs on the *reliability* or *predictability* of remittance receipts over the past 6 months. We classify remittance-receiving individuals into two categories intended to group individuals according to the reliability of their remittance receipts. If an individual receives transfers of *equal* amounts every month, every other month or every third month, we argue that these receipts are predictable and reliable. We distinguish individuals in that group from those with less predictable and reliable remittance-receiving patterns, such as individuals receiving different amounts every month or individuals receiving money in the first two months and none thereafter. According to the figures in Table 2, a higher proportion of female remittance-receivers get these money inflows on a predictable and reliable basis than their male counterparts, i.e.  $(0.021/0.036)=0.58$  and  $(0.014/0.026)=0.53$ , respectively. Hence, women appear more likely than men to receive remittances on a more frequent basis, as well as in a more reliable manner.

Table 3 links the various patterns of remittance receipt with individual labor supply patterns by displaying the incidence of work and mean work hours of working-age individuals according to whether or not they receive remittances and, if so, the pattern of remittance receipt. As in Table 2, we first group individuals according to the frequency of their remittance-receiving patterns. We then test for statistically significant differences in the propensity to work and in hours worked (if working) according to the frequency of remittance receipts. Turning first to non-remittance receiving households, we find that about 83 percent of working-age men and 45

percent of working-age women work. Additionally, if employed, their average hours worked are 209 hours/month in the case of men and 168 hours/month in the case of women. The incidence of work (77 percent of working-age men and 43 percent of working-age women) and the hours worked (199 hours/month for men and 159 hours/month for women) are both significantly lower among working-age individuals residing in households receiving remittances on a sporadic basis. Similarly, the incidence of work is significantly lower for working-age men and women receiving remittances on a monthly basis (63 percent of working-age men and 35 percent of working-age women) than for their counterparts receiving remittances on a sporadic basis. As such, these figures suggest that, as predicted in equation (6), increased regularity in remittance receipts favors the purchase of leisure.

Subsequently, we group individuals according to the reliability of their remittance inflows. We then test for statistically significant differences in the propensity to work and in hours worked (if working) according to the reliability of their remittance inflows. Just as we see in the upper part of Table 3, the incidence of work and the number of hours worked are both significantly higher for men and women who never receive remittances than for their counterparts receiving remittances in a non-reliable manner.<sup>6</sup> Likewise, working-age men and women receiving remittances unreliably have a higher propensity to work than their counterparts receiving regular payments, who display the lowest employment incidence (67 percent of working-age men and 35 percent of working-age women).

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<sup>6</sup> For instance, about 83 percent of working-age men are employed in households that do not receive remittances relative to 71 percent of working-age men in households that receive remittances in a non-reliable manner. In the case of women, these percentages are 45 percent and 40 percent, respectively. If employed, there are also significant differences in the number of hours worked monthly. Working men in households that do not receive remittances work, on average, 209 hours/month compared to 198 hours/month worked by their counterparts residing in households that receive remittances in a non-reliable manner. Among women, these figures amount to 168 hours/month and 157 hours/month, correspondingly.

Finally, in the bottom part of Table 3, we work with a continuous measure of the volatility of remittance receipt, *i.e.* the coefficient of variation of remittance income receipts for the past 6 months. We group remittance recipients into two categories corresponding to greater and lower remittance income volatility as captured by whether recipients endure a remittance income volatility that falls below or above the median value of the coefficient of variation in remittance income. We then test for statistically significant differences in the propensity to work and in hours worked (if working) according to their level of remittance income volatility. It is worth noting that working-age individuals with higher remittance income volatility display a higher propensity to work (76 percent for men and 43 percent for women) when compared to their counterparts with lower remittance income volatility (for whom the percent working is 63 for men and 34 for women). Yet, just as with the frequency and reliability of remittance receipts, once we look at remittance-receiving individuals already working, we find no statistical significant differences in the number of hours worked.

In sum, the descriptive statistics for the incidence of work and work hours according to various patterns of remittance receipt are rather similar regardless of the proxy for remittance income uncertainty being used, *i.e.* frequency, reliability or volatility. In that regard, the descriptive statistics are reassuring. However, we still need to choose one of the measures as a proxy for remittance income uncertainty. Furthermore, we need to be able to construct a similar measure for the uncertainty in other sources of household non-labor income to be included in the analysis. While informative, the *frequency* dummy provides limited information concerning the predictability of receipts.<sup>7</sup> Likewise, while capable of delineating a predictable pattern of receipts from an unpredictable pattern of receipts, the *reliability* dummy is not only naïve (since

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<sup>7</sup> You may receive remittance inflows sporadically, but such receipts may be perfectly predictable if the receiving household already knew ahead of time about the frequency of remittance receipts.

a less smooth pattern of receipt is not necessarily unpredictable)<sup>8</sup> but, more importantly, it is not feasible to construct a parallel measure for other sources of household non-labor income.<sup>9</sup> Consequently, we use the coefficient of variation to proxy for remittance income uncertainty and for uncertainty in other sources of household non-labor income. While the coefficient of variation is also limited in its ability to capture income uncertainty, it informs about the volatility of inflows and, due to its continuous nature, gathers more information than the frequency or reliability dummies. Additionally, it is straight forward to construct a similar measure for other sources of household non-labor income (excluding remittances) possibly influencing the individual's labor supply patterns. Hence, the assumption behind the use of the coefficient of variation is that variability serves as a proxy for uncertainty.<sup>10</sup>

Table 4 reports on the subsample of individuals we ultimately use in our analysis, that is, working-age men and women residing in remittance-receiving households. Only 38 percent of this subsample is male, implying that working-age men are less likely to reside in remittance receiving households than working-age women. Both men and women in the subsample average 36 years of age and a much higher proportion of men work (70 percent) relative to women (38 percent). Additionally, on average, employed men in remittance-receiving households work more hours (198 hours/month) than women (157 hours/month). A higher fraction of men reside in traditional households, possibly related to the fact that women are less likely to migrate than men and, as such, are also more likely to reside in single-headed households than their male counterparts. There is, however, no significant gender difference with regards to housing quality

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<sup>8</sup> Indeed, one can still receive varying remittance amounts every 6 months and the remittance inflow may still be perfectly predictable if such a remittance-receiving pattern was already expected by the receiving household.

