

Do Remittances Increase Borrowing?

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Abstract

While recent literature has pointed out that migrants' remittances have a positive impact on savings with financial institutions, findings with respect to access to and the use of loans have been ambiguous. This paper investigates whether the reception of remittances facilitates taking up loans from formal or informal sources among Mexican households and finds positive and statistically significant effects of remittances on borrowing and on the existence of debts. We address methodological concerns of selection bias and reverse causality through household fixed effects and an instrumental strategy that exploits distance to train lines and labor market conditions in the US as exogenous determinants of remittances.

JEL Classification: F24, D14, I15, O12

I. Introduction and related literature

Remittances - the money migrants send home, usually to their families staying behind - are today the second most important source of foreign finance for the group of developing countries. Their continuous increase over the last two decades, interrupted only through a 5.8% decline of remittances to developing countries in 2009 following the global financial crisis (World Bank, 2010), has raised interest on their impact on economic development both in policy and academia. A large number of studies have addressed their impact on poverty and inequality (Acosta et al., 2008; Adams and Cuecuecha, 2013; Adams and Page, 2003; Jones, 1998; Koechlin and León, 2006), spending behavior (Adams and Cuecuecha, 2010; Cox Edwards and Ureta, 2003; Massey and Parrado, 1998; Woodruff and Zenteno, 2007; Yang, 2005) and macroeconomic effects (Acosta et al., 2007; Amuedo-Dorantes and Pozo, 2004; Buch and Kuckulenz, 2010; Sayan, 2006). More recently, the effects of remittances on the access to and the use of financial services has gained attention and become a primary focus in development policy. It is usually argued that linking remittances with additional financial services has important benefits by providing households with additional tools of risk management and asset accumulation and because the saving of remittances at financial institutions allows channeling savings from remittances towards the demand for credit elsewhere (Orozco and Fedewa, 2006; see for example Orozco, 2004; Terry and Wilson, 2005). However, the effect of remittances on access to and use of financial services is not straightforward. The literature on remittances and financial access has put forward two views: One view claims that remittances function as a substitute for credit. Different behavior of spending by remittances-receiving households is often explained within a theoretical framework of imperfect credit markets, where remittances help poor households overcome liquidity constraints that restrict investment in human or physical capital (Calero et al., 2009, p. e.g.; Taylor and Wyatt, T.J., 1996). More explicitly, Woodruff and Zenteno (2007) refer to the substitution between remittances and credit as an explanation for their empirical findings that credit-constrained Mexican microenterprises with transnational ties invest more than micro entrepreneurs without such ties. Along a similar line of argument,

Giuliano and Ruiz-Arranz (2009) find a larger impact on growth in countries with low levels of financial development because – as they argue –, remittances can substitute for the lack of access to credit and enable households and enterprises to increase their investment in human and physical capital in countries with larger credit constraints, which translates into higher growth. Ambrosius and Cuecuecha (2013) find that remittances respond to households' demand for financing emergencies and make them less reliant on debt-financing when they suffer from health-related negative events.

A different line of research claims that remittances may function as a 'catalyst' for financial development. A number of empirical studies have found positive effects of remittances on savings indicators at the cross-country level (Aggarwal et al., 2010; Gupta et al., 2009) and for case studies on Mexico (Ambrosius, 2012; Demirgüç-Kunt et al., 2011) and El Salvador (Anzoategui et al., 2014). Several reasons are given for a positive impact of remittances on the amount of deposits: On the side of institutions, banks may have an interest in capturing remittances for the financial system and therefore target receivers specifically. On the side of receivers, the lumpiness of remittances may create a demand for savings options. Also the knowledge of financial products could be higher in the case where migrants transmit 'financial knowledge' together with remittances. Others have argued that financial institutions might include remittances in the evaluation of creditworthiness of clients (Cuecuecha and Da Rocha, 2011; Orozco and Fedewa, 2006). However, while empirical studies on remittances and financial development have found a robust impact on savings and deposits, the effect of remittances on credit from formal financial institutions is either weak (Aggarwal et al., 2010; Ambrosius, 2012; Demirgüç-Kunt et al., 2011) or has not been confirmed (Anzoategui et al., 2014).

The two perspectives on remittances and financial services are not contradictory: Research based on financial diaries has shown that poor households mix and combine different financial tools and instruments to cope with expected and unexpected financial gaps (Banerjee and Duflo, 2011; Collins et al., 2009; Rutherford, 2003). Since migration and financial services are both asset-building and risk-management tools, remittances and financial services may, in some cases, substitute for each other – for example, when family members in the US function as a source of capital from outside the regular

household to cover emergency spending, or when remittances finance investment in human or physical capital in the context of absent or rudimentary financial markets in the countries of origin. In other cases, remittances and financial services may complement each other because the reception of remittances may pave the way for additional financial services such as savings accounts or function as collateral for loans.

