Freie Universität Berlin

Are Remittances a 'Catalyst' for Financial Access? Evidence from Mexican Household Data

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School of Business & Economics
Discussion Paper

Economics

2012/8

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February 2012

Word Count: 10,545 (excluding Annex)

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Abstract

In policy discussions, it has frequently been claimed that migrants' remittances could function as a 'catalyst' for financial access among receiving households. This paper provides empirical evidence on this hypothesis from Mexico, a major receiver of remittances worldwide. Using the Mexican Family Life Survey panel (MxFLS) for 2002 and 2005, the results from the fixed effects logit model show that receiving remittances is strongly correlated with the ownership of savings accounts and, to some degree, with the availability of borrowing options. These effects are more important for rural households than for urban households and are more important for microfinance institutions, than for traditional banks.

Keywords: Remittances, Mexico, Financial Access, Microfinance

JEL Classification: G21, O16, F24

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* I am grateful to the German Research Foundation (DFG) for financial support and helpful comments by three anonymous referees. The paper also benefitted from comments by Alfredo Cuecuecha, Irwin Collier, Gerardo Esquivel, Barbara Fritz, Diego Hernández, Ursula Stiegler, Christoph Trebesch and participants at seminaries at *Freie Universität Berlin*, *Humboldt-Universität zu Berlin*, *Colegio de México* and *Universidad Iberoamericana de Puebla.*

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Abstract

In policy discussions, it has frequently been claimed that migrants' remittances could function as a 'catalyst' for financial access among receiving households. This paper provides empirical evidence on this hypothesis from Mexico, a major receiver of remittances worldwide. Using the Mexican Family Life Survey panel (MxFLS) for 2002 and 2005, the results from the fixed effects logit model show that receiving remittances is strongly correlated with the ownership of savings accounts and, to some degree, with the availability of borrowing options. These effects are more important for rural households than for urban households and are more important for microfinance institutions, than for traditional banks.

1. Introduction

The strong increase in remittances – the money sent by migrants to their families remaining in their home country – has given rise to a major debate on the impact of these financial flows on receiving countries. This article turns around a question that – although popular in policy discussions – has received relatively little attention in the academic literature: Remittances and access to financial services among the receivers of remittances. Looking at the direct effects of remittances on households and the use of these funds alone ignores important aspects of how remittances influence receiving countries. This paper draws attention to some of the indirect effects of remittances on the economies of receiving countries via its linkages to the financial sector. Moreover, it aims to improve the understanding of financial markets in developing countries and how they relate to financial management of migrant households.

A large part of the population in developing countries lack access to financial services. In most Latin American countries, for example, only one-fourth of the population owns savings accounts, compared to more than 90 percent for most Western European countries (Honohan 2008). This lack of access to financial services among poor households limits their strategies for risk management and asset accumulation as poor households often hold onto cash or invest it in the form of fixed assets like land and cattle. Furthermore, they have limited opportunities to attain credit from formal financial institutions in order to cope with unforeseen shocks, finance larger purchases, or invest in small businesses (for a general discussion, see Armendáriz de Aghion & Murdoch (2005); for a literature review focusing on rural markets, see Conning & Udry (2005)). In this context, linking remittances with additional financial services can have positive effects not only on remittance-receiving households but also on receiving countries more generally, and has therefore become an important issue on the policy agenda (see, for example, Orozco 2004, Terry & Wilson 2005, and Orozco & Fedewa 2006). First, receivers themselves may benefit from more efficient asset-building strategies through monetary savings options and eventually by gaining access to other financial services like credit and insurance products. Beyond these direct benefits to receivers, linking remittances with financial services has potentially wider economic effects. Savings from remittances can be channelled to their most productive use and be matched with the demand for credit elsewhere, therefore also benefiting those who do not directly receive remittances themselves. To this effect, there is a wide consensus among development economists that financial institutions play a crucial role in the process of economic development (see Levine 1997 for an overview). For example, cross-country studies have shown that a relative increase in savings and credit is associated with an increase in both growth and per capita income (Goldsmith 1969; King & Levine 1993;

Thorsten Beck et al. 2000b; Thorsten Beck et al. 2000a). Access to financial services is a key dimension of financial development because a more inclusive financial sector is capable of generating higher absolute levels of savings and investment, reduces dependence on foreign capital, and leads to more equitable development (Jalilian & Kirkpatrik 2002; Thomas Beck et al. 2007).