<sup>9</sup> Due to its many different components, it is not possible to construct an equivalent measure for other sources of household non-labor income.

<sup>10</sup> We have also experimented with ARCH measures of remittance income uncertainty as a robustness check. While the ARCH measure is arguably less naïve than the coefficient of variation, it is quite limited in its ability to pick up patterns and accurately measure uncertainty due to the short duration (six months) of our series.

and about half of the subsample resides in rural areas, which is consistent with previous findings showing that remittances are more likely to be enjoyed by rural households. Finally, Table 4 also reports on a summary descriptive statistic for uncertainty in remittance income and in other sources of household non-labor income. Specifically, using the coefficient of variation as a proxy for income uncertainty, we find that uncertainty in remittance income and uncertainty in other sources of household non-labor income is greater for men than for women.

## V. Methodology

Our primary goal is to assess how labor supply decisions are impacted by the level and the uncertainty in remittance income. Are individuals who endure greater remittance income uncertainty less likely to work than their counterparts enjoying more stable remittance inflows? And, once working, are individuals with steadier remittance inflows more likely to purchase leisure and reduce their labor supply? Our hypothesis is that larger remittance inflows may reduce the employment likelihood and hours worked. In contrast, higher uncertainty in the receipt of such remittance inflows will likely stem the aforementioned effects as individuals find it necessary to work and save due to less predictable income inflows from abroad.

To assess how the level of remittance income and, specifically, the uncertainty of remittance inflows impact the respondent's decision to work as well as the hours of labor supplied, we estimate the following model:<sup>11</sup>

$$Y_i^* = \alpha_0 + \alpha_1 R_i + \alpha_2 RU_i + X_i \beta + \varepsilon_i, \text{ where: } \varepsilon_i \sim N(0, \sigma^2) \text{ and } Y_i = \max(0, Y_i^*) \quad (7)$$

for  $i=1, \dots, n$  individuals. Our dependent variable,  $Y$ , measures hours of work,  $R$  captures remittance income,  $RU$  is our measure of remittance income uncertainty, and  $X$  is a vector of

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<sup>11</sup> To the extent that individuals may hold more than one type of employment, e.g. they may work as non-paid employees in the household business while also holding a wage and salaried job, it is not appropriate to model the employment decision as a multinomial logit or probit.

exogenous explanatory household and individual level variables traditionally included in the labor literature when modeling labor supply patterns. Specifically, we include information on respondents' characteristics, such as whether or not they are household heads, their age and educational attainment, all highly crucial in understanding labor supply patterns. Likewise, the analysis controls for a variety of household descriptors, such as its size, composition (i.e. percent of household members –other than the respondent– currently employed, percent of young children and of elderly household members, whether the household is single female headed or single male headed or of traditional composition), level and uncertainty of non-labor household income excluding remittances, housing quality, and whether or not the household is located in a rural area.<sup>12</sup> Finally, a battery of state dummies capturing regional characteristics possibly driving labor supply behavior, such as well-established migration networks in poorer states,<sup>13</sup> are also incorporated into the model specification.

A few econometric issues arise in the estimation of equation (7). First, the outcome of interest has a large number of zeros as a significant share of individuals does not work. Therefore, the estimation of equation (7) by OLS would yield biased and inconsistent estimates of the impact of remittances on hours worked. Second, remittances and the uncertainty of these monetary inflows may be correlated with the error term. As such, remittance income and its uncertainty may be endogenous and their coefficient estimates biased. There are two potential sources for this endogeneity. Unobserved heterogeneity and omitted variable bias may exist if remittances and/or the uncertainty in these inflows are related to unobserved or unmeasured

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<sup>12</sup> Because we are interested in getting a better understanding of the gender differences in labor supply responses to fluctuations in remittance income previously found in the literature and because labor supply –in addition to being affected by household characteristics we control for– is shaped by the prospective worker's human capital and personal characteristics, we focus our attention on individual labor supply patterns. Nonetheless, we include information on the number of household members (other than the respondent) currently employed, as well as information on other household composition characteristics possibly affecting the individual's labor supply.

<sup>13</sup> The ENIGH lacks information on household migration.



household characteristics which, in turn, may influence how much individuals choose to work.<sup>14</sup> Additionally, there is the potential of reverse causality as household work patterns may influence migrants' decision to send remittances home as well as the frequency with which they make such transfers. Finally, remittance income and, as such, their uncertainty, may be subject to the classical errors-in-variables (CEV) problem as a result of the six-month time period for which we have information on remittance receipts. The CEV problem is likely to cause an attenuation bias, thus underestimating the impact of remittance income and remittance income uncertainty on respondents' labor supply patterns. Although we do not expect large measurement problems,<sup>15</sup> we still acknowledge this problem.