A better understanding of how households combine formal and informal strategies of risk management and asset building is important both from a theoretical and a practical standpoint of designing adequate policy instruments. Yet, although the relationship between remittances and financial services ranks high on the development policy agenda, there are still surprisingly few systematic studies on the topic. In particular, research so far failed to provide a clear picture on whether remittances have a positive impact on access to and the use of credit. In this paper, we test the hypothesis that remittances facilitate taking up loans using Mexican household data. A positive impact of remittances on loans may operate both through a demand-driven and a supply-driven effect. From the demand side, a more flexible budgetary constraint among remittances-receiving households might reduce their risk aversions and increase the propensity of potential borrowers to take up debt. From the lenders' point of view, an additional, easily verifiable and relatively stable source of income from outside the local economy enhances the creditworthiness of borrowers. Everything else being equal, we therefore expect to find a positive impact of remittances on borrowing by households compared to a household with equal observable characteristics and no remittances. Because poor households have limited access to formal loans and usually rely on various formal and informal sources for taking up credit, we do not restrict this hypothesis to loans from formal financial institutions. It is important to understand that remittances can increase borrowing on formal and informal lenders. This is a direct consequence of the "developing" labor market characteristics of Mexico where 37% of the labor force was self employed in 2005 (INEGI 2014). This implies that for all these households their income is not easily verifiable and therefore they are perceived as high risk potential customers. On the other hand, 97% of all remittances are received through electronic transfers (Banxico, 2013) which make them an easily verifiable source of income. In the

case of formal lenders, the fact that the market of remittance reception in Mexico is dominated by business directly linked to banks (i.e. Banco Azteca, Banamex and BBV Bancomer) implies that they have an information advantage when working with remittance reception households, that they would surely want to exploit.

From the point of view of informal lenders, a similar argument applies since for them it may be as difficult as it is for a bank to observe the income of self employed individuals. Moreover, remittance also represent an information advantage for them since each transaction must be accompanied by a printed receipt, which households could later use with informal lenders as proof of income reception.

Putting forward this hypothesis does not exclude the possibility that remittances may also function as a substitute for credit, as argued elsewhere (Ambrosius and Cuecuecha, 2013). Rather, we claim that household mix and combine different formal and informal financial instruments. Although remittances function as insurance that may protect households from over-indebtedness in the face of negative events (ibid.), we expect that remittances and loans may also be complementary. Hence, our hypothesis implies that the collateral effect of remittances is not crowded out by a substitution effect.

The rest of the paper proceeds as follows: In the following section II, we introduce the Mexican case and describe our data sources. Section III explains our empirical strategy. Studying the effect of migration and remittances on borrowing faces methodological challenges of selection bias (the observed and unobserved characteristics of remittance-receiving households differs from non-receiving households) reverse causalities (debt might itself be causal to migration, for example if migration is financed through debt or when migration is a strategy of escaping from debt), and specification bias (the complexity of migration and remittance decision makes difficult to select a reduced form equation free of it). Or remittances (or migration) and debt may both respond to a third variable (e.g. health shocks, see Ambrosius and Cuecuecha, 2013). As explained in more detail in section three, we employ several strategies in order to address these concerns. First, the detailed household panel data of the Mexican Family Life Survey allows us to follow the same households over time and to control for time-constant household fixed effects additional to a large number of time-varying socioeconomic characteristics and

the shock history of households. Second, we employ an instrumental variable strategy, where we combine two instruments. Following previous studies (Demirgüç-Kunt et al., 2011; López Córdova, 2005; Woodruff and Zenteno, 2007), we use distance to train lines as an instrument for migration and remittances between the US and Mexico. Access to transportation systems has been an important determinant of migration to the US during early migratory movements from Mexico to the US. Due to the persistence of network effects, still today the migration intensity across Mexican regions is highly correlated with distance to train lines (Woodruff, 2007; cp. Demirgüç-Kunt et al., 2011, p. 230). As a second instrument, we use exogenous variation in the labor market conditions in the US as an exogenous determinant of remittances (used similarly by Adams and Cuecuecha, 2010; Anzoategui et al., 2014) where the argument is that given the restrictions for illegal and legal migration, the migration flow is primarily dominated by the labor demand forces. In using this instrument it is important to understand that it is well known that the Mexican and US industrial sectors are highly correlated, which implies that shocks in the US labor market will have not only effects on the supply of Mexican migrants but also on every other economic aspect of life in Mexico, including the need for loans. Moreover, since migrants will not necessarily send remittances in the very short run it is likely to expect that the effect of US labor market conditions on remittance reception in Mexico will be seen with a time lag. These two conditions lead us to use lags of the US labor market conditions as instruments (as it is done by Adams and Cuecuecha, 2010) and to use as control variables general indicators of macroeconomic conditions in Mexico in 2005. Tests of validity of instruments demonstrate that the combination of these two indicators into a single instrument generates best results in terms of weakness of instruments tests. The rationale for this result is that by multiplying the time-constant instrument at the municipal level (distance to train lines) with the time-varying instrument at the state level (labor market conditions in the US) we obtain a stronger instrument. In order to test the robustness of our results, we also employ alternative dependent and independent variables. Section IV presents the results. We find a strong and significant effect of remittances on the existence of debt and on recent borrowing, but no robust effects of transnational status. Findings for remittances are confirmed when we use an instrumental strategy. Section V highlights implications with respect to the design

of adequate policy instruments and reconciles our study with general findings on the financial management of migrant households, where several formal and informal strategies and instruments may exist next to each other.