Mexico provides an interesting case for studying the impact of remittances on financial access because more than 10 percent of Mexico's population of circa 110 million people live outside their country of birth, forming the largest group of immigrants in the US (Pew 2009). With more than 22 billion USD of remittances transferred by Mexican migrants to their home country in 2009, Mexico is one of the main receivers of remittances worldwide, after India and China (World Bank 2011a). Despite a 16 percent decrease in the sending of remittances following the 2008 US financial crisis, remittances still play an important role in the Mexican economy, as remittances were about the same size as foreign direct investment (FDI) to Mexico in 2008, contributing 2.4 percent to Mexico's GDP (World Bank 2011b). At the regional level, remittances are even more important: Michoacán und Zacatecas, the states with the highest emigration rates, had remittance-based income totalling 13.2 percent and 9.2 percent of GDP in 2006, respectively (Banco de México 2007). In Mexico, as in many other countries, remittances are usually sent and received in cash, and many remittance-receivers belong to lower-income groups, which are excluded from the (mainstream) financial system.

This paper is organized as follows: Section II summarizes the state of current research on remittances and financial intermediation, while section III introduces the Mexican Family Life Survey (MxFLS), a nationally representative panel data set at the individual and

household level that allows researchers to combine information on remittances with access to and the usage of financial services. Section IV specifies the estimation strategy of a conditional fixed effects logit model and section V discusses the results. Remittances are strongly correlated with the ownership of savings accounts and, to some degree, with the availability of borrowing options. These effects are more important for rural households compared to urban households and more important for microfinance institutions than for commercial banks. The final section summarizes these findings and presents conclusions.

2. Remittances and Financial Access: State of Current Research

In recent years, much research has been done on the manifold impacts of remittances on receiving countries.[1] This paper focuses on the effects that remittances have on access to financial services, a debate strongly dominated by policy papers and practitioners' perspectives presenting case studies on financial institutions that have included remittances in their product portfolio and offer additional financial services to remittance receivers. Most of these case studies refer to institutions from the microfinance sector that focus on lower income clients (Orozco & Hamilton 2005; Hastings 2006; Orozco 2008). Their conclusion is that receivers of remittances often match the profile of the typical clients of microfinance institutions better than those of commercial banks, and linking remittances with microfinance institutions therefore has important positive effects. While providing insights into the possibilities and the potential of linking remittances with additional financial services, these studies allow for few generalization of findings, do not systematically assess the remittance-receivers' demand for financial services or the success

of such initiatives, and do not quantify the linkages between remittances and financial intermediation.

In spite of figuring so prominently in development policy, academia has remained relatively silent on the issue, with few studies having systematically approached the impact of remittances on the financial sector. Using cross-country panel data, Aggarwal et al. (2010) provide global-level evidence that remittances are correlated with deeper financial sectors in receiving countries, measured as savings and, to a lesser degree, credit in relation to GDP. Following a similar methodology, Gupta et al. (2009) study the impact of remittances on financial development specifically for Sub-Saharan Africa and find a correlation of remittances with deposits in relation to GDP and money supply M2 in relation to GDP. Several arguments explaining why remittances could be beneficial to financial development are brought forward by these authors. First, banks may 'get to know' remittance receivers who did not previously have bank accounts through remittances, paving the way for further financial services. Second, remittances may create a demand for financial services from receivers because remittances are sent periodically and receivers need a safe place to store their savings. Finally, banks can earn income from remittance fees, creating an incentive to locate bank branches near remittance-receivers (Aggarwal et al. 2010; Aslı Demirgüç-Kunt et al. 2011). Other authors stress cases where remittances might be accepted by financial institutions as a substitute for the lack of formal income (Orozco & Fedewa 2006). Cuecuecha & Da Rocha (2011), for example, argue that changes in remittances not only affect income and poverty rates directly, but also indirectly by facilitating access to credit among receivers. Financial institutions paying remittances are able to build a financial history based on remittances for receivers who otherwise lack a

formal income – remittances could then be included as an additional source of income to a client's evaluation when requesting credit. Moreover, remittances are sent out of altruistic motives and tend to increase and stabilize a household's income (Bugamelli & Paterno 2009; Buch & Kuckulenz 2010), reducing the risk of default because remittance receivers have additional 'insurance', making them less risky debtors from a bank's point of view.