To account for the aforementioned statistical concerns –that is: (i) the large number of zeros in our dependent variable, (ii) the endogeneity of remittance income and remittance income uncertainty, and (iii) the CEV problem in measuring remittance income and remittance income uncertainty,<sup>16</sup> we estimate a Tobit model where we instrument for our endogenous regressors; henceforth IV-Tobit. To instrument for both remittance income and its uncertainty, we rely on measures indicative of unemployment and wages in U.S. states that are the destination of Mexican emigrants over the time period under consideration. First, we obtain information on emigration patterns for each Mexican state in our sample from the Mexican Migration Project (MMP) database, which reveals in which U.S. states prior migrants from each Mexican state used to reside. Using that information, we derive weights for the likely U.S. destinations of

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<sup>14</sup> The ENIGH is a cross-sectional dataset and as such we are unable to account for household level heterogeneity. Unfortunately, this is a fairly common problem encountered when using income and expenditure surveys for most countries. Yet, as with the Census, we are still able to account for crucial characteristics and rely on a large enough and representative sample to infer important information. Furthermore, the lack of longitudinal information or, for that matter, information on household migrants, creates the potential for an omitted variable bias on the coefficient of interest –an issue that can be addressed by appropriately instrumenting for remittance income uncertainty as we do in the present study.

<sup>15</sup> These descriptive statistics are in line with the remitting patterns reported in other surveys.

<sup>16</sup> See Wooldridge 2003, p. 503 for a discussion on the use of instrumental variable techniques as a means to address any remaining CEV biases.

current Mexican emigrants that we use to construct weighted averages of 2000, 2002, 2004 and 2005 U.S. unemployment and wages for emigrants from each of the Mexican states in the ENIGH. For example, in the state of Durango, the MMP has found that about 31 percent of return migrants resided in California, 28 percent resided in Texas, 26 percent in Illinois and 15 percent elsewhere in the United States. Using that information about emigration patterns, we compute average U.S. earnings for emigrants from Durango in the year 2000 as follows:  $(0.31*\bar{w}_{CA}+0.28*\bar{w}_{TX}+0.26*\bar{w}_{IL}+0.15*\bar{w}_{US})$ , where, for instance,  $\bar{w}_{CA}$  denotes average manufacturing earnings in California in the year 2000. Weighted U.S. unemployment rate averages are also computed in an analogous manner. To obtain a measure of uncertainty in U.S. earnings in the year 2000, we compute the standard deviation of percentage changes in month-to-month earnings in each U.S. state during the year 2000. The information on migration networks is then applied to compute a weighted average of the standard deviation of percentage changes in month-to-month U.S. earnings during the year 2000. A comparable procedure is employed for the other years, *i.e.* 2002, 2004 and 2005. Volatility in U.S. unemployment rates is measured in an analogous manner. These weighted U.S. unemployment rates and weighted U.S. unemployment rate volatility series are used as instruments for the remittance flows received by households in various Mexican states and survey years. Similarly, remittance income uncertainty is instrumented using information on U.S. earnings and on U.S. earnings volatility.

In addition to being significantly correlated to remittance income and its uncertainty, the proposed instruments should be uncorrelated to the error term in the main regression. Our identifying assumption is that current U.S. labor market conditions do not affect the labor supply patterns of Mexican residents other than through remittances. After all, U.S. wages and employment in Mexican emigrant destination states are derived from information on state-level

migration networks from a different survey and, as such, do not reflect individual household level migration choices.<sup>17</sup> The same can be argued with regards to our uncertainty measures.

Nonetheless, no instruments are ever perfect and we foresee some shortcomings in our choice of instruments. For example, one potential threat is that the instruments may be related to household characteristics that affect the labor supply behavior of family members left behind, such as household income. Higher income households may have been historically more likely to place migrants in economically more attractive states in the U.S. To address this concern, we try to control for as much information as we possibly can about the household, including information on the level and uncertainty of other sources of household non-labor income. A second possible threat to the validity of our instruments could come from the fact that Mexican migrants from different Mexican states may traditionally send migrants to specific U.S. states. In that case, the instruments could be simply capturing regional differences across Mexican communities, such as differences in per capital income levels and unemployment rates. To account for any state-level differences resulting in distinct migratory patterns, we include a set of Mexican state dummies. A third potential concern with our instruments is the possibility that labor supply in Mexico may vary if migrants return to Mexico on account of poor economic conditions in the U.S. Yet, recent evidence points to the limited responsiveness of Mexican return migration to economic conditions in the U.S., at least in the short-run. Increasing border enforcement and difficulties in re-entering the U.S. appear to be minimizing the return migration of Mexican migrants. Finally, we include a rural dummy to address differences in infrastructure possibly affecting remittance receiving patterns, as well as year dummies to capture changes in

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<sup>17</sup> The ENIGH does not contain information on emigration which, in any event, we would be unable to exploit as instruments as it would not be exogenous to individual labor supply patterns.

macroeconomic conditions driving labor supply patterns, as in the case of a country-wide recession.

In addition to discussing the theoretical basis and rationale for our choice of instruments, we inspect our instrumental variables to ascertain their validity as instruments from an econometric standpoint. First, we confirm that they are significantly correlated with household remittance income and its uncertainty –the endogenous regressors to be instrumented. The problem of “weak instruments” arises when either the instruments are weakly correlated with the endogenous regressors or the number of instruments is too large (Angrist and Krueger 2001). Secondly, we test for the exogeneity of our instruments with respect to our outcomes of interest using the over-identification test proposed in Wooldridge (2003).

## **VI. Results**

### **A) Non-instrumented Regression Results**

Our primary aim is to gain a better understanding of how the amount of remittance income and the uncertainty with which those funds are received by the household impact the labor supply patterns of its working-age members. Are individuals in families subject to greater remittance income uncertainty more likely to work than individuals in families enjoying stable remittance inflows? And, once working, are individuals’ steadier remittance inflows more likely to purchase leisure and reduce their hours of labor supply? Our first testable hypothesis is that larger remittance inflows may allow for less work. However, according to our second testable hypothesis, higher uncertainty in the receipt of such monetary inflows can lessen the aforementioned effect as individuals view their remittance income as less dependable.

