

Remittance Income Uncertainty and Household Asset Accumulation

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A. Introduction

Remittances, like migration, are known to impact the expenditure patterns of households. Using the Mexican National Rural Household Survey, Taylor and Mora (2006) conclude that households affected by international migration modify their expenditure patterns by increasing the share of expenditures on investment at the expense of consumption. Likewise, Adams (2005) finds that remittance receiving households in Guatemala spend less on consumption (defined as food, consumer goods and durables), and more on education, health and real estate relative to non-remittance receiving households. Similar findings are also reported by Zarate-Hoyos (2004) and Airola (2007). Zarate-Hoyos (2004) finds evidence of greater investments by remittance-receiving households, whereas Airola (2007) reports that remittance-receiving households spend relatively more on durable goods, on health and on housing, but less on food relative to households that do not receive remittances. In this study, we explore additional factors shaping households' expenditure patterns by examining how the uncertainty (in addition to the level) of remittance inflows affects expenditure shares.

While it is important to understand how the *level* of transfers from family abroad affects household spending, it is also useful to ascertain how the predictability of such inflows influences household spending. Some households receive remittances on a regular and predictable basis month after month. Other households receive these funds irregularly –in some cases when the emigrant returns home, in other cases when s/he has earned enough to send to family members in the home country, and in some cases at the whim of the emigrant. Consequently, while some remittance-receiving households are able to forecast with reasonable precision future remittance inflows, other recipient households are unable to do so. It stands to reason that these two types of households will likely use the resource inflows differently.

Consider one household who receives \$200 each and every month from January to May, versus another household receiving the identical \$1000 over the same five-month period but on a seemingly random and irregular basis. Our expectation is that the expenditure patterns observed in these two households are likely to differ, all other things equal. We seek to explore this difference with an analysis of the impact of the uncertainty of remittance inflows on the expenditure patterns of recipient households.

We hypothesize that households with regular and predictable remittance inflows are more likely to use those funds to meet ordinary, perhaps scheduled, consumption needs. In contrast, households that receive remittances on an irregular and less predictable basis are more likely to use those funds toward the accumulation of “assets” broadly defined. This hypothesized behavior follows from the life-cycle permanent income hypothesis (LCPIH), according to which regular and permanent increases in income will most likely be consumed as individuals can expect to enjoy those income increments over the long term. In other words, the expectation of an increase in income for the long-run allows for an upward adjustment of consumption over the lifecycle. In contrast, irregular increases in income are less likely to be viewed as permanent. Because households cannot count on them for the longer-run, they are more likely to be “saved”, giving the household the option to spread the increase in income over the lifecycle.¹

The idea that less “regular” income is more likely to be saved is further supported by the precautionary saving motive (Leland 1968). When households find it more difficult to predict future income flows and there is greater uncertainty about them, households tend to save more –

¹ See, for example, Friedman (1957), Ando and Modigliani (1957), Modigliani and Brumberg (1954). This idea is articulated and tested in a study by Adams (1998), where he finds that remittance income (in contrast to regular income) is more likely to be spent on farming investments in rural Pakistan. Remittances are viewed as temporary income relative to other sources of income earned by the rural household and, hence, they were regarded as less suitable to finance recurring consumption expenditures. Our hypothesis differs in that we distinguish regular and predictable remittance income from irregular and less predictable remittance income. Households with regular remittance inflows will likely engage in more consumption, while households with less regular remittance income are likely to engage in more asset accumulation, all other things equal.

as a precaution against future income short falls. We hypothesize that remittance-receiving households with more volatile remittance inflows will end up spending more of the inflows on asset accumulation.

Finally, one may ask: why should we care about the role of remittance income uncertainty on households' expenditure patterns? Because it allows us to better understand some of the key factors shaping how remittance-receiving households end up making use of their remittance inflows. Concern about the economic and social implications of remittances in the receiving countries has permeated much of the debate on remittances. In particular, considerable controversy regarding the desirability of remittance inflows has emerged following studies that conclude that remittances may have detrimental impacts on recipient households and/or on the economy at large (Glytsos, 1993, Durand, et al 1996). At the household level, it has been claimed that remittances are used in ways that breed "dependency" instead of promoting longer term capital accumulation and economic growth. According to this thesis (see Keely and Tran (1989) for a review), remittances are mainly used to finance household consumption, reducing labor force participation of family members in the home country and diminishing the household's longer-term ability to prosper on its own. Our analysis may illuminate our comprehension of the ultimate economic and social impact of remittances in receiving economies.

We do not subscribe to the view that expenditures on consumption are undesirable, as the usage of remittances to purchase food and other basic products can have significant social value by adding to the quality of life of the recipient household. However, human, physical and financial investments are highly desirable as they are recognized to allow for long-term increases in productivity. Additionally, the accumulation of physical and financial assets provides the

household with back up savings for consumption smoothing over the lifecycle and with reserves to allow for engagement in, perhaps risky, entrepreneurial activities which may reap rewards for the investor and may also serve the common good. Consequently, a better understanding of the factors shaping households' allocation of remittance inflows with respect to the accumulation of human, financial and physical assets will aid in deciding on the best policies to harness the most out of remittance inflows.

B. Data

We use data from the more recent and harmonized 2002, 2004 and 2005 waves of the Mexican *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 survey was first administered in 1983-1984. It was then re-administered in 1989 and, from 1992 through 2004 was carried out biannually. From 2005 and onward, the ENIGH has been administered annually. The ENIGH is designed to be representative at the following levels via appropriate household level weighting: (a) national, (b) localities with 2,500 inhabitants or more (urban), and (c) localities with less than 2,500 inhabitants (rural). Its population coverage includes all national and foreign households living in private dwellings in the national territory. The sampling frame is the one used by the INEGI for multiple purposes and is derived from demographic and geographic information obtained from the 1995 national census (Conteo de Población y Vivienda).