II. The Mexican Context and Data Description

We test the hypothesis that remittances facilitate taking up loans using Mexican household data. Mexico provides an interesting case study for several reasons: First, Mexico is one of the most important emigration countries in the world with approximately 10 million Mexican-born immigrants in the US, equaling 10% of Mexico's total population. With an estimated 23.2 billion USD of remittances in 2012, Mexico was the third largest receiver of remittances in absolute terms after India and China (World Bank, 2013). At the same time, access to formal financial services is limited: In 2011, only an estimated 27% of Mexican adults uses formal financial services (World Bank, 2014). Mexican migrants predominantly originate from lower-income groups and from rural areas that are often excluded from access to formal finance due to information asymmetries, low competition of banks at local level and high transaction costs.¹ In this context of a relatively limited access to finance, remittances play a potentially important role in facilitating access to loans by formal or informal lenders. Finally, Mexico makes an ideal case study thanks to the availability of several data sources and a large variation of our key explanatory variables both at the household and regional level that we exploit in our empirical strategy. Our main household level observations come from the Mexican Family Life Survey (MxFLS), which is a prospective panel survey of individuals, households and families; it is nationally representative and multithematic. The first wave was conducted in 2002 and was

¹ Several indicators signal that Mexico has problems with the competitiveness of the financial sector. Recent data has shown that Mexico has lower credit to GDP ratio than comparable Latin American countries (CNBV, 2011). At the same time, Mexico has the bank with the largest ROA in Latin America (The Banker Database, 2013). During 2013, a financial reform has been launched in Mexico with the objective to increase the competitiveness of the sector.

representative of the population at that time. It was carried out jointly by the *Centro de Investigación y Docencia Económica* (Center for Research and Teaching in Economics, CIDE) and the *Universidad Iberoamericana* in Mexico City, and the second (2005-2006) and third (2009-2011) waves by *Universidad Iberoamericana* in Mexico City. As a multi-thematic database, the MxFLS combines information on household finance with migration histories and a large number of additional socioeconomic characteristics of households and individuals. The MxFLS is a nationally representative sample of households that were selected under criteria considering national, urban-rural, and regional representations on pre-established demographic and economic variables undertaken by the National Institute of Geography, Statistics, and Information (*Instituto Nacional de Estadística, Geografía e Informática* INEGI). The approximate sampling size is 8,440 households with approximately 35,000 individual interviews in 150 communities throughout the Mexican Republic. Out of a total of four survey rounds that are planned through 2012, survey results for 2002 and 2005 are available at the time of writing. The same households in the MxFLS are followed over time so that changes across time can be observed for each household. We have data for both time periods for 7,572 households, coming from 177 municipalities.²

As our main dependent variable, we construct a binary indicator *DBT* whether households reported to have outstanding debt at the moment of the survey. Debt may be with formal financial institutions as well as with semi-formal or informal institutions (financial cooperatives, credit unions, NGOs or money lenders) or through personal networks (friends, colleagues). We deliberately include the informal financial sector in the analysis in order to take account of the large institutional diversity in financial markets next to the traditional banking sector, to which lower income households and those living in rural households have only limited access. Alternatively, we ask whether at least one household member borrowed money during the twelve months previous to

² For a detailed description of the MxFIS survey see Teruel, Rubalcava and Arenas (2012).

the survey (*BOR*). While the former indicator contains information about existing debt stocks, the latter indicator refers to relatively recent flows of debt.

Our main explanatory variable *REM* is a binary variable that takes the value '1' when at least one household member received remittances from abroad during the previous 12 months. While households were not directly asked about receiving international remittances, this information can be constructed indirectly by combining questions on whether households received monetary transfers during the last year (and from whom) and whether they have family members that live abroad. Households are classified as remittance-receiving households if at least one household member received monetary transfers from a family member living in the US during the last year. In 2002, our measure of remittance-receiving households indicates that 5.7% of all households received remittances, while that figure was 6.3% in 2005.³ As an alternative explanatory variable, we use a binary indicator *TRN* whether at least one household member reported to have a nuclear family member (either a parent, a child or a spouse) living in the US. This allows us to compare effects of the narrower indicator on remittances with the broader effects of migration. According to the MxFLS, in 16% of all households in 2002

³ While households were not directly asked about receiving international remittances, this information can be constructed indirectly by combining questions on whether households received monetary transfers during the last year (and from whom) and whether they have family members that live abroad. In some cases, households could not be clearly classified into remittance-receiving households. Respondents only replied if they received transfers from a sibling, an uncle/aunt, parents, etc. For example, if a respondent has two brothers, one living in the US and another living in a different household in Mexico, it is not possible to know from the survey data whether the respondent received the transfer from the brother living in Mexico, or a different brother living in the US. These households are classified as remittance-receiving households although there is some uncertainty in this classification and some of these transfers might actually be national remittances. Even so, this variable can be considered to be a good proxy for international remittances. The estimates for the share of remittance-receiving households based on this procedure are very similar to the estimates on remittances from other sources. According to Esquivel and Huerta-Pineda (2007), estimations based on ENIGH 2002 (Encuesta Nacional de Ingreso y Gasto de los Hogares, a biannual household survey carried out by the Mexican Statistics Institute INEGI) indicate that 5.7 percent of Mexican households received remittances in 2002.

and 18% of households in 2005 a member of the nuclear family (a, parent, child or spouse) lived in the US.

We include a number of time-varying control variables at the household level, such as total monthly household expenditure (*EXPHH*), the number of persons living in the household (*SIZHH*), the age of the head of household (*AGEHH*), and a binary variable whether the head of household gained income from work or business (*WRKHH*). We also include variables whether household members suffered from different types of shocks during the previous five years: Loss of job or business (*SHKEC*), serious accidents or diseases that required hospital treatment (*SHKSK*), loss of crop (*SHKCR*), loss of livestock (*SHKLV*) or natural disasters (*SHKDS*). We combine household level data from the MxFLS with data at the level of the 16 (out of 32) states and 177 municipalities from which households in the MxFLS were sampled and include information on rain fall and GDP at state level. Data for state level GDP comes from INEGI (2014) and data on rain at state level comes from CONAGUA (2014).