Table 5 sheds some light on our questions and, in particular, provides a preliminary test of our two hypotheses using a benchmark Tobit model of the decision to work and hours worked

by remittance-receiving households. Indeed, because the question of how remittance income uncertainty impacts labor supply only concerns remittance-receiving individuals, we focus our attention on remittance-receiving individuals for whom our remittance income uncertainty measure can be constructed. What are the key findings? As hypothesized and found by other studies in the literature, larger amounts of remittance income have the expected income effect on the labor supply decisions of both men and women. Specifically, the increase in this form of non-labor income shifts each individual's budget constraint upwards in a parallel fashion, allowing them to reach a higher indifference curve and purchase more leisure. In particular, a 1,000 peso increase in remittance income (about US\$ 100) lowers the employment likelihood of men and women by 0.4 percentage points for men and 0.5 percentage points for women.<sup>18</sup> Among working individuals, this increase in remittance income reduces the number of hours worked each month by about 1.4 hours for men and by approximately 0.9 hours for women.

Also of interest to us is the impact of higher *uncertainty* in remittance inflows on individual's labor supply behavior. In accordance with our second testable hypothesis, households with more variable remittance inflows –as captured by the coefficient of variation in remittance income– are more likely to work and work more hours than their counterparts enjoying more stable remittance income inflows. Specifically, a half standard deviation increase in remittance income uncertainty<sup>19</sup> raises the work likelihood by 0.6 percentage points for men and by 1 percentage point for women,<sup>20</sup> while hours of work go up by about 2.3 hours/month for men and by approximately 2 hours/month for women.<sup>21</sup>

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<sup>18</sup> Note that, as specified in Table A in the appendix, remittances are measured in 10,000 pesos.

<sup>19</sup> A one-half standard deviation movement to the right of the mean represents 19 percent of the distribution.

<sup>20</sup> These are obtained as  $(0.4375*0.014*100)$  for men and as  $(0.436*0.024*100)$  for women, where 0.4375 and 0.436 are half of the standard deviation of remittance income uncertainty for men and women, respectively. See the figures in Table 3.

<sup>21</sup> These figures are obtained as  $(0.4375*5.208)$  in the case of men and as  $(0.436*4.547)$  in the case of women.

Other determinants of the employment likelihood and the number of hours per month worked include age, household head status, educational attainment, household composition, non-labor income and its uncertainty, and rural residency. In particular, age increases the employment likelihood among men, while being a household head or living in a single female headed household raises it among women. Better educated men and women have a higher tendency to work and work more hours; yet, a relatively larger number of children in the household reduce the employment likelihood of women, not men. It is also interesting to note that non-labor income, which includes other income transfers, is positively correlated to female labor supply. To the extent that we only observe this effect among women, it is possible that the receipt of these non-labor income transfers is linked to a work requirement –as it is the case with welfare receipts in the U.S. Nevertheless, this effect is only marginally significant at the 10 percent level. More importantly, it is worth noting that, just as with uncertainty in remittance income, increased uncertainty in other sources of household non-labor income (excluding remittances) also raises the employment likelihood and hours worked by both men and women.<sup>22</sup> Finally, rural residency has opposite impacts on men and women. Men are more likely to work and work more hours when they reside in a rural area, while women are more likely to increase their labor supply when they reside in an urban area. As such, the rural residency dummy seems to reflect the more traditional gender roles observed in rural areas, as well as, perhaps, the greater employment opportunities available to women in the city.

## **B) Instrumental Variable Regression Results**

The estimates from Table 5 assume that both the level and the uncertainty in remittance income are exogenous. Yet, it is easy to foresee instances in which remittance inflows by

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<sup>22</sup> A half standard deviation increase in the uncertainty of other sources of non-labor income raises the employment likelihood among men and women by approximately 0.9 and 0.8 percentage points, respectively, whereas hours of work increase by 3.5 and 1.5 hours/month, correspondingly.

household members residing abroad respond to household needs which, in turn, depend on the employment and work hours of family members left behind. Therefore, we address the potential endogeneity of remittance income and its uncertainty by estimating a Tobit model using instrumental variable techniques in Table 6.

As noted in the methodology, we instrument the level and uncertainty of remittance income inflows using four instruments that gather information on the economic conditions in the states from where remittances are likely to originate. We rely on information from the Mexican Migration Project to determine past migratory flows from each state in Mexico to different states in the U.S. We then use information on average weekly earnings and unemployment rates in Mexican emigrant destination states in the U.S., along with their volatility over time, to instrument for household remittance income and remittance uncertainty. Table B in the appendix shows the results (for the variables of interest) from the regressions predicting household remittance income and its uncertainty. We first check that our instruments are sufficiently correlated to the dependent variables. This is confirmed by the estimation results displayed in Table B. Higher unemployment rates and greater variability in unemployment contribute toward smaller remittance receipts as they may curtail immigrants' ability to remit due to liquidity constraints. Likewise, we find that increases in U.S. earnings significantly reduce remittance income uncertainty on the receiving side, suggesting that migrants' ability to send money home is one of the main factors driving their remitting patterns. While the volatility in U.S. earnings does not appear to be statistically different from zero in the regression predicting remittance income uncertainty, it does contribute to the statistical significance of U.S. earnings.<sup>23</sup> Therefore, although we only need one variable to instrument for remittance income uncertainty, we incorporate both variables –U.S. earnings and its volatility– when predicting uncertainty in

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<sup>23</sup> U.S. earnings and its volatility are correlated and jointly significant in explaining remittance income uncertainty.

remittance income.<sup>24</sup> Secondly, we test for the exogeneity of the instruments from an econometric standpoint following Wooldridge (2003, p. 505). The results from the Wald test are displayed at the bottom of Table 6 and suggest that our instruments do not help explain individual labor supply patterns other than via the level and uncertainty of remittance inflows.