The ENIGH covers all household expenditures, including expenditures on education, health, durable assets, micro-enterprise investments, financial asset accumulation, real estate,

food, transportation and personal care expenditures. Our approach is to group these expenditures into two categories, which we label as “ordinary consumption” and “asset accumulation.” We define asset accumulation in a broad manner to include human capital accumulation (education and health), the accumulation of physical assets (durable assets, businesses and micro-enterprises, real estate assets –mainly housing), and the accumulation of financial capital (bank deposits, loans to others, stocks, bonds, and other financial market investment instruments). While our definition of “asset accumulation” as a form of saving may appear unusual, in a country like Mexico, much of the population have limited avenues for accumulating assets owing to their unbanked status, mistrust of financial institutions and relative shallowness of the financial system. This is especially true among rural households, a population of primary interest in the analysis of remittances as they receive most of Mexico’s remittance inflows. Therefore, the purchase of durable assets,² spending on human capital,³ and improving their housing can account for much of their asset accumulation.

In addition to detailed data on expenditures, the ENIGH contains information on general socio-demographic and economic characteristics of all household members.⁴ Of particular interest to us is the thorough information on all income received by the household in each of the past six months. The six-month detailed income history is indeed unique to the ENIGH.⁵ By asking respondents about their receipt of remittances over the six months prior to the interview,

² Even for U.S. households, Fernández-Villaverde and Krueger (2005) make a case for including durable asset accumulation when studying life-cycle saving. They suggest that, especially early in the life-cycle, households use durable assets to insure against income shocks.

³ See Table A in the appendix for details on variable definitions.

⁴ For instance, the survey collects information on respondents’ age, gender, relationship to the household head, marital status, as well as educational attainment and employment. Additionally, the survey gathers detailed information on the housing unit and living conditions of the household and income inflows.

⁵ Other Mexican surveys containing nationally representative information on household income and expenditures, such as the Mexican Life Family Survey, do not allow us to: (1) Distinguish between national and international remittance transfers, and (2) Do not contain detailed month to month income information required to construct measures of remittance income uncertainty. Similarly, the Mexican census only reports last month’s receipts.

we are able to exploit the information contained in the time series to construct the coefficient of variation of household remittance income and use it as a proxy for remittance income uncertainty. The coefficient of variation of remittance inflows is computed as the standard deviation of mean inflows for the household over the six-month period divided by the average monthly inflow. There are several advantages to using the coefficient of variation. It is unitless, and can therefore be straight forward to compute. However, one could argue that it captures expected plus unexpected volatility in remittance receipts and, therefore, it does not entirely fit with the theory, which suggests that uncertainty or unexpected volatility is what really drives changes in saving behavior. For that reason, and given that the predictions from the LCPIH and precautionary savings theories are based on the concept of uncertain or unexpected variations in income, we are also exploiting the information at hand to construct GARCH measures of remittance income uncertainty. These remittance income uncertainty proxies will be used in ongoing work to forecast the future average value of inflows along with the subjective uncertainty surrounding that average value.

Before proceeding any further, it is important to note some limitations that emerge from our data and the fact that we only have information on remittance receipts over the past six months. In some instances, we may run into a selection bias as some households may be receiving remittances only once a year during the other six months we lack data on. In those instances, we will be assigning those infrequent remittance-receiving households to the non-recipient sub-sample of households simply because we do not observe remittance receipts over the surveyed 6-month period, (say June through December) when indeed the household did receive receipts, in say, January. This is a problem that exists for any study on remittances. For example, the 2000 Mexican census asked households about their remittance receipts over the

past month. Consequently, any study that estimates the impact of remittances on Mexican households using the census will suffer from the same bias, as there will be a group of household who do not receive remittances in the previous month, but did in prior months. However, it is also worth noting that, first, our bias is likely to be small given that in other surveys of remittances, very few remitters claim to remit at frequencies lower than twice a year. Secondly, to the extent that infrequent remittance receivers will be assigned a value of 0 for their remittance income uncertainty, i.e. complete certainty regarding their remittance inflows as they are assigned to the non-remittance receiving group, we would, in any event, underestimate remittance income uncertainty. While this is a source of measurement bias, under the classical errors-in-variables (CEV) assumption where the measurement error is uncorrelated with the unobserved explanatory variable, the estimated effect will be attenuated (Wooldridge 2003). Therefore, if remittance income uncertainty has a positive coefficient, the estimated coefficient will tend to underestimate (instead of the more problematic overestimating) the true coefficient. In any event, as we shall explain in greater detail in the methods section, we also use instrumental variables as a way to address the omitted variable problem.

C. Some Descriptive Evidence

Table 1 provides a brief description of households in our sample. We work with approximately 63,000 households. A little over 20 percent of all households are female-headed. The average household has 4 members, of whom 0.6 are children six years of age or younger (i.e. about 15 percent of household members) and 0.24 individuals are adults 65 years old and above (i.e. approximately 6 percent of household members). More than half the members in an average household, that is, about 2.2 individuals in each household, have low levels of education. An additional 1.2 individuals (or 30 percent of household members) have a middle school

education. On average, only 0.5 individuals or 13 percent of household members have a high school degree or higher educational attainment. Also worth noting is that, on average, 1.7 individuals or 43 percent of household members are working, but only 0.6 household members (i.e. 18 percent of the household) have health insurance. Finally, geographically, a little more than a quarter of total households are located in rural areas.