Yet, remittances may also function as a substitute for credit and insurance from formal financial institutions. Several studies have underlined that a large part of remittances are spent on health and other 'emergency' spending (Amueda-Dorantes & Pozo 2004a; Amueda-Dorantes et al. 2007; Yang & Choi 2007). Remittance-receivers who demand financing – due to a loss of work, illness, or other sudden income shocks – are able to rely on an additional and relatively stable source of income that is not present to non-receivers. Woodruff & Zenteno (2007) and Giuliano & Ruiz-Arranz (2009) explicitly argue that remittances function as a substitute for a lack of access to productive credit and play an important role in financing investment by micro-entrepreneurs, meaning that remittances compete with formal financial services, possibly reducing the demand for credits and other financial products like insurance.

Studies on remittances' impact on the financial sector – similar to other research on remittances that rely on time series central bank data – are constrained by the quality of macro data. First, reducing transfer costs for formal money transfers shifted transfers away from unregistered informal channels (friends, families, couriers, others) towards formal transfers (money transfer operators and banks). Second, central banks follow different methodologies of data collection and have changed their methodologies over time; part of the strong rise in remittances is therefore due to a formalization of remittance flows and

changes in data registration (Luna Martinez 2005; for a discussion of the Mexican case, see Rodolfo Tuirán et al. 2006; and Canales 2008). Empirical research conducted with central bank data must therefore be interpreted with caution, especially for time series data.

Demirgüç-Kunt et al. (2011) take an alternative approach to studying the impact of remittances on financial development on a meso-level in their case study on Mexico, as they cross financial data with remittance data at the level of municipalities and find that the share of households receiving remittances in a municipality is positively correlated with deposits to GDP and, to a minor degree, with credits to GDP at the municipal level.

This paper contributes to the research questions and findings pioneered by Demirgüç-Kunt et al. and Aggarwal et al., and includes important additional issues. First, the MxFLS provides a data source at the individual and household levels, including information on the migration history, monetary transfers, and the financial service usage of households, which allows me to take into account a broader set of socioeconomic variables correlated with financial service usage and remittances, and to differentiate the impact of remittances according to the socioeconomic status of receiving households. Moreover, unlike Demirgüç-Kunt et al., I do not lose information by aggregating data to the municipal level. Second, most research on the impact of remittances on the financial sector has been restricted to the impact of remittances on the commercial banking sector because, generally speaking, only institutions under national banking regulation report data to the national financial authorities. The MxFLS data includes financial service usage both on commercial banks and (often informal or semi-formal) institutions from the microfinance sector. This allows me to include the non-traditional banking sector in the analyses and to differentiate the impact of remittances on the financial sector by different kinds of institutions. For

poorer households in rural areas, where much of the Mexican migration originates (more than half of all remittance-receiving households lived in rural communities with less than 2,000 inhabitants, see below), non-traditional banking institutions are especially important, whereas commercial banks rarely open branches in rural communities. Third, from an aggregated macro-level (cross-country) or meso-level (municipal) analysis, it is not possible to distinguish between the direct effects of remittances from indirect effects: For example, is the correlation of remittances with indicators of financial sector development due to a different use of financial services among receiving households or due to externalities in the local economy that translate to the financial sector? Fourth, the same households in MxFLS are followed over time, allowing me to exploit the panel structure of the data and to control for time-constant heterogeneity between households, making my analysis less vulnerable to endogeneity concerns.

3. Data Description

The Mexican Family Life Survey (MxFLS) is a panel data survey 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. As a multi-thematic database, it combines information on financial service usage, migration histories, monetary transfers, and a large number of additional socioeconomic characteristics of households and individuals. The raw data is organised in several thematic books. The present study relies on information from Book 1 (household consumption), Book 2 (information on type and value of assets owned by the household), Book 3a (employment situation), Book 3b (migration history of household members, transfers, use of financial

services), and Book C (general household characteristics like the geographic location of the households, housing conditions and the number, education levels and age of households members). MxFLS is a nationally representative sample of households that were selected under criteria of 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 were 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. Some households fell out of the sample because they could not be located during the second time period for various reasons (they migrated, were deceased, etc). New households entered the sample when households from 2002 split into different households in 2005 (when household members left the household e.g. in the case of marriage or when household members moved away for other reasons). In order to exploit changes during time, I use a balanced data set where I only include the 7,572 households that were observed in both time periods (868 households of the 2002 sample were not included in the 2005 sample, an attrition rate of 11.5 percent). Although not explicitly designed for studying the relationships between remittances and the financial sector, several sections contain information that can be exploited for the purpose of this study.