What are the main findings from Table 6? For conciseness, we focus our discussion on the coefficients of interest. As hypothesized earlier, men and women both respond to remittance income uncertainty by raising their labor supply. Specifically, a half standard deviation increase in remittance income uncertainty raises the employment likelihood of men by 1.7 percentage points and raises the number of hours worked by 6.4 hours/month or by 3 percent. Likewise, a similar increase in remittance income uncertainty raises women's employment likelihood by 7.5 percentage points and the number of hours worked by 14.6 hours/month or by 9 percent.

Note that the impact of remittance income levels disappears once we account for its endogeneity, whereas the impact of remittance income uncertainty strengthens. This result suggests that the impact of remittance levels is biased upwards in the non-instrumented regression analysis, while the opposite is true for remittance income uncertainty. When is this likely to be the case? When omitted variables, such as household wealth,<sup>25</sup> are inversely related to household remittance income and directly related to remittance income uncertainty. That is, if richer households are less likely to receive large remittance inflows and more prone to receive remittances infrequently and irregularly since they do not need such funds to pay for day-to-day expenses. If labor supply is generally inversely related to household wealth, the impacts of

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<sup>24</sup> Our main findings are robust to the exclusion of U.S. earnings volatility from the equation predicting remittance income uncertainty. These results are available from the authors.

<sup>25</sup> The ENIGH does not record information on household wealth, only on household income.



remittance income and remittance income uncertainty in Table 6 are likely to be upward biased and downward biased, respectively.<sup>26</sup>

An additional finding worth discussing is the larger impact that an increase in remittance income uncertainty has on the labor supply of women relative to men. This is not surprising as women are much less likely to be at work than men (e.g. about 38 percent of women, as opposed to 70 percent of men, are employed in our sample). Likewise, if employed, women work significantly fewer hours per month than men (see Table 4). Therefore, when remittance income uncertainty rises, women may be more able to step into the labor market and/or increase their hours of work than men, who are more likely to already be at work and, if employed, work full-time. In that regard, women's employment may be used as a buffer against increased household remittance income uncertainty.

Finally, it is worth noting that uncertainty in other sources of household non-labor income does not affect the labor supply of either men or women, whereas remittance income uncertainty does. This finding underscores the difference between uncertainty in remittance income and uncertainty in other sources of household non-labor income and suggests that, perhaps, volatility in other sources of household non-labor income is not as "unpredictable" as is the volatility in remittance income. This may have something to do with the fact that the household may be better informed about changes in other sources of household non-labor income than about changes in remittance income. After all, remittances are more likely to be

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<sup>26</sup> Following Wooldridge (2003, pp. 92), the sign of the bias depends on the sign resulting from multiplying: (a) the signs of the correlation between the variable being instrumented and the omitted variable in question, and (b) the sign that the omitted variable would have in the main regression. In the case of remittance income, we likely have that:  $\text{corr}(\text{remittance income}, \text{household wealth}) < 0$ . If household wealth is generally inversely related to the individual's labor supply (i.e.  $\beta_{\text{wealth}} < 0$ ), the coefficient of remittance income in the non-instrumented regression results is likely suffering from a positive bias, i.e. (-) times (-) is (+). In contrast, if richer households receive remittances sporadically on an irregular basis (that is:  $\text{corr}(\text{remittance income uncertainty}, \text{household wealth}) > 0$ ), the coefficient on remittance income uncertainty in the non-instrumented regression results is likely suffering from a negative bias, i.e. (+) times (-) is (-).

driven by host country characteristics and personal migrant circumstances that the household in Mexico is unaware of.

## VII. Conclusions

In this paper, we attempt to take the literature exploring how remittances impact the home community one step further by examining how remittance income uncertainty affects the labor supply of the individuals residing in remittance-receiving households. While considerable effort has been dedicated to gaining a better understanding of the impact that the level of remittance inflows may have on household behavior, the potential impact of remittance income uncertainty has yet to be studied.<sup>27</sup> Yet, particularly in the case of labor supply, household behavior cannot be fully understood unless we also take into consideration remittance income uncertainty. Labor supply reductions are stronger and more likely to take place if remittance inflows are regular and predictable. In contrast, irregular inflows induce more work, presumably because the recipients need to create a buffer in light of irregular and unpredictable inflows. Failure to account for both the level and the uncertainty of remittance income may bias the estimated impact of these money transfers on the labor supply of their recipients.

Our study models labor supply of remittance-receiving Mexican men and women as a function of both the level and the predictability with which remittances are received. We find that the labor supply of men and women residing in remittance-receiving households responds to both the *level* and the *uncertainty* of remittance inflows when we do not account for the endogeneity of these two regressors. However, once we instrument for the level and uncertainty

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<sup>27</sup> This question should not be confused with the central idea behind the New Economics of Labor Migration (NELM), which argues that migration takes place in order to smooth home community consumption via the receipt of remittance income. In that case, remittances respond to fluctuations in household income in the NELM framework. However, we do not examine how remittances help smooth household consumption or how they respond to fluctuations in household income. Instead, our analysis is focused on how household members change their labor supply in response to fluctuations in remittance income.

of remittance income inflows, the labor supply of men and women solely responds to the *uncertainty* of remittance inflows. As such, our findings suggest that the coefficients on remittance income and remittance income uncertainty in the non-instrumented regression results are, correspondingly, over- and underestimated, possibly owing to omitted variable biases. We also find that the labor supply response of women to increases in remittance income uncertainty appears significantly larger than the labor supply response of men. Perhaps women, due to their lower labor force participation rates and due to working fewer hours when employed, are more likely to step into the labor market and/or increase their hours of work to buffer household income. This response may be constrained in the case of men, who are more likely to already be at work and employed full-time and, hence, have less flexibility with regards to work hours.