What can we say about the spending patterns of households in our sample? Table 2 reports on the percentage of households with expenditures in the different categories of interest.⁶ By far, following ordinary consumption expenditures, health expenditures are the most common expenditures with approximately 48 percent of households reporting some healthcare expenditure over the past six-month period. Table 2 also reports on the average six-month expenditure in each of the categories of interest conditional on incurring expenditures in that category. After ordinary consumption expenditures, the largest expenditure is on real estate. Conditional on spending on real estate, average expenditure in this category amounts to approximately 2,373 pesos over six months.

What are the remittance receiving patterns of households in our sample? Table 3 addresses this question. About five and a half percent of the sixty-three thousand households in our sample receive remittances. Slightly more than half of these households (3.1 percent of all households in the sample) receive remittances each month. The other remittance-receiving households receive international transfers on a more irregular basis, receiving remittances at least once in the past six-month period, but not every month. How large are these remittance inflows? Conditional on residing in a remittance-receiving household (i.e. for 3,403 households), total household remittance receipts average 16,996 pesos over a six-month period (i.e. about 2,833

⁶ Table A in the appendix includes a description of the various expenditure categories being examined as well as of the remaining variables of interest to this study.

pesos or US\$ 270 per month).⁷ These figures compare to 37,511 pesos of income (excluding remittances) over a six-month period (i.e. 6,252 pesos or US\$ 595 per month). Therefore, remittances (on average) account for almost one third of income in remittance-receiving households and, as such, have the potential to significantly impact expenditure patterns of said households.

Do remittance-receivers display a different spending pattern than their non-remittance receiving counterparts? And, if they do, does the uncertainty of receipts affect the share they spend on human, physical and financial asset once we account for the peso amount received? Table 4 and Table 5 provide some insight into these questions. At a mere descriptive level, remittance-receiving households' share of spending on human, physical and financial assets is 6 percent –about 2 percentage points more than for non-remittance receiving households (see Table 4).⁸ Such a finding is consistent with the notion that increases in remittances are spent differently than increases in ordinary income. Furthermore, as we distinguish by expenditure category, remittance-receiving households appear to spend a greater share on most asset categories being examined. For example, the average share of spending on real estate by remittance-receivers is 1 percent, while those who do not receive remittances only spend about half a percent on real estate. Likewise, remittance-receiving households' share of spending on financial assets is 2 percent, about half a percentage point greater than that of non-recipient households, whose share is about 1.6 percent. It is only on education that non-remittance

⁷ Peso figures are deflated using the Mexican CPI with 1999-2000 as the base year (International Financial Statistics database, International Monetary Fund). We used the average exchange rate over the January 2002 through December 2005 period (10.5 pesos per dollar) to convert pesos into US dollars.

⁸ How reasonable are these “saving rates”? While conventional personal saving rates estimated by the Bureau of Economic Analysis for U.S. consumers are currently estimated to be about zero percent (for an example, go to: <http://www.bea.gov/newsreleases/national/gdp/gdpnewsrelease.htm>), Formaini and McKenzie (1999) argue that it makes sense to augment traditional saving definitions with spending on education, durable assets, and undistributed corporate profits. If one does so, the U.S. personal saving rate rises from about 0 to 10 percent using data that they work with for 1999.

receivers spend just slightly more (i.e. only 0.04 of a percentage point more) than remittance-receiving households. This finding supports Kandel and Kao's (2001) argument that investments in education of children in Mexican households with emigrant family members is lower due to differences in the opportunity cost and returns to education for household with and without migration networks. Migration networks increase the likelihood of future emigration to the U.S. Given that Mexican education is not valued in the U.S. labor market, there is less of an incentive to spend in that direction on the part of families more likely to emigrate. The receipt of remittances suggests that these households have greater access to migration networks.

To gain further insights into the impacts of remittance inflows on households' spending patterns, Table 5 reports households' expenditure shares according to the uncertainty of their remittance inflows. With that purpose, we divide households in two groups. The first group consists of remittance-receiving households enduring high uncertainty in their remittance inflows as captured by a coefficient of variation of remittance income that lies in the upper two quartiles of the distribution. The second group is composed of remittance-receiving households with less volatile remittance inflows as reflected by a coefficient of variation for remittance income that falls within the lower two quartiles of the distribution. Overall, higher uncertainty in the receipt of remittance inflows favors asset accumulation by about an additional 1 percentage point. By asset category, we find that more volatile remittance income results in a statistically higher share of asset accumulation in health, durable asset accumulation and real estate.. However, the figures in Table 5 do not control for other household characteristics possibly correlated with households' spending and remittance-receiving patterns. Therefore, we now proceed to a more thorough analysis of the impact of remittance inflows and their uncertainty on households' spending patterns.

D. Methods

Our purpose is to examine the role that greater uncertainty in the receipt of remittance inflows plays on the spending patterns of remittance-receiving households and, in particular, on their human, physical and financial asset accumulation patterns once we account for the dollar amount received. To this end, we start by first estimating the following benchmark model:

$$(1) \quad Y_i^* = \alpha_0 + \alpha_1 R_i + \alpha_2 RV_i + X_i \beta + \varepsilon_i, \quad \varepsilon_i \sim \text{Normal}(0, \sigma^2) \text{ and } Y_i = \max(0, Y_i^*),$$

for $i=1, \dots, n$ remittance-receiving households.⁹ Our dependent variable, Y , measures the share of spending on asset (human, physical and financial) accumulation over the past month. R is the fraction of overall household income that originates from remittance transfers received during the past six-months and RV is our measure of remittance income uncertainty over the same time period.¹⁰ Finally, X is a vector of exogenous explanatory household and individual level variables, including the level and uncertainty of other sources of income.