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. On average between 2002 and 2005, six percent of all households received remittances.[2] In rural communities with less than 2,000 habitants (the definition applied by the national statistics office, INEGI, for rural households), 7.8% of all households received remittances, compared to 4.8 percent of households in urban areas.

Access to financial services can be understood and measured in different ways. For example, a household might have access to (often unregulated and semi-formal) credit unions or savings banks, but not to commercial banks; or might have access to credit, but not to savings options. Here, I use two alternative indicators to measure financial access: First, whether at least one household member owns a savings account with a financial institution, a measurement frequently used in literature on financial access (for example Honohan 2008). Alternatively, I use access to borrowing options from financial institutions as an indicator for financial access – where households can ask for credit without owning a savings account. Many institutions in microfinance, such as the most important player in the Mexican Microfinance sector – 'Compartamos' –, focus on lending and do not offer savings accounts. In the case of credit, I ask for the theoretical availability of credit rather than its actual use because I want to measure access – it is more interesting to know whether households are able to receive credit if they wanted to, not if they really did: Households simply may not have demand for credit. In the case of savings, I am not able to measure the availability of savings options and instead measure the actual use (ownership)

of savings accounts.[3] Using two alternative indicators for financial access allows me to draw a more nuanced picture on the impact of remittances on different dimensions of financial access.

Questions regarding the use of financial services were asked individually to all adult household members. Based on this information, I create a dummy variable that takes the value '1' when at least one household member owns a savings account with a financial institution (commercial banks, credit unions, savings banks, or other formal or semi-formal institutions from the microfinance sector). Concerning credits, I proceed in the same way and create dummies for each household based on whether at least one household member knows a financial institution where he/she would be able to obtain a credit. On average, over 2002 and 2005, at least one household member owned a savings account in 17 percent of all Mexican households; in around 30 percent of households, at least one member had borrowing options with a financial institution. These data refer to different types of financial institutions and, next to the traditional banking sector, also include credit unions, savings banks, and other deposit-taking or lending institutions that offer financial services to lower-income segments of the population. Many of these institutions have a local focus only and, in some cases, are not formally regulated. Eight percent of households had a savings account with a non-traditional banking institution from the heterogeneous microfinance sector (compared to 11 percent with commercial banks) and 21 percent of households had borrowing options with a microfinance lending institution (compared to 17 percent that had borrowing options with a commercial bank).[4] Among rural households, financial access is more restricted: Only nine percent of rural households owned a savings account compared to 22 percent among urban households; and 22 percent of rural

households had borrowing options with a financial institution compared to 36 percent among urban households. Among rural households, financial access is particularly limited with respect to commercial banks, which rarely open branches in rural communities. While financial services offered by microfinance institutions play an important role both for households from urban and for households from rural communities, their importance relative to commercial banks is stronger among rural households (see Table 1).

In order to control for differences between households, additional variables were taken into account. I first created a poverty score for each household describing the probability of the household falling below a certain poverty line, valued 0 (lowest probability) to 100 (highest probability); this index is based on Schreiner (2009) and combines information on the number of children in the household, education levels, employment situation, housing conditions, and household assets (see Annex 1 for a more detailed description). The score is used as a proxy for the socioeconomic status of a household through a one-score summary, which allows for the controlling of a number of household characteristics and several dimensions of poverty without including them separately in the regression. Next to this non-monetary poverty indicator, I also included the monthly per capita spending of households as a proxy for income levels. The regression additionally takes into account the size of households, whether the household's head earned income from work or business, and whether households benefitted from cash-transfer programs. Table 1 provides a summary of the variables used and some descriptive statistics, with a separate description for the rural and urban subsets.