Our findings suggest that policies that influence the predictability and volatility of remittances will have appreciable impacts on the labor supply patterns of men and women. We do not advocate that policies should favor more or less variable remittance flows. Rather, we note that policies promising equivalent levels of remittance flows are not the same if the time patterns of remittance flows in each policy differ. As the percent of individuals living in countries other than their countries of birth rises,<sup>28</sup> gaining a better understanding of the impact that remittance-receiving patterns –not just remittance volumes– have on the receiving economies becomes increasingly important for future policy-making and planning.

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<sup>28</sup> See the United Nations Secretary-General's address to the Global Forum on Migration and Development on July 10, 2007. Available at: <http://www.un.org/News/Press/docs//2007/sgsm11084.doc.htm>

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**Table 1**  
**Descriptive Statistics of Working-age Individuals**

<b>Variables</b>	<b>Men</b>			<b>Women</b>		
	<b>Obs.</b>	<b>Mean or Proportion</b>	<b>S.D.</b>	<b>Obs.</b>	<b>Mean or Proportion</b>	<b>S.D.</b>
Age	84486	34.808	13.248	94118	34.845	13.056
Household Head	84486	0.591	0.492	94118	0.129	0.335
Primary Education or Less	84486	0.386	0.487	94118	0.441	0.496
Secondary Education	84486	0.413	0.492	94118	0.387	0.487
High Education	84486	0.193	0.395	94118	0.169	0.375
Working	84442	0.829	0.376	93749	0.444	0.497
Hours Worked (if employed)	70007	208.857	61.560	41664	167.561	73.242
Percent of Young Children in the HH	84486	0.112	0.156	94118	0.122	0.161
Percent of Elderly HH Members	84486	0.030	0.097	94118	0.037	0.108
Percent Working HH Members	84486	0.004	0.039	94118	0.003	0.036
HH without an Adult Head	84486	0.001	0.028	94118	0.001	0.026
Single Female Headed HH	84486	0.090	0.286	94118	0.189	0.392
Single Male Headed HH	84486	0.082	0.274	94118	0.034	0.180
Traditional HH	84486	0.838	0.368	94118	0.786	0.410
Quality of Home Construction	84486	7.587	1.618	94118	7.640	1.591
Lives in a Rural Area	84486	0.267	0.442	94118	0.256	0.437

**Table 2**  
**Remittance and Other Income Descriptive Statistics**

<b>Variables</b>	<b>Men</b>			<b>Women</b>		
	<b>Obs.</b>	<b>Mean or Proportion</b>	<b>S.D.</b>	<b>Obs.</b>	<b>Mean or Proportion</b>	<b>S.D.</b>
Individuals in Remittance Receiving HHs	84486	0.039	0.195	94118	0.057	0.232
Monthly HH remittance receipt (pesos)	3333	1932.495	1945.78	5361	2166.005	2077.049
Monthly HH income (except remittances)	84486	1987.777	7400.339	94092	2071.744	7575.629
<i>Frequency of Receipts</i>						
Never	84486	0.960	0.195	94118	0.943	0.232
Once or more but not every month (Sporadic)	84486	0.019	0.137	94118	0.025	0.156
Every Month	84486	0.020	0.141	94118	0.032	0.176
<i>Reliability of Receipts</i>						
Never	84486	0.960	0.195	94118	0.943	0.232
Unreliable	84486	0.026	0.158	94118	0.036	0.185
Reliable	84486	0.014	0.117	94118	0.021	0.145

**Table 3**  
**Work Incidence and Hours Worked According to the Pattern of Remittance Receipt**

Variables	Men		Women	
	Work	Work Hours	Work	Work Hours
<i>Frequency of Receipts</i>				
Never	0.834	209	0.448	168
Once or more but not every month (Sporadic)	0.769	199	0.425	159
Every Month	0.631	198	0.350	155
Difference between Never and Sporadic:	0.066***	10.337***	0.023***	9.049***
t-statistic	6.208	5.336	2.225	3.475
Difference between Sporadic and Every Month:	0.137***	1.197	0.075***	3.640
t-statistic	8.763	0.420	5.601	1.008
<i>Reliability of Receipts</i>				
Never	0.834	209	0.448	168
Unreliably	0.711	198	0.403	157
Reliably	0.672	199	0.350	158
Difference between Never and Unreliably:	0.123***	11.305***	0.045***	11.243***
t-statistic	12.497	6.406	5.232	4.955
Difference between Unreliably and Reliably:	0.039***	-1.199	0.053***	-0.941
t-statistic	2.320	-0.401	3.912	-0.249
<i>Volatility of Receipts</i>				
High Volatility	0.761	200	0.425	158
Low Volatility	0.634	196	0.341	156
Difference between High and Low Volatility:	0.127***	2.726	0.084***	1.805
t-statistic	8.035	0.961	6.325	0.475

**Notes:** The null hypothesis is:  $H_0$ : diff = 0 and the alternative hypothesis is given by  $H_a$ : diff < 0. \*\*\*Significant at the 1 percent level or better, \*\*significant at 5 percent level or better and \*significant at the 10 percent level or better.