A few econometric issues arise in the estimation of equation (1). First, the outcome of interest is a zero-inflated continuous variable. We expect a significant share of remittance-receiving households to engage in no asset accumulation. Indeed, this is the case for approximately 21 percent of remittance receiving households in our sample. The estimation of equation (1) by OLS would yield biased and inconsistent estimates of the impact of remittances expenditure shares by the household. Second, remittances and the uncertainty of these monetary inflows may be correlated with the error term in equation (1). As such, remittance income and its uncertainty may be endogenous and their coefficient estimates biased. There are two

⁹ Note that the question of whether remittance uncertainty affects household spending patterns is a relevant question among remittance receiving households for whom we can effectively measure uncertainty in the receipt of these monetary flows.

¹⁰ Our measure of remittance income uncertainty is intended to proxy for remittance income predictability or uncertainty by capturing remittance income regularity and variability. Therefore, we use these terms interchangeably throughout the study.

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 household characteristics which, in turn, may influence how much the household chooses to spend on asset accumulation.¹¹ Additionally, there is the potential of reverse causality as household expenditure patterns may influence emigrants' decision to send remittances home as well as the frequency with which they make such transfers. Finally, remittance income and, as such, its 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. As noted earlier in the proposal, the CEV problem is likely to cause an attenuation bias, thus underestimating the impact of remittance income and remittance income uncertainty on respondents' spending patterns. Although we do not expect large measurement problems based on the remitting patterns reported in other surveys,¹² we still acknowledge this problem and, as it is often done in the literature (Wooldridge 2003), we can use instrumental variable techniques as a means to address any remaining CEV biases.

Therefore, to account for all the aforementioned issues –that is: (i) the zero inflated nature of 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, we will use Amemiya Generalized Least Squares (AGLS) estimator for the

¹¹ The ENIGH is a cross-sectional dataset; therefore, we are unable to account for household level heterogeneity. Unfortunately, this is a fairly common problem with income and expenditure surveys in 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 propose doing in the present study.

¹² According to other surveys of remittances, very few remitters claim to remit at frequencies lower than twice a year. For example, according to a survey of immigrants in San Diego County –the SDSU San Diego Area Study: Immigrants and Immigration Issues from October 2005– only 1.8 percent of those who claim to send remittances to Mexico, remit at frequencies of once a year or less.

Tobit with endogenous regressors described in Newey (1985, eq. 5.6) –henceforth IV-Tobit– to estimate equation (1). We instrument the fraction of household income that originate from remittances and the uncertainty of remittance income using information on variables indicative of economic conditions in the U.S. These are thought of as potentially good instruments based on empirical observations as well as based on the theory on remitting motives. Specifically, we instrument the fraction of household income that corresponds to remittance transfers with the average employment and weekly earnings in Mexican emigrant destination states in the U.S. over the time period under consideration.¹³ Using data from the Mexican Migration Project (MMP), we can determine the U.S. destinations for emigrants from each of the Mexican states. We then use this information (the geographic location of the stock of emigrants from each of the Mexican states to each of the U.S states) to construct weighted averages of 2000-2005 U.S. employment and wages for the stock of emigrants from each of the Mexican states in the ENIGH survey. We then use those weighted averages of U.S. employment and wages as instruments for the remittance flows received by households according to their Mexican state of residency. Likewise, we instrument for remittance income uncertainty using measures of the volatility of the employment and wage series in Mexican emigrant destination states in the U.S.¹⁴

The aforementioned instruments can be argued to be closely linked to the dollar amount received by household members in Mexico based on empirical observation and on what we know about the theory on remitting motives. Indeed, we first ascertain that our instruments are sufficiently correlated with the fraction and uncertainty of remittance income by examining the statistical significance of our instruments in the first stage regressions. Additionally, there are theoretical reasons to expect that better economic conditions in the U.S. and, in particular, higher

¹³ Employment and weekly earnings data at the state level was obtained from the Current Employment Statistics survey <http://data.bls.gov/cgi-bin/dsrv>.

¹⁴ See Table A in the appendix for further information on the instruments.

employment and weekly earnings in U.S. destination areas will likely raise emigrants' disposable earnings and increase the likelihood and level of remittances sent home. According to the theory on remitting purposes, two of the reasons as for why emigrants send money home include altruism and the desire to invest, for example, in the purchase or construction of a home they may occupy upon retirement. Greater earnings are then likely to translate into greater remittances to care for family and friends left behind or to invest. Likewise, there are theoretical reasons to expect that volatility of employment and wages in U.S. destination states is likely to also be significantly correlated to uncertainty in remittance income of Mexican households. Indeed, self-insurance is one of the recognized motives for remitting money back home by emigrants (Amuedo-Dorantes and Pozo, 2006). According to the self-insurance motive, migrants may send money home as a means to insure themselves against an unsuccessful migration experience. Therefore, greater earnings' uncertainty resulting from increased uncertainty in either employment or wages is likely to induce a more stable remitting pattern on the part of emigrants.