Table 1: Description of Variables and Summary Statistics

var.	description		pooled	rural	urban
REM	binary variable that takes the value '1' for households that receive remittances	*mean*	6.1%	7.8%	4.8%
		# obs.	*14,862*	*6,166*	*8,696*
SAV	binary variable that takes the value '1' for households where at least one household member owns a savings account with a financial institution	*mean*	16.7%	9.0%	22.4%
		# obs.	*13,374*	*5,697*	*7,677*
	… with a non-traditional banking institution from the microfinance sector (savings banks, credit unions, etc.)	*mean*	7.6%	3.5%	1.8%
		# obs.	*12,055*	*5,372*	*6,683*
	… with a commercial bank	*mean*	11.3%	6.2%	15.4%
		# obs.	*12,566*	*5,525*	*7,041*
BOR	binary variable that takes the value '1' for households where at least one household member knows a financial institution where they could obtain credit	*mean*	30.2%	21.6%	36.4%
		# obs.	*14,572*	*6,100*	*8,472*
	… from a microfinance institution	*mean*	21.1%	15.8%	24.9%
		# obs.	*14,572*	*6,100*	*8,472*
	… from a commercial bank	*mean*	17.6%	1.2%	23.0%
		# obs.	*14,572*	*6,100*	*8,472*
CON	monthly per capita spending, in Mexican pesos	*mean*	1,186	767	1,478
		s.e.	*[1,612]*	*[1,039]*	*[1,857]*
		#obs	*15,144*	*6,208*	*8,936*
POV	One-score summary for the probability that the household falls below a certain poverty line, from 0 (highest probability) to 100 (lowest probability). The index is adapted from Schreiner (2009) and combines information on the number of children, education levels, employment situation, housing conditions, and household assets (see Annex 1)	*mean*	58	50	63
		s.e.	*[17]*	*[18]*	*[15]*
		#obs	*15,144*	*6,208*	*8,936*
SIZ	number of household members	*mean*	4.5	4.7	4.4
		s.e.	*[2.2]*	*[2.4]*	*[2.1]*
		#obs	*15,144*	*6,208*	*8,936*
GOV	binary variable that takes the value '1' for households that benefitted from cash-transfer programs during the previous 12 months	*mean*	16.6%	33.5%	4.9%
		# obs.	*15,144*	*6,208*	*8,936*
WRK	binary variable that takes the value '1' for households where the household's head earned income during the previous 12 months	*mean*	77.9%	76.0%	79.2%
		# obs.	*15,144*	*6,208*	*8,936*
RUR	binary variable that takes the value '1' for households that live in locations with less than 2,000 inhabitants	*mean*	41.0%		
		# obs.	*15,144*	*6,208*	*8,936*

Source: MxFLS 2005 and 2002. Missing values for household size, household consumption, government transfers, whether household heads earned income, and for the creation of the poverty score have been imputed using the 'mice' package (Buuren & Groothuis-Oudshoorn 2010) in the statistical software R (R Development Core Team 2009).

Table 2 compares the ownership of savings accounts and the availability of borrowing options among remittance-receiving and non-receiving households separately for rural and for urban households and for different types of financial institutions. On average, receiving households have better access to financial services, both with respect to the ownership of savings accounts and with respect to the availability of borrowing options. Differences between the two groups are stronger for savings accounts than for borrowing options and more striking when the comparison is restricted to rural households only; the table also shows that differences between remittance-receiving and non-receiving households are stronger for microfinance institutions (MFI) than for commercial banks.

Table 2: Share of Households (%) with Financial Access, for Remittances-Receiving and Non-Receiving Households from Rural and from Urban Communities

		rural		**urban**	
		non-receivers	*receivers*	*non-receivers*	*receivers*
	# obs.	*5,683*	*483*	*8,278*	*418*
savings account	*any financial institution*	8.0	12.0	19.6	23.2
	MFI	*2.9*	*5.2*	*8.2*	*11.5*
	commercial banks	*5.4*	*6.8*	*12.4*	*13.6*
borrowing options	*any financial institution*	20.5	31.1	35.4	38.3
	MFI	*14.8*	*24.6*	*24.0*	*29.7*
	commercial banks	*9.8*	*13.5*	*22.5*	*19.1*

Source: Own calculation based on MxFLS 2002, 2005. Data is given as average for the pooled data from 2002 and 2005. Percentage shares for MFI and commercial banks do not sum up to the shares for any financial institution because households can have savings accounts and borrowing options with both types of financial institutions.