**Table 4**  
**Descriptive Statistics for Working-age Individuals in Remittance-receiving Households**

Variables	Men			Women		
	Obs.	Mean or Proportion	S.D.	Obs.	Mean or Proportion	S.D.
Age	3333	36.428	15.363	5361	35.737	14.217
Household Head	3333	0.533	0.499	5361	0.226	0.418
Primary Education or Less	3333	0.496	0.500	5361	0.586	0.493
Secondary Education	3333	0.322	0.467	5361	0.336	0.472
High Education	3333	0.085	0.279	5361	0.077	0.267
Working	3330	0.698	0.459	5356	0.383	0.486
Hours Worked (if employed)	2323	198.319	68.395	2051	157.167	81.758
Percent of Young Children in the HH	3333	0.117	0.156	5361	0.142	0.172
Percent of Elderly HH Members	3333	0.046	0.123	5361	0.057	0.130
Percent of Working Members in the HH	3333	0.006	0.047	5361	0.006	0.050
HH without an Adult Head	3333	0.001	0.035	5361	0.001	0.033
Single Female Headed HH	3333	0.112	0.315	5361	0.210	0.407
Single Male Headed HH	3333	0.172	0.377	5361	0.106	0.307
Traditional HH	3333	0.834	0.372	5361	0.766	0.423
Quality of Home Construction	3333	7.483	1.392	5361	7.519	1.378
Lives in a Rural Area	3333	0.512	0.500	5361	0.504	0.500
Uncertainty in Remittance Income	3333	0.828	0.875	5361	0.801	0.872
Uncertainty in HH NLI (No Remittances)	3333	0.861	0.910	5361	0.761	0.867

**Table 5**  
**Tobit Model for Work and Hours Worked by Men and Women**

Variables	Men				Women			
	Coefficient	S.E.	M.E. on Prob (Y>0)	M.E. on E(Y Y>0)	Coefficient	S.E.	M.E. on Prob (Y>0)	M.E. on E(Y Y>0)
<b>HH Remittance Income</b>	<b>-17.420***</b>	<b>3.055</b>	<b>-0.037</b>	<b>-13.931</b>	<b>-22.861***</b>	<b>3.700</b>	<b>-0.047</b>	<b>-9.068</b>
<b>Uncertainty in Remittance Income</b>	<b>6.512**</b>	<b>3.075</b>	<b>0.014</b>	<b>5.208</b>	<b>11.463***</b>	<b>4.020</b>	<b>0.024</b>	<b>4.547</b>
Age	1.293***	0.262	0.003	1.034	-0.057	0.267	0.000	-0.023
Household Head	3.715	8.267	0.008	2.970	49.441***	8.410	0.103	21.008
Secondary Education	20.279***	6.329	0.042	16.366	27.845***	7.848	0.057	11.308
High Education	16.704*	9.757	0.034	13.597	73.310***	12.380	0.154	33.837
Percent of Young Children in the HH	25.468	17.063	0.054	20.368	-77.584***	19.154	-0.159	-30.774
Percent of Elderly HH Members	-3.696	21.355	-0.008	-2.956	28.336	24.423	0.058	11.240
Percent of Working HH Members	137.689***	50.929	0.292	110.116	129.116**	57.809	0.265	51.215
HH without an Adult Head	-101.651	74.187	-0.271	-68.324	-93.614	101.271	-0.173	-28.711
Single Female Headed HH	-5.942	8.354	-0.013	-4.723	43.538***	8.018	0.090	18.414
Single Male Headed HH	-136.831***	7.775	-0.353	-93.600	12.351	11.217	0.025	5.023
HH NLI Excluding Remittances	0.458	1.549	0.001	0.366	3.510*	1.909	0.007	1.392
Uncertainty in HH NLI Excluding Remittances	9.550***	3.002	0.020	7.637	8.698**	3.745	0.018	3.450
of Home Construction Quality	-2.061	1.931	-0.004	-1.648	1.898	2.437	0.004	0.753
Lives in a Rural Area	10.025*	5.383	0.021	8.015	-28.398***	6.776	-0.058	-11.273
<b>Regression Fit Statistics</b>								
No. of Observations:		3333				5361		
Uncensored Observations		2323				2051		
LR Chi-square		736.44				409.03		
Prob > Chi-square		0.0000				0.0000		

**Notes:** \*\*\*Significant at the 1 percent level or better, \*\*significant at 5 percent level or better and \*significant at the 10 percent level or better. Regressions include a constant term and Mexican state dummies.

**Table 6**  
**IV-Tobit Model for Work and Hours Worked by Men and Women**

Variables	Men				Women			
	Coefficient	S.E.	M.E. on Prob (Y>0)	M.E. on E(Y Y>0)	Coefficient	S.E.	M.E. on Prob (Y>0)	M.E. on E(Y Y>0)
<b>HH Remittance Income</b>	<b>3.110</b>	<b>118.582</b>	<b>0.007</b>	<b>2.482</b>	<b>20.335</b>	<b>57.625</b>	<b>0.041</b>	<b>8.075</b>
<b>Uncertainty in Remittance Income</b>	<b>18.314**</b>	<b>9.048</b>	<b>0.039</b>	<b>14.617</b>	<b>84.520***</b>	<b>17.885</b>	<b>0.172</b>	<b>33.563</b>
Age	1.256**	0.545	0.003	1.002	-0.074	0.313	-1.50E-04	-0.029
Household Head	5.939	16.418	0.013	4.737	47.860***	16.185	0.099	20.308
Secondary Education	19.370**	8.323	0.040	15.595	27.224***	6.681	0.056	11.062
High Education	14.837	16.539	0.030	12.029	72.050***	13.488	0.150	33.180
Percent of Young Children in the HH	19.651	28.228	0.041	15.684	-84.247***	21.380	-0.172	-33.455
Percent of Elderly HH Members	-2.640	24.022	-0.006	-2.107	36.003	32.601	0.073	14.297
Percent of Working HH Members	132.728**	60.319	0.280	105.936	85.827	71.845	0.175	34.082
HH without an Adult Head	-95.185	267.080	-0.250	-64.766	-123.191	459.379	-0.216	-34.793
Single Female Headed HH	-3.412	11.666	-0.007	-2.713	50.526***	8.018	0.105	21.595
Single Male Headed HH	-142.473***	29.921	-0.366	-96.591	9.083	23.212	0.019	3.673
HH NLI Excluding Remittances	-0.849	1.496	-0.002	-0.677	2.416	2.537	0.005	0.960
Uncertainty in HH NLI Excluding Remittances	8.291	7.622	0.018	6.618	-0.220	4.791	-4.48E-04	-0.087
Quality of Home Construction	-3.303	3.973	-0.007	-2.636	0.463	3.271	0.001	0.184
Lives in a Rural Area	9.512	16.349	0.020	7.589	-34.085***	13.813	-0.069	-13.549
<b>Regression Fit Statistics</b>								
No. of Observations:		3310				5329		
Uncensored Observations		2308				2038		
Log Likelihood		-15456.617				-15442.594		
IV Exogeneity Test <sup>a</sup>		1.07 < $\chi^2_{4,5\%} = 9.49$				1.06 < $\chi^2_{4,5\%} = 9.49$		