In addition to being significantly correlated to the endogenous regressors to be instrumented, we have no a priori reason to believe that the aforementioned instruments are correlated to household expenditure patterns in Mexico other than through remittances themselves. 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, does not reflect individual household level migration choices.¹⁵ Therefore, the same can be argued with regards to their uncertainty measures. Nonetheless, we also use over-identification tests to examine the exogeneity of the instruments. Because of existing concerns regarding the low

¹⁵ The ENIGH does not contain information on household level emigration which, in any event, we would be unable to exploit as instruments as it would not be exogenous to household labor supply patterns.

power of these tests in case of general misspecifications (e.g. Newey 1985), we use Sargan's (1958) as well as a recommended variation of the Basmann (1960) test –the Basmann-LIML form of the test (see Staiger and Stock 1997). Both tests examine the exogeneity of each one of our instruments conditional on the other one being valid. Yet, to the extent that the rationale behind these instruments is similar, i.e. they represent economic conditions in the U.S., the fact that the excluded instruments are uncorrelated with the error term in the main equation is likely to indicate of the other instruments also being correctly excluded from the main equation. Regardless of the test being used, we are unable to reject the null hypothesis as reported at the bottom of Table 7. As such, our instrumental variables appear to be sufficiently uncorrelated to the error term in the main equations.

E. Preliminary Findings

Our primary aim is to ascertain the impact of remittance income uncertainty on the spending patterns of remittance receiving households. Does it matter if remittances are forthcoming on a regular basis? Do households adjust their spending patterns to the certainty with which they receive inflows from abroad? Table 6 sheds some light on these questions by displaying the results from estimating a benchmark Tobit model of the fraction of total household expenditures on (human, physical or financial) asset purchases among remittance-receiving households. A couple of facts are worth noting regarding our model specification before proceeding any further. First, our dependent variable refers to the share of last month's household expenditures on human, physical and financial assets. The latter specifically include household expenditures on education, health, durable assets, real estate, business investments, and financial assets as specified in Table A in the appendix. We consider all of these human, physical and financial assets as they are often included within the so-called “productive” uses of

remittance inflows. Second, among our independent variables, we account for the level of remittance flows as well as for other household income and its respective uncertainty, along with other household characteristics (described in Table A in the appendix), as potential determinants of household spending patterns.

What are the key findings from Table 6?¹⁶ Not only the fraction of remittance income but also the certainty with which these monetary funds are received by the household affect spending shares on human, physical and financial assets. Specifically, as hypothesized earlier, households with more variable remittance inflows –as captured by the coefficient of variation of household remittance income– spend higher shares on human, physical and financial assets. A one standard deviation increase in the uncertainty of remittance income raises the likelihood of household spending on asset accumulation by approximately 2.9 percentage points ($0.88*0.0329$) and the share of household expenditures in this category by about 0.6 percent ($0.88*0.0064$).¹⁷ These responses are similar to the responses of Mexican households to increases in the uncertainty of other household income. A one standard deviation increase in the uncertainty of other sources of household income also raises the probability of asset accumulation by 3 percentage points ($0.61*0.0490$) and the share by 0.6 percent ($0.61*0.0095$).¹⁸

The figures from Table 6 also reveal that the share of household spending on asset accumulation increases with the share of remittances in overall household income, although to a lesser extent than when the household experiences an increase in remittance income uncertainty. For instance, a 10 percent increase in the share of remittance income¹⁹ raises the likelihood of

¹⁶ For the sake of brevity, we focus on the discussion of our key regressors.

¹⁷ The standard deviation of the coefficient of variation of remittance income uncertainty is 0.88.

¹⁸ The standard deviation of the coefficient of variation of household income excluding remittances is 0.61.

¹⁹ For our sample of remittance-receiving households, this increase amounts to approximately a 4.5 percentage point increase in the (Remittances/HH Income) ratio from an average of 0.45 to about 0.5. Alternatively, a 10 percent increase in the (Remittances/HH Income) ratio implies an increase from 16,996 pesos/six-months to about 18,756 pesos/six-months or from an average of \$283/month to about \$313/month, i.e. about an additional \$30/month.

spending on human, physical and financial assets by approximately 1 percentage point (i.e. $0.1 * 0.1043$) and the share of household spending on these assets by about 0.2 percent (i.e. $0.1 * 0.0203$), i.e. a small increase in the average share of household spending in these categories from about 6 percent to approximately 6.012.

The estimates in Table 6 assume that both the level and the uncertainty of remittance income received by the household are exogenous. However, one can foresee the case when remittance inflows by household members residing abroad may respond to household needs and expenditures back home. For example, real estate investments may be rare and, for that reason, remittances sent to and received by the household may be irregular. Therefore, in Table 7, we address the potential endogeneity of both the level and the uncertainty of household remittance income with the usage of two instruments that collect information on economic conditions in the states from which remittances are likely to originate. In particular, we use information from the Mexican Migration Project to determine past migratory flows from each state in Mexico to the different states in the U.S. We then used information on unemployment rates and average weekly earnings in Mexican emigrant destination states in the U.S. along with their volatility over time to instrument for household remittance inflows and their uncertainty. Table B in the appendix shows the first stage regressions of the IV-Tobit. Both average unemployment rates and weekly earnings in Mexican emigrant destinations in the U.S., along with the volatility of weekly earnings, help predict the fraction of remittance income and its uncertainty in the direction expected. Greater unemployment rates in the U.S. limit migrants' remitting capacity, while the opposite is true of higher weekly earnings in the U.S. These two instruments also help explain uncertainty in the receipt of remittance funds by Mexican households, with greater unemployment rates in the U.S. making remittance inflows more uncertain, while higher weekly

earnings in the U.S. have the opposite effect. The volatility of U.S. weekly earnings also helps predict the share of remittance income and its uncertainty in the direction hypothesized by the theory on remitting motives. For migrants remitting money home, higher earnings volatility in the U.S. –a sign of future uncertainty with regards to the success of their migration experience– induces them to send more money home and in a more regular manner as a self insurance mechanism. Yet, these U.S. economic indicators have no reason to be correlated to household expenditures in Mexico other than through remittance inflows, which we are instrumenting for.