In our instrumental variable strategy, we exploit regional variation of migration patterns in Mexico. We estimate remittances from two sources of exogenous variation that are correlated with remittances: 1) Distance to rail lines as a historical determinant of US-Mexico social migration network and 2) variation in US state job creation five years previous to the specific year of survey as an indicator of “relatively” recent US demand for Mexican migrants. Distance to rail lines is obtained crosschecking information from the MxFLS about the municipality in which households reside with information from railroads depots available from Mexlist (2014) and from Google maps to calculate the distance from head of municipality to the nearest railroad depot. US employment data at the state level comes from US Bureau of Labor Statistics 2012 (USBLS, 2012). We obtain job creation by simply dividing jobs in US state k in year $(x-5)$ over jobs in US state k in year $(x-6)$ and subtracting one from the above result. To generate variation per Mexican state, we generate an importance indicator that we constructed by looking at the percentage of consular documents that were requested by individuals from Mexican state j who lived in US state k in 2005. This information is available from IME (2008). This indicator is then multiplied by job creation in US state k in year $(x-5)$. Note that the IME

(2008) data is left intentionally without variation so that all time variation in the created variable is due to the fluctuations in job creation.

Table 1 shows the definition of variables, data sources and descriptive statistics. In the next chapter, we explain our empirical strategy in more detail.

[HERE: TABLE 1: DATA DESCRIPTION]

III. The Empirical Strategy

Studying the effect of remittances on household debt and borrowing poses several methodological challenges. First, average socioeconomic conditions among migrant households differ from those of non-migrant households due to self-selection of migrants. Second, remittances and debt may both respond to a third variable, for example health shocks (Ambrosius and Cuecuecha, 2013). Third, the causation between remittances (or migration) and debt could go in both directions: Migration could be a household coping strategy in response to high debts, or the high costs especially of informal migration could be financed through debt. In both cases, debt would precede migration rather than the other way round. Fourth, due to the complexity of the migration and remittance decisions it is hard to find a reduced form equation that will represent correctly the decisions of the household, which may lead to specification bias.

We employ several strategies in order to respond to these concerns. First, in order to address self-selection of migrants and omitted variable bias, we control for time-constant unobservable differences (for example, different motivations or capacities that are difficult to measure but are time-constant) through household fixed effects in addition to observable control variables at the household level that are related to their socioeconomic status of households and their shock histories. We also include indicators on the level of economic development of states where households live and levels of public expenditure at the municipal level, as well as an indicator of potential shocks due to rain variation at the municipality. Second, we employ an instrumental variable strategy in order to address

issues of reverse causality. To this end, we combine two instruments for remittances to Mexico previously used in the literature: First, distance to train lines as a factor that reduced the costs of migration and was therefore closely linked to the establishment of migrant social networks, and second we use variations in labor market conditions in US states where Mexican migrants reside. Finally, we use alternative definitions of our dependent variables: As an alternative to the existence of debt, we measure the effect of remittances on borrowing during the 12 months previous to the survey. We believe that concerns with respect to reverse causation are less justified in this case, because migration and the sending of remittances usually occur with delays. The incurring of debt in order to finance migration of a family member should take place before migrants become senders of remittances. Studies have found that remittance-sending often follows an inverted U-curve over time (Lucas and Stark, 1985; Cai, 2003; Liu and Reilly, 2004; cp. Carling, 2008, p. 593). According to these studies, the typical remitters would be those who have resided long enough to be well-established and have a stable income, but not so long that links with the home country have weakened. Within such a 'typical' remittance cycle, it would be difficult to imagine how recent borrowing would be causal to remittances in the same time period. Also, the use of alternative definitions for the dependent variable reduce the concern about the potential specification bias, since confirming results on different specifications imply that our results show causation and not simply a random result obtained due to ad hoc specifications.

In a first step, we estimate a conditional fixed effects logit model (Chamberlain, 1984) of the following basic form:

$$(1) DBT_{i,t} = \beta_1 REM_{i,t} + \beta_3 X_{i,t} + v_i + u_{i,t} ,$$

where *DBT* is a binary variable whether households reported to have debt. Alternatively, we use borrowing (*BOR*) during the previous year as dependent variable in order to distinguish recent loans from existing debt stocks. *REM* is the main (binary) explanatory variable. Alternatively, we use an indicator *TRN* whether at least one household member

had a nuclear family member (a parent, child or spouse) in the US. This permits us to compare the effect of remittances on debts and borrowing with the broader effects of migration on these variables. X are control variables at the household and state level, as summarized in Table 1. a is an unobserved household specific fixed effect, that enables us to control for all unobserved time-constant characteristics of households additional to the time-varying covariates X . u is the usual error term.

While this strategy allows us to control for self-selection of migrants and omitted variable bias (e.g. variables that would have an effect both on remittances and on borrowing or debt), it does not provide an answer to the direction of causality between migration and remittances on the one hand, and access to and use of loans on the other hand. We therefore provide an additional strategy, where we instrument for remittances using exogenous instruments Z , that are correlated with remittances but do not have a direct effect on debts at the household level. In the instrumental strategy, we exploit the fact that patterns of migration and remittances show a large regional variation in Mexico. For one, Mexican migration to the US has deep historical roots that date back to US labor demand in the earlier parts of the 20th century, particularly during railway constructions in the 1920s. During the Bracero guest worker program from the 1940s to 60s, US recruiters used rail lines to attract Mexican migrants (Demirgüç-Kunt et al., 2011, p. 230) and early migration was facilitated by the proximity to railway networks that considerably reduced migration costs. Due to network effects, these historical migration patterns demonstrate a strong path dependency that persists until today, a fact that we exploit in our identification strategy. As previous studies (Demirgüç-Kunt et al., 2011; López Córdova, 2005; Woodruff and Zenteno, 2007), we therefore use distance to rail lines as an instrument for remittances as explained previously. As a second instrument, we use employment creation in the US states where Mexican migrants reside, exploiting the fact that migration patterns have evolved around different migration corridors and destinations in the US vary across regions. The specific instrument used in our data is the employment creation rate in time $(t-5)$. We do not use employment creation in time t because it is known that the US and Mexican economies are synchronized, which implies that the US economic conditions at time t affect also the conditions in the Mexican credit