**Notes:** \*\*\*Significant at the 1 percent level or better, \*\*significant at 5 percent level or better and \*significant at the 10 percent level or better. Regressions include a constant term and Mexican state dummies. <sup>(a)</sup> The exogeneity test is carried out using the number of observations and the adjusted R-squared obtained from regressing the residuals from an instrumental variable linear regression of hours of work on all the system's exogenous variables and the instrumental variables (Wooldridge 2003, p. 508).

## APPENDIX TABLES

**Table A**  
**Variable Names and Definition**

Variables	Definition
Hours of Work	Total number of hours worked last month
<i>Independent Variables:</i>	
HH Remittance Income (in 10,000 pesos)	Gifts and donations from abroad during the past six months
Uncertainty in Remittance Income	Coefficient of variation of monthly remittance inflows during the past six months
HH NLI Excluding Remittances (in 10,000 pesos)	Sum of all household income from work, own businesses, coops, rents from real estate and financial assets, income transfers (excluding international remittances), and other sources of income (e.g. revenues from selling a car, household goods, or other income categories not included above) during the past six months
Uncertainty in HH NLI Excluding Remittances	Coefficient of variation of monthly non-labor income during the past six months
Age	Respondent's age
Male	Respondent's gender
Household Head	Respondent is the household head
High Education	Respondent has a university degree or higher education (i.e. superior and posgrado)
Secondary Education	Respondent has a secondary education or vocational training (i.e. secundaria, preparatoria, vocacional and normal)
Percent of Young Children in the HH	Percent of household members 6 years old and younger
Percent of Elderly HH Members	Percent of household members 65 years of age and older
Percent of Working Members in the HH	Percent of employed household members (excluding the respondent)
HH without an Adult Head	Dummy equal to 1 if there are no adult household heads
Single Female Headed HH	Dummy equal to 1 if the household head is a single woman
Single Male Headed HH	Dummy equal to 1 if the household head is a single man
Construction Quality of Home	Index measure created using information on the quality of the floors, walls and ceiling of the house
Lives in a Rural Area	Household resides in an area with fewer than 2,500 inhabitants
U.S. Earnings (in 100 dollars)	Weighted average of weekly earnings for manufacturing workers in the U.S. Weights reflect the incidence of migration from the Mexican state in question to U.S. destinations.
U.S. Earnings Volatility	Weighted average of the standard deviation of monthly U.S. earnings. Weights reflect the incidence of migration from the Mexican state in question to U.S. destinations.
U.S. Unemployment Rate	Weighted average of US state unemployment rates. Weights reflect the incidence of migration from the Mexican state in question to U.S. destinations.
U.S. Unemployment Rate Volatility	Weighted average of standard deviation of monthly unemployment rates. Weights reflect the incidence of migration from the Mexican state in question to U.S. destinations.

**Table B**  
**Tobit Models Predicting Remittance Income and Remittance Income Uncertainty**

<b>Sample</b>		<b>Men</b>			
<b>Variables</b>	<b>Remittance Income</b>		<b>Remittance Income Uncertainty</b>		
	<b>Coefficient</b>	<b>S.E.</b>	<b>Coefficient</b>	<b>S.E.</b>	
U.S. Earnings	-	-	-2.280***	0.675	
U.S. Earnings Volatility	-	-	6.389	5.971	
U.S. Unemployment Rate	-0.662***	0.243	-	-	
U.S. Unemployment Rate Volatility	-2.554***	0.768	-	-	
Number of Observations:	80972		3310		
Uncensored Observations	3310		2286		
LR Chi-square	3702.99		387.57		
Prob > Chi-square	0.000		0.000		
<b>Sample</b>		<b>Women</b>			
<b>Variables</b>	<b>Remittance Income</b>		<b>Remittance Income Uncertainty</b>		
	<b>Coefficient</b>	<b>S.E.</b>	<b>Coefficient</b>	<b>S.E.</b>	
U.S. Earnings	-	-	-1.130**	0.550	
U.S. Earnings Volatility	-	-	5.603	4.703	
U.S. Unemployment Rate	-0.539***	0.203	-	-	
U.S. Unemployment Rate Volatility	-2.716***	0.637	-	-	
Number of Observations:	90504		5329		
Uncensored Observations	5329		3529		
LR Chi-square	5956.27		535.85		
Prob > Chi-square	0.000		0.000		

**Notes:** \*\*\*Significant at the 1 percent level or better, \*\*significant at 5 percent level or better and \*significant at the 10 percent level or better. Regressions include a constant term, age, a dummy for household head, education dummies, percent of young children, percent of elderly in the household, percent of working members in the household, a set of dummies indicating whether the household is headed by a single female, a single male, no adults, or by a couple of adults (reference category), the level and uncertainty of other sources of household non-labor income, index indicative of the quality of home construction, a dummy for whether the household resides in a rural area, and a set of state dummies.