Does the certainty of remittance income continue to significantly shape household asset accumulation patterns? According to the figures in Table 7, yes, although just marginally. A one standard deviation increase in the uncertainty of remittance income raises the likelihood of household spending on asset accumulation by approximately 0.2 of a percentage point ($0.88*0.0027$) and the share of household expenditures in such category by approximately 1.2 percent ($0.88*0.0135$). However, unlike in Table 6, households' spending on human, physical and financial assets does not seem to significantly increases with the uncertainty of other sources of household income. Yet, the share of remittance income continues to drive household expenditure shares on human, physical and financial assets, although, once more, to a lesser extent than the uncertainty in remittance income. In particular, a 10 percent increase in remittance income raises the likelihood of spending on human, physical and financial assets by approximately 0.1 percentage point (i.e. $0.1*0.0086$) and the share of household spending on these assets by about 0.4 percent (i.e. $0.1*0.0429$) from an average of 6 percent to 6.4.

In sum, regardless of whether we instrument for remittance income and its uncertainty, the certainty of remittance income does seem to shape the spending and asset accumulation patterns of remittance-receiving households. Furthermore, the response of asset accumulation to

variability in receipts is, at least as large or even larger when we instrument, than for ordinary income.

F. Preliminary Conclusions and Ongoing Work

Thus far, we have limited evidence suggesting that remittance-receiving households engage in different spending patterns relative to non-remittance receiving households. Remittance-receiving households spend relatively more on asset accumulation as captured by their expenditure shares on human, physical and financial assets. Similar patterns of spending seem to have been uncovered by a number of studies using Mexican and other country data, thus questioning the view that remittances are simply spent frivously on ordinary and conspicuous consumption. Furthermore, we find preliminary evidence supporting the notion that the uncertainty of remittance inflows also plays a role in households' spending patterns. Among remittance-receiving households, those with more volatile and uncertain remittance inflows appear to spend more on asset accumulation, as would be predicted by the permanent income hypothesis and precautionary saving theories.

Understanding household spending patterns is important in order to inform policy-making. For example, policies regarding remittances from the U.S. to poor countries have been focused on i) lowering transactions fees and on ii) the integration of immigrant populations into the formal financial (banking) sector with the expectation that cheaper and more secure money transfer mechanisms will increase remittance flows. Yet, to date, we know little about the optimal design of these policies. Would we do best encouraging and facilitating large lump-sum transfers? How about smaller, evenly spaced, periodic transfers? Will remittance-receiving households respond differently to periodic and certain transfers versus less certain and less

predictable transfers? And, if so, does this help us understand the established usage patterns of remittance inflows in various emigrant-sending economies?

Immigration policies may also have impacts on the timing and certainty of remittance flows and, thereby, on the spending patterns of remittance-receiving households. For example, changes in policies that cause undocumented immigrants to feel more vulnerable to detection and deportation might induce immigrants to remit all excess earnings on a regular basis. Alternatively, increased vulnerability may cause immigrants to avoid formal money transfer mechanisms (e.g. Western Union and bank transfers), inducing migrants to resort to less regular and informal transmission methods (e.g. friends traveling back home). In all instances, these policies change the method and the timing of remittance transfers and, as such, they are likely to affect the predictability of the receipts received back home. However, little consideration has been paid to how these policies affect the time pattern of remittance flows. Our preliminary findings suggest that the predictability of remittance income should be given full consideration in order to comprehend how households spend remittance receipts and accordingly, how remittance-related policies should be designed to influence household spending patterns and leverage the most out of remittance inflows to developing economies. In ongoing work, we are polishing the empirical approach, constructing more precise measures of remittance income uncertainty as well as more refined instruments for the relative magnitude of remittance income flows and their uncertainty.

Table 1
Household Level Descriptive Statistics

Variables	Observations	Mean	S.D.	Min	Max
Female headed household	62,900	0.221	0.412	0	1
Household Size	62,900	4.095	2.04	1	25
Number of Young Children in HH	62,900	0.584	0.854	0	8
Number of Elderly Members in HH	62,900	0.244	0.545	0	4
Number of HH Members with Primary Education or Less	62,900	2.153	1.801	0	20
Number of HH Members with Middle School	62,900	1.207	1.205	0	12
Number of HH Members with High School or More	62,900	0.479	0.853	0	8
Number of Working Individuals in HH	62,900	1.659	1.075	0	10
Number of Individuals with Insurance Coverage in HH	62,900	0.595	0.808	0	7
Lives in a Rural Area	62,900	0.260	0.439	0	1

Table 2
Household Expenditures over the Past Six Months

Variables	Percent of HH Reporting this Expenditure	Average Peso Expenditure if Reporting
Educational Investments	27	367
Health Investments	48	453
Real State Investments (i.e. housing, land, etc.)	7	2,373
Business Investments (i.e. micro-enterprises)	4	1,016
Financial Investments (e.g. bank deposits, stock, etc.)	26	2,164
Purchase of Durable Assets	13	623
Ordinary Expenditures (e.g. food, clothing, transportation, etc.)	100	21,749
Total Average Spending	100	22,918