market at time t . Moreover, the link between the US labor market and the remittance reception is also expected to occur with some delay since migrants that sent remittances will take some time to adjust to the US labor market and will send remittances once some time has occurred since their migration. We assume then that the US job creation is correlated positively with the demand for Mexican workers in the US and therefore with the occurrence of remittances to Mexico, but not with unobserved components in eq (1). To ensure this argument is correct, we include as controls in all the regressions measures of rain at state level, the expenditure at the municipality level and the GDP at the state level.

As explained before, we create regional variation of this indicator by multiplying the job creation rate in US state k with the information obtained from IME (2008) which varies by US state k and Mexican state j . Labor market conditions in the country of destination have previously been used as instruments for remittances by Adams and Cuecuecha (2010), Adams and Cuecuecha (2013) and Anzoategui et al. (2014), among others. We combine both instruments into one indicator by multiplying the time-varying state-level indicator with the log of distance to the nearest train line.⁴ This allows us to create a different value for each of the 177 municipalities at each period and to maintain household fixed effects in the instrumental regression. Because both the instrumented variable (*REM*) and the dependent variables (*DBT*, *BOR*) are binary, we face a problem of 'forbidden regression' (Wooldridge, 2002, p. 236). Therefore, we opt for using linear regression when including instruments. This comes at a price: Coefficients from the linear regression do not show the true size of the effect. We accept this limitation of our strategy, since the main interest of the instrumental approach lies in confirming the existence of an effect (its sign and significance) rather than its magnitude.

⁴ We take $\log(\text{TRAIN}+2)$ in order to get non-zero values for all indicators.

IV. Results

Table 2 provides results from a conditional logit model with household fixed effects on eight different specifications. In Specs. I to IV, we use remittances (*REM*) as explanatory variable. In Specs. V to VII, we use the existence of close family members (a parent, child or spouse) by at least one household member in the US (*TRN*) as explanatory variable. The effect of each of the explanatory variables is estimated on the existence of debts and on borrowing during the last twelve months. All specifications control for household fixed effect (unobservable time-constant differences). In addition, specs. II, IV, VI and VIII include controls for time-varying household characteristics, as well as state level time varying characteristics.⁵

For the effect of remittances on debts and borrowing (Specs. I - IV), we find a strong and statistically significant effect in all specifications (with and without controls, both for debt and for borrowing). In contrast, we do not find a clear effect for the existence of close family ties to the US (*TRN*, Specs. V-VIII). The coefficient for *TRN* is statistically significant only in Spec VII and VIII.⁶

Size and significance of the coefficients on *REM* (and *TRN*) change only slightly when introducing further controls, additional to the household fixed effects. For both the existence of debt and for recent borrowing the size of households (*SIZHH*), whether an indigenous language was spoken in the household (*ETHNIC*) and whether the head of household earned income from work or business (*WRKHH*) have positive and significant effects. State level GDP (*GDPST*) and the log of expenditure (*EXPHH*) have negative and significant effects, indicating that households living in poorer states and that are

⁵ We include these control variables as a way to compare these results with our instrumented regressions. While in the logit regressions the municipality and state level control are not fundamental, they become very important in our instrumented regressions as they insure that more observed shocks at the municipality and state level are controlled for.

⁶ All coefficients are in logit scale. Partial effects on the response probabilities cannot be estimated from the conditional fixed effects logit model because of the unknown fixed effects parameter v_i

poorer tend to take up more debt. The age of the head of household (*AGEHH*) is not statistically significant. We also include indicators on the shock history of households. As expected, the occurrence of different types of shocks during the previous five years (health-related shocks *SHKSK*, loss of job or business failures *SHKEC*, or total loss of crop *SHKCR* or livestock *SHKLV*) increases the probability of the existence of debt and of recent borrowing. For major covariate shocks like more rain at the state level (*RAIN*) we do not find an effect on debt or borrowing.⁷

While results for *REM* in Table 2 show a correlation only (a change in remittances-receiving status is accompanied by an increase in debts and borrowing), the regressions in Table 2 provide a hint that remittances do facilitate taking up loans and that this effect is not due to reverse causality, for example the possibility that debt is larger among migrant households due to the financing of migration: First, we do not find robust effects of (a change in) migration status on the existence of debt or borrowing activities, while we do find a strong effect for remittances, suggesting that the effect operates through remittances and not through migration. Second, the correlation is positive not only for the existence of debt but also for recent borrowing. Because the financing of migration and the sending of remittances occurs with delay in a typical migration-remittance cycle, it is difficult to imagine how recent borrowing would be causal to remittances. Since we include both time-varying observables and household fixed effects, these correlations should not be driven by underlying differences among households.