Table 2 only provides a static picture on access to financial services among Mexican households and should not be interpreted causally. The econometric strategy belwo exploits

the panel structure of the data by observing how changes in remittances-receiving status are correlated with changes in financial access over time. A summary of the time variation for the variables on remittances and on financial access is given in Table 3. Many of the households who received remittances changed their status between 2002 and 2005. While 1.3 percent of all households received remittances in both years, almost ten percent received remittances in only one of the two years. This large variation in the remittance-receiving status of households occurred within a period of intense migratory movements between Mexico and the US, and a strong increase in registered remittances. Corona & Tuirán (2008) estimate that 400,000 emigrants left Mexico every year in the early 2000s, corresponding to a yearly net emigration rate of roughly 0.4 percent of Mexico's population of 100 million. In addition, the number of temporary migrants who regularly moved between Mexico and the US was estimated to lie at around 600-800,000 (ibid). These migratory processes influenced remittances to Mexican households in several ways. On the one hand, households turned into remittance-receiving households through the emigration of family members. Between 2000 and 2006, registered remittances to Mexico grew by an average of more than 26 percent on a yearly basis (World Bank 2011a). On the other hand, households that received remittances in 2002 may not have received remittances in 2005, either because family members returned to Mexico, because monetary support was not given permanently but only for specific one-time purposes, or because transnational links became weaker with time ("remittances-decay-hypotheses", e.g. Merkle & Zimmermann 1992). Changes in remittance-receiving status may also have been a result of changes in household composition, for example when household members who formerly received remittances emigrated themselves or left the household for other reasons (such as death, marriage, national migration, or others).[5]

Table 3: Time Variation in Remittance-Receiving Status and Financial Access

	no. of households observed	**both years (%)**	**2002 only (%)**	**2005 only (%)**	***households with variation in t (%)***
receiving remittances	*7,290*	1.3	4.5	5.2	*9.7*
savings account	*5,973*	7.0	10.6	8.0	*18.6*
borrowing options	*7,043*	12.2	13.4	22.7	*36.1*

Source: Own calculation based on MxFLS 2002, 2005

With respect to the ownership of savings accounts and the availability of borrowing options, many households also reported a change in their status between 2002 and 2005: Almost 19 percent of households reported a change of status with respect to savings account, and more than 36 percent with respect to borrowing options. Reasons for changes in financial access may be due to changes in the socioeconomic status of households (including the reception of remittances) or changes occurring within the financial sector (e.g. the appearance of new and different institutions or changes in their policy and/or the supply of financial services). As with remittances, time variation in access to financial services may also reflect changes in household compositions. While more households in 2005 had borrowing options compared to 2002, such a positive tendency is not visible for the ownership of savings accounts.

4. Model Specification

I am interested in the effect of receiving remittances on access to financial services. The alternative indicators for measuring financial access - the ownership of savings accounts and the availability of borrowing options - are measured as dummy variables that take the value '1' for households with financial access in a specific time period. The effect of

receiving remittances on this binary access variable can be estimated with a panel logit model of the following general form:

$$\Pr\left(ACC_{it} = 1\right) = \frac{\exp\left(\beta_1 REM_{\mathrm{it}} + \beta_2 \mathrm{X}_{\mathrm{it}} + v_i\right)}{1 + \exp\left(\beta_1 REM_{\mathrm{it}} + \beta_2 \mathrm{X}_{\mathrm{it}} + v_i\right)},$$

where the probability of having financial access ACC depends on whether household i received remittances (REM) in time period t, a Matrix of time-variant explanatory variables X_{it} and household fixed effects v_i. Here, β are the estimated coefficients. The time-variant variables in X_{it} include household size, the log of per capita consumption, a multi-dimensional poverty score, whether households benefitted from cash-transfer programs, and whether the household head earned income from work or business (see Table 1 for a description). Next to these time-variant variables, v_i contains all time-constant variables that determine access and may also be correlated with receiving status of households, such as their geographic location, cultural variables, and generally different propensities to use financial services.[6]

As an alternative to the fixed effects model, estimation can be done using random effects where the unobserved values v_i are themselves given a probability distribution (cp. Wooldridge 2002, p.474f). Estimations from the random effects model are, however, biased if v_i is not independent across observations, as it would be expected in most applications. The main advantage of panel data is precisely to get rid of the unobserved effect and therefore to reduce the danger of biased estimates. Remittance-receiving households may differ from non-receiving households on dimensions that are difficult to control for directly with cross-sectional data, such as cultural differences, or other latent differences in motivation and skills, etc. Using a Hausman-type test, the assumption that the coefficients

from the random effects model are unbiased can formally be tested by comparing them to the unbiased estimates from the fixed effect model.