Table 3
Remittance and Other Income Descriptive Statistics over the Past Six Months

Variables	Observations	Mean	S.D.
Remittance Receiving Household	62,900	0.054	0.226
Households Receiving Remittance Each Month	62,900	0.031	0.173
Households Receiving Remittances 2 to 5 Times in Six Months	62,900	0.016	0.124
Households Receiving Remittances Once in Six Months	62,900	0.008	0.087
Household Remittance Income (pesos) (six-months)	3,403	16,996	115,090
Household Income Excluding Remittances (pesos) (six-months)	62,900	37,511	65,685

Table 4
Share of Household Expenditures in Each Category According to Remittance Receipt

Type of Expenditure	N	Share of HH Expenditures	Difference	t-statistic
<i>Overall Asset Accumulation</i>				
Receiving Remittances	3,403	0.056		
Not Receiving Remittances	59,497	0.038	0.019***	10.88
<i>Educational Investments</i>				
Receiving Remittances	3,403	3.93e-03	--	
Not Receiving Remittances	59,497	4.37e-03	-4.37e-04 ***	-2.44
<i>Health Investments</i>				
Receiving Remittances	3,403	0.015	--	-
Not Receiving Remittances	59,497	0.009	0.007***	9.12
<i>Purchase of Durable Assets</i>				
Receiving Remittances	3,403	0.005	--	
Not Receiving Remittances	59,497	0.003	0.001***	3.47
<i>Real Estate Investments</i>				
Receiving Remittances	3,403	0.009	--	
Not Receiving Remittances	59,497	0.004	0.005***	5.10
<i>Financial Investments</i>				
Receiving Remittances	3,403	0.020	--	
Not Receiving Remittances	59,497	0.016	0.004***	4.12
<i>Business Investments</i>				
Receiving Remittances	3,403	0.003	--	
Not Receiving Remittances	59,497	0.001	0.001***	3.93
<i>Ordinary Expenditures</i>				
Receiving Remittances	3,403	0.944	--	
Not Receiving Remittances	59,497	0.962	-0.018***	-10.88

Notes: ***Significant at the 1% level or better.

Table 5
Share of Household Expenditures in Each Category According to Remittance Income Uncertainty

Type of Expenditure	N	Share of HH Expenditures	Difference	t-statistic
<i>Overall Asset Accumulation</i>				
High Uncertainty	1,701	0.059	--	
Low Uncertainty	1,702	0.052	0.007**	2.17
<i>Educational Investments</i>				
High Uncertainty	1,701	3.65e-03	--	
Low Uncertainty	1,702	4.21e-03	-5.64e-04*	-1.63
<i>Health Investments</i>				
High Uncertainty	1,701	0.017	--	-
Low Uncertainty	1,702	0.014	0.003**	1.78
<i>Purchase of Durable Assets</i>				
High Uncertainty	1,701	0.005	--	
Low Uncertainty	1,702	0.004	0.001*	1.34
<i>Real Estate Investments</i>				
High Uncertainty	1,701	0.011	--	
Low Uncertainty	1,702	0.007	0.005***	2.52
<i>Financial Investments</i>				
High Uncertainty	1,701	0.020	--	
Low Uncertainty	1,702	0.021	-0.001	-0.43
<i>Business Investments</i>				
High Uncertainty	1,701	0.003	--	
Low Uncertainty	1,702	0.002	0.001	0.51
<i>Ordinary Expenditures</i>				
High Uncertainty	1,701	0.941	--	
Low Uncertainty	1,702	0.948	-0.007**	-2.17

Notes: **Significant at the 5% level or better, ***Significant at the 1% level or better.

Table 6
Tobit Model of the Share of Remittance-Receiving Households' Expenditures on Human, Physical and Financial Assets

Independent Variables	Coefficient	S.E.	M.E. on Prob (Y>0)	M.E. on E(Y Y>0)
Uncertainty of Remittance Income (Remittances/HH Income)	0.0099*** 0.0313***	0.0028 0.0083	0.0329 0.1043	0.0064 0.0203
Uncertainty of HH Income Excluding Remittances	0.0147***	0.0038	0.0490	0.0095
Female Headed HH	0.0048	0.0046	0.0160	0.0031
Number of Young Children in the HH	0.0036	0.0031	0.0121	0.0024
Number of Elderly HH Members	0.0036	0.0033	0.0119	0.0023
Number in HH Members with High School or Above	0.0127***	0.0039	0.0422	0.0082
Number in HH Members with Middle School	0.0084***	0.0022	0.0281	0.0055
Number of HH Members Employed	0.0075***	0.0024	0.0249	0.0049
Number of HH Members with Insurance Coverage	-3.87E-05	0.0042	-0.0001	0.0000
Household Size	-0.0029*	0.0015	-0.0098	-0.0019
Rural Household	-0.0037	0.0046	-0.0124	-0.0024
Constant	-0.0036	0.0087	-	-
Number of Observations:			3025	
Uncensored Observations			2450	
LR Chi-square (12)			69.54	
Prob > Chi-square (12)			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.