[HERE: TABLE 2 FIXED EFFECTS LOGIT]

In order to address remaining doubts with respect to the endogeneity of remittances we also provide an instrumental strategy. Through the use of instruments, we address three

⁷ As pointed out in the literature, local-level coping strategies such as informal lending practices may break down in case of large covariate shocks that affect whole communities (cp. Dercon 2002).

main concerns with respect to the validity of our results. First, high debts might itself be a motivation to migrate. Second, migration might be financed through debt. In both cases, debt (or borrowing) would precede migration and remittances, rather than the other way around. Finally, it is possible that both remittances and debts respond to a third omitted variable we are not able to control for (for example, a shock we do not observe).

As mentioned above, we combine distance to railways and labor market conditions in the US states where Mexican migrants reside into one instrument Z . Table 3 shows results for the first step (linear) estimation where we predict remittances-receiving status of households from the instrument Z plus a set of exogenous control variables X . It is shown that the instrument predicts both more remittances and more family members in the US and it is statistically significant at the 1% level. Table 3 also shows consistency in the signs observed between the covariates and the dependent variables REM and TRN. Age, expenditure, household size and the occurrence of shocks all predict more remittances and household members in the US. On the other hand, ethnic origin, household members working, rain and state GDP all predict less remittances and less household members in the US.

[HERE: TABLE 3 WITH 1ST STEP RESULTS]

[HERE: TABLE 4 WITH 2ND STEP RESULTS]

Table 4 shows the results of using an instrumental variable approach while maintaining the household fixed effects.⁸ The estimation confirms the positive sign and significance of remittances with credit market outcomes. The table also shows that once we condition on the estimated remittances, we only have a significant effect for the existence of

⁸ Since the first stage for these estimations is the same OLS regression shown in Table 3, we omit this table here.

economic shocks and the state GDP variable. The economic shocks predict more debts, while the state GDP predicts less debts for richer states. The test of validity of instruments shows that while we still have a strong instrument this time it is possible that our estimations are less than 15% above or below its true value, but more than 10% above or below its true value.

The table also shows that the estimation for the case of the TRN variable is not statistically significant for any of our specifications and that the instrument is a weak instrument predicting whether or not the household has members in the US. We interpret this result as suggesting that since our instrument is linked to the strength in the US labor demand, this is in turn linked to the employment probability, the hours worked and wage offers received by migrants which ultimately govern the amount of remittances sent to Mexico. On the other hand, given the complexity of the migration decisions taken by the households, the strength in the US labor demand is not enough to generate exogenous variation to explain the migration patterns of Mexican households. Consequently, we can not conclude that our instrumental variable estimation rejects the causal relation between TRN and the DBT or BOR variables, since we do not have enough statistical evidence.

However, we can certainly conclude from the various model specifications that there is strong evidence for an effect of remittances on the existence of debts and on borrowing. What we observe is not driven by unobserved fixed effects or by reverse causality: We confirm a positive and statistically significant relationship when controlling for observable and unobservable differences across households; and when using instruments in order to control for the endogeneity of remittances.

V. Conclusion

All specifications that control for fixed effects point to a positive and statistically significant effect of remittances on debts and on borrowing. Our specifications that addressed methodological concerns of selection bias, omitted variable bias and reverse causality also confirmed the above results. We also addressed concerns about potential specification bias by employing alternative definitions of the dependent variable. We conclude that results are not driven by underlying differences between migrant

households and non-migrant households or by the endogeneity of remittances. The results provide strong evidence that the reception of remittances facilitates taking up loans, either through a demand-driven effect (receivers of remittances have a lower risk-aversion because they may rely on an additional source of income out of which to pay their debts) or through a supply-driven effect (lenders may accept remittances as collateral for loans or consider receivers of remittances to be more creditworthy because they have an additional and relatively stable source of income). While a specific test that would help decide whether our results are demand or supply driven is beyond the scope of this paper, we can say that with our current results it is more likely that the link is coming from the supply side, since the indicators observed by the researcher and most likely by the lenders (the reception of remittances) seem to be more important than the indicators observed by the borrower (whether there is a household member in the US).

The theoretical starting point of this paper was an understanding of remittances as part of a complex financial management of migrant households, in which several formal and informal instruments may exist next to each other. Because migration and financial services can both be understood as asset-building and risk-management tools, remittances and debt may, in some cases, substitute for each other – for example, when family members in the US function as a source of insurance from outside the regular household to cover emergency spending, similar to “rainy” day credit or insurance from financial institutions. In these cases, receivers of remittances may have less need to rely on lending when they face liquidity shortages. In other cases, remittances and lending may complement each other, because receivers of remittances may have unfulfilled lumpy investment options that cannot be financed by the regular remittance flow or because the same insurance function of remittances reduces lending constraints among risk-averse lenders and borrowers. However, the effect of remittances on lenders could operate even if they are risk neutral, as theory usually portrays banks, if remittances provide an information advantage vis a vis an observationally equivalent household without remittances. In this sense, the two opposing views that exist in the literature - namely that remittances function as a substitute for credit but that they may also have a positive

impact on the access to and the use of financial services – are not necessarily contradictory.

Linking remittances with financial sector development has become an important topic on the policy agenda. We believe that our study can make an important contribution to this debate by showing that the financial decisions of remittance receiving households are rather complex since they can simultaneously use remittance and credit to finance their diverse credit needs, which ultimately reveals a demand for additional financial tools among migrant households. At the same time, much of this demand is not met by the formal financial sector and there is a need for institutions to address the particular demand for financial services by remittances-receiving households from rural and lower income groups. In our study, we do not differentiate between loans from formal and from informal sources. While the ability to take up loans may enhance risk management and asset building tools of households, the literature has also pointed towards the dangers of over indebtedness especially with respect to informal loans and moneylenders that charge high interest rates. Further research is needed to understand which institutions are best suited to provide financial services to remittances-receiving households, and whether linking remittances with additional financial services may generate social or economic change within or outside households.

VI. Literature

- Acosta, P., Calderón, C., Fajnzylber, P., Lopez, H., 2008. What is the Impact of International Remittances on Poverty and Inequality in Latin America? *World Dev.* 36, 88–114.
- Acosta, P., Fajnzylber, P., Lopez, H., 2007. The Impact of Remittances on Poverty and Human Capital: Evidence from Latin American Household Surveys.
- Adams, R., Cuecuecha, A., 2010. Remittances, Household Expenditure and Investment in Guatemala. *World Dev.* 38, 1626–1641.
- Adams, R., Page, J., 2003. International Migration, Remittances and Poverty in Developing Countries. The World Bank.
- Adams, R.H., Cuecuecha, A., 2013. The Impact of Remittances on Investment and Poverty in Ghana. *World Dev.* 50, 24–40.
- Aggarwal, R., Demirgüç-Kunt, A., Martinez Peria, M.S., 2010. Do remittances promote financial development? *J. Dev. Econ.* 96, 255–264.

- Ambrosius, C., 2012. Are remittances a “catalyst” for financial access? Evidence from Mexican household data. School of Business & Economics, Discussion Paper: Economics.
- Ambrosius, C., Cuecuecha, A., 2013. Are Remittances a Substitute for Credit? Carrying the Financial Burden of Health Shocks in National and Transnational Households. *World Dev.* 46, 143–152.
- Amuedo-Dorantes, C., Pozo, S., 2004. Remittances and Insurance. Evidence from Mexican Migrants. *J. Popul. Econ.* 19, 227–254.
- Anzoategui, D., Demirgüç-Kunt, A., Martínez Pería, M.S., 2014. Remittances and Financial Inclusion: Evidence from El Salvador. *World Dev.* 54, 338–349.
- Buch, C.M., Kuckulenz, A., 2010. Worker Remittances and Capital Flows to Developing Countries. *Int. Migr.* 48, 89–117.
- Cai, Q., 2003. Migrant remittances and family ties: a case study in China. *Int. J. Popul. Geogr.* 9, 471–483.
- Calero, C., Bedi, A.S., Sparrow, R., 2009. Remittances, Liquidity Constraints and Human Capital Investments in Ecuador. *World Dev.* 37, 1143–1154.
- Carling, J., 2008. The determinants of migrant remittances. *Oxf. Rev. Econ. Policy* 24, 581–598.
- Chamberlain, G., 1984. Panel Data, in: *Handbook of Econometrics*. North Holland, Amsterdam, pp. 1247–1348.
- Collins, D., Morduch, J., Rutherford, S., Ruthven, O., 2009. *Portfolios of the Poor: How the World’s Poor Live on \$2 a Day*. Princeton University Press, Princeton.
- Comisión Nacional Bancaria y de Valores (CNBV), 2011. *Reporte de Inclusión Financiera*, Vicepresidencia de Política Regulatoria. ed.
- Comisión Nacional del Aguja (CONAGUA), 2014. *Banco Nacional de Datos Climatológicos*.
- Cox Edwards, A., Ureta, M., 2003. International Migration, Remittances, and Schooling: Evidence from El Salvador. *J. Dev. Econ.* 72, 429–461.
- Cuecuecha, A., Da Rocha, J.M., 2011. El acceso al crédito en tiempos de crisis, las remesas y la medición de la pobreza, in: Mendoza, A., Watkins, K., Watkins Fassler, K. (Eds.), *Reflexiones Sobre La Crisis Financiera*. UPAP, UNAM, Puebla, Pue.
- Demirgüç-Kunt, A., López Córdova, E., Martínez Pería, M.S., Woodruff, C., 2011. Remittances and banking sector breadth and depth. Evidence from Mexico. *J. Dev. Econ.* 95, 229–241.
- Esquivel, G., Huerta-Pineda, A., 2007. Remittances and Poverty in Mexico: A Propensity Score Matching Approach. *Integr. Trade J.* 45–57.
- Giuliano, P., Ruiz-Arranz, M., 2009. Remittances, Financial Development, and Growth. *J. Dev. Econ.* 90, 144–152.
- Gupta, S., Pattillo, C.A., Wagh, S., 2009. Effect of Remittances on Poverty and Financial Development in Sub-Saharan Africa. *World Dev.* 37, 104–115.
- Instituto de los Mexicanos en el Exterior (IME), 2008. *Matrículas consulares de alta seguridad expedidas por consulado y estado mexicano de procedencia*.
- Instituto Nacional de Estadística y Geografía (INEGI), 2014. *Banco de Información Económica. Producto Interno Bruto por Entidad Federativa*.