Table 7**IV Tobit of the Share of Remittance-Receiving Households' Expenditures on Human, Physical and Financial Assets**

Independent Variables	Coefficient	S.E.	M.E. on Prob (Y>0)	M.E. on E(Y Y>0)
Uncertainty of Remittance Income (Remittances/HH Income)	0.1212* 0.3376**	0.0746 0.1641	0.0027 0.0086	0.0135 0.0429
Uncertainty of HH Income Excluding Remittances	-0.0294	0.0239	-3.41E-05	-0.0002
Female Headed HH	-0.0121	0.0129	-0.0003	-0.0016
Number of Young Children in the HH	-0.0029	0.0053	0.0002	0.0009
Number of Elderly HH Members	0.0113*	0.0070	0.0004	0.0021
Number in HH Members with High School or Above	0.0240***	0.0086	0.0010	0.0048
Number in HH Members with Middle School	0.0140***	0.0043	0.0006	0.0030
Number of HH Members Employed	0.0192***	0.0078	0.0007	0.0036
Number of HH Members with Insurance Coverage	0.0234*	0.0135	0.0005	0.0023
Household Size	-0.0007	0.0033	-0.0002	-0.0012
Rural Household	-0.0273**	0.0142	-0.0004	-0.0018
Constant	-0.2456*	0.1406	-	-
<i>Regression Fit Statistics:</i>				
Number of Observations:			2999	
Uncensored Observations			2428	
Wald Chi-square (12)			36.41	
Prob > Chi-square (12)			0.0003	
<i>Over-identification tests:</i>				
Sargan test		Chi-square (2) = 4.268		P-value = 0.1184
Basmann test		Chi-square (2) = 4.271		P-value = 0.1182

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. Over-identification tests are performed using an instrumental linear regression specification.

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APPENDIX TABLES

Table A
Variable Names and Definition

Variable Name	Definition
Educational Investments	Expenditures on primary, secondary and higher education, educational services (tutoring, boarding, transportation to school, etc.), and educational goods (books, school items, repair of school items,...). All health related expenditures, including medicines with and without a prescription, glasses, etc., but excluding health insurance.
Health Investments	Real estate purchases, mortgage payments, and maintenance and repair of property.
Real Estate Investments (i.e. housing, land, etc.)	Business investments and business related purchases, e.g. machinery, etc.
Business Investments (i.e. micro-enterprises)	Deposits in bank accounts; loans to third parties; purchase of foreign currency, jewelry, and art,...; purchase of stock, bonds and financial assets; purchase of brand names, patents, and author rights.
Financial Investments (e.g. bank deposits, stock, etc.)	Purchase of home related durable assets, such as a washing machine.
Purchase of Durable Assets	Sum of the expenditures listed above divided by total household expenditures.
Share of expenditures on Human, Physical and Financial Assets	
<i>Independent Variables:</i>	
Uncertainty in Remittance Income (Remittances/HH Income)	Coefficient of variation of remittance income Gifts and donations from abroad divided by all other household income (e.g. from work, own businesses, coops, rents from real estate and financial assets, income transfers, and other sources of income (e.g. revenues from selling a car, household goods, or other income categories).
Uncertainty in HH Income Excluding Remittances	Coefficient of variation of household income excluding remittances
Female Headed HH	Household head is female
Number of Young Children in the HH	Number of household members 6 years old and younger
Number of Elderly HH Members	Number of household members 65 years of age and older
Number in HH Members with High School or Above	Number of household members with university and higher education (i.e. superior and posgrado)
Number in HH Members with Middle School	Number of household members with secondary education or vocational training (i.e. secundaria, preparatoria, vocacional and normal)
Number of HH Members Employed	Number of household members employed
Number of HH Members with Insurance Coverage	Number of household members with medical coverage
Household Size	Household size
Rural Household	Household resides in an area with fewer than 2,500 inhabitants
U.S. Earnings (in 100 dollars)	Weighted average of weekly growth rates in earnings (for immigrants and for Hispanic workers) in US states that are destinations for Mexican emigrants (by Mexican state).
U.S. Earnings Volatility	Standard deviation of the above.
U.S. Unemployment Rate (in 100 dollars)	Weighted average of unemployment rates (for immigrants and for Hispanic workers) in US states that are destinations for Mexican emigrants (by Mexican state).
U.S. Unemployment Rate Volatility	Standard deviation of the above.

Table B
First Stage Results from the IV-Tobit

Independent Variables	Remittances/HH Income		Remittance Income Uncertainty	
	Coefficient	S.E.	Coefficient	S.E.
U.S. Unemployment Rate	-0.0628***	0.0133	0.1195***	0.0389
U.S. Unemployment Rate Volatility	-0.0525	0.1557	0.2008	0.4565
U.S. Earnings	0.0611***	0.0170	-0.0897*	0.0497
U.S. Earnings Volatility	2.6469*	1.6391	-11.8030***	4.8058
Female Headed HH	0.1319***	0.0119	-0.2214***	0.0349
Number of Young Children in the HH	0.0150*	0.0080	0.0162	0.0233
Number of Elderly HH Members	0.0058	0.0086	-0.0858***	0.0253
Number in HH Members with High School or Above	-0.0106	0.0102	-0.0760***	0.0299
Number in HH Members with Middle School	-0.0097*	0.0059	-0.0226	0.0173
Number of HH Members Employed	-0.0829***	0.0061	0.1202***	0.0179
Number of HH Members with Insurance Coverage	-0.0905***	0.0109	0.0485	0.0321
Uncertainty of HH Income Excluding Remittances	0.1644***	0.0093	-0.0525**	0.0272
Household Size	0.0151***	0.0040	-0.0618***	0.0117
Rural Household	0.0580***	0.0121	0.0529	0.0354
Constant	0.3563**	0.1534	1.0468**	0.4498
Number of Observations:		2999		2999
F(14, 2984)		103.43		12.27
Prob > F		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.