- Jones, R.C., 1998. Remittances and Inequality: A Question of Migration Stage and Geographic Scale. *Econ. Geogr.* 74, 8–25.
- Koechlin, V., León, G., 2006. International Remittances and Income Inequality: An Empirical Investigation. *J. Econ. Policy Reform* 10, 123–144.
- Liu, Q., Reilly, B., 2004. Income transfers of Chinese rural migrants: some empirical evidence from Jinan. *Appl. Econ.* 36, 1295–1313.
- López Córdova, E., 2005. Globalization, Migration and Development: The Role of Mexican Migrant Remittances. *Econ. J. Lat. Am. Caribb. Econ. Assoc.* Forthcom.
- Lucas, R.E.B., Stark, O., 1985. Motivations to remit: Evidence from Botswana. *J. Polit. Econ.* 901–918.
- Massey, D., Parrado, E., 1998. International Migration and Business Formation in Mexico. *Soc. Sci. Q.* 79, 1–20.
- Mexlist, 2014. Mexico Railroad Depots by State [WWW Document]. URL <http://www.mexlist.com/estaciones/>
- Orozco, M., 2004. International Financial Flows and Worker Remittances: Best Practices.
- Orozco, M., Fedewa, R., 2006. Leveraging Efforts on Remittances and Financial Intermediation.
- Rutherford, S., 2003. Money talks: Conversations with poor households in Bangladesh about managing money. *J. MicrofinanceESR Rev.* 5, 43–76.
- Sayan, S., 2006. Business Cycles and Workers' Remittances: How Do Migrant Workers Respond to Cyclical Movements of GDP at Home?
- Taylor, E.J., Wyatt, T.J., 1996. The Shadow Value of Migrant Remittances, Income and Inequality in a Household-farm Economy. *J. Dev. Stud.* 32, 899–912.
- Terry, D.F., Wilson, S.R., 2005. Beyond Small Changes- Making Migrant Remittances. Inter-American Development Bank, Inter-American Development Bank, Washington, DC.
- Teruel, G., Rubalcava, L., Arenas, E., 2012. Migration in the Family Life Survey, in: *Migration and Remittances from Mexico*. Lexington Books, Lanham, Md.
- The Banker Database, 2013. Financial Information on Mexican Banks.
- Woodruff, C., 2007. Mexican microenterprise investment and employment: The role of remittances. *INTAL-ITD Work. Pap.* 26.
- Woodruff, C., Zenteno, R., 2007. Migration Networks and Microenterprises in Mexico. *J. Dev. Econ.* 82, 509–528.
- Wooldridge, J.M., 2002. *Econometric analysis of cross section and panel data*. The MIT press, Cambridge, Mass.
- World Bank, 2010. *Migration and remittances factbook 2011*. World Bank, Washington, D.C.
- World Bank, 2013. *World Development Indicators Online Database*.
- World Bank, 2014. *Financial Inclusion Data. Mexico Dashboard*.
- Yang, D., 2005. *International Migration, Human Capital, and Entrepreneurship: Evidence from Philippine Migrants' Exchange Rate Shocks* (World Bank Policy Research Working Paper Series No. 3578).

Table 1: Data Description

variable	description	2002	2005
DBT ^a	binary variable that takes the value 1 for households that reported to have outstanding debt	0.31 (0.46)	0.25 (0.43)
BOR ^a	binary variable that takes the value 1 for households where at least one household member borrowed money from a formal or informal source during the previous 12 months	0.2 (0.4)	0.15 (0.35)
REM ^a	binary variable that takes the value 1 for households that received remittances during the previous 12 months	0.06 (0.23)	0.06 (0.24)
TRN ^a	binary variable that takes the value 1 for households where at least one household member had either a spouse, a parent or a child in the US	0.16 (0.37)	0.18 (0.38)
AGEHH ^a	age of the head of household	43.85 (15.74)	46.58 (15.5)
SIZHH ^a	number of household members	4.28 (2.06)	4.69 (2.33)
EXPHH ^a	monthly per capita spending, in Mexican pesos	7.87 (0.97)	7.97 (1.09)
SHKEC ^a	binary variable that takes the value 1 for unemployment or a business failure by any household member	0.08 (0.27)	0.06 (0.24)
SHKSK ^a	binary variable that takes the value 1 for illness or serious accident that required hospital treatment by any household member	0.13 (0.34)	0.11 (0.31)
SHKCP ^a	binary variable that takes the value 1 for total loss of crop of households	0.06 (0.23)	0.03 (0.16)
SHKDT ^a	binary variable that takes the value 1 for home or business loss, due to earthquake, flood, or natural disaster	0.01 (0.11)	0.01 (0.09)
SHKLV ^a	binary variable that takes the value 1 for loss, robbery, or death of production livestock	0.02 (0.14)	0.01 (0.11)
WRKHH ^a	binary variable that takes the value 1 for households where the household head earned income during the previous 12 months	0.8 (0.4)	0.76 (0.43)
GDPST ^b	state level GDP in thousands of Mexican Pesos (current value)	14.55 (6.72)	15.13 (6.74)
EXPMN ^c	expenditures of the municipality government, in Mexican Pesos (current values)	144.13 (68.91)	191.4 (85.8)
RAIN ^d	rain fall at state level	760.83 (318.99)	760.7 (319.)
TRAIN ^e	distance from the head of municipality to the nearest railroad depot, in kilometers	66.88 (122.45)	66.79 (122.)
USEMP ^f	Indicator on job creation in US states where Mexican migrants reside. Obtained by dividing jobs in US state k in year (t-5) over jobs in US state k in year (t-6) and subtracting one. In order to generate variation per Mexican state, we generate an importance indicator based on the percentage of consular documents that were requested by individuals from Mexican state j who lived in US state k in 2005	106 (80.29)	90.99 (137.82)

Mean values and standard errors in brackets are given separately for 2002 and 2005 and for the 7,752 observations for which data was observed at both time periods. Sources: a) MxFLS, b) INEGI (2014), c) INEGI (2014a), d) CONAGUA (2014) e) Mexlist (2014) and Google maps f) USBLS (2012) and IME (2008)