As shown by Chamberlain (1980; 1984), the fixed effects logit model can be estimated by conditional maximum likelihood, where the constant household fixed effects v_i are conditioned out of the likelihood function.[7] However, getting unbiased estimates from the conditional fixed effects logit model has several trade-offs: First, the coefficients β are estimated from households only with a variation on the response variable (all those households with variation in financial access as shown in Table 3), whereas households without variation in this variable drop out of the likelihood function. The number of observations from which to estimate an effect of remittances on financial access is therefore lower than the total number of households in the sample. Consequently, the standard errors from the estimation can be expected to be larger, especially with short time periods as in this case. Second, partial effects on the response probabilities cannot be estimated unless values are plugged in for the unknown parameter v_i. Estimation results therefore have to be interpreted as odds ratios. Finally, no coefficients can be estimated for the constant variables; this is, however, not a serious concern since the main interest lies on the correlation of remittances with access to financial service, while constant variables such as the location of households act as control variables.

5. Regression Results

After evaluating different fits to the data, alternative specifications for the logit model are presented in Table 4a (for the ownership of savings accounts) and 4b (for the availability of borrowing options). Specifications I and II give results for all households and for all kinds

of financial institutions, alternatively estimated with a random effects model (spec. I) and with household fixed effects, using conditional maximum likelihood (spec. II). Coefficients for the two indicators for financial access in Table 4a and 4b follow, in general, similar tendencies in the random effects and the fixed effects version of the model. In specification I without households fixed effects, additional time-invariant variables are included for the location of households. The coefficients for 'rural' are negative and significant in both Tables 4a and 4b, confirming that rural households had a lower probability of having access to financial services. In addition, state dummies for 16 of the 32 Mexican states from which households were sampled are included in order to control for regional differences that are not captured by variables at the household level. The models with household fixed effects are preferred over the random effects models because they allow controlling for all time-invariant characteristics of households. The Hausman test statistics of 110 (Table 4a) and 40 (Table 4b) on 7 degrees of freedom lead to a rejection of the model without fixed effects.

In addition to the pooled model in specification II, specifications III to VIII show results from the fixed effects model for different subsets and for alternative definitions of the dependent variable. The pooled fixed effects regressions on all financial institution (spec. II) show that the probability of having financial access, measured either as the ownership of a savings account or as the availability of borrowing options, is lower for poor households. This is true for the monetary poverty indicator (log of monthly per capita spending) as well as for the non-monetary poverty indicator (poverty score). This correlation is as expected, because poor households face more obstacles in gaining access to financial services. The probability of having access to financial services is also higher for households where the

household head gained income from work or business. The larger the household size, the higher the probability that at least one household member has access to financial services. Having benefitted from cash transfer programs is also positively correlated with financial access. Government support programs may have a positive effect on the socioeconomic status of households and could also have a positive influence on access to financial services when paid through financial institutions. This correlation is, however, weak and statistically significant (at a 10% level) only for the ownership of a savings account.

The main interest lies on the correlation between remittances and financial access. With respect to the ownership of savings accounts, the coefficient for remittances is large and significant. The coefficient is larger in the fixed effects model (spec. II), compared to the random effects model (spec. I), indicating that the estimation from the cross-sectional variation across households underestimates the correlation between remittances and financial access.

The correlation between remittances and the ownership of savings accounts differs across different groups and for different types of institutions. The pooled models on all households (specs. I and II) include an interaction term for remittance-receiving status with the poverty score of households. The negative and statistically significant interaction term between receiving status and poverty score implies that the effect of remittances on the ownership of savings accounts is larger for poor households. For them, receiving remittances increases the probability of owning a savings account in a sizeable manner, while for richer households the probability of owning a savings account increases much less (or does not increase) with remittances.

These differences in the effect of receiving remittances on financial access between households from different socioeconomic backgrounds are also reflected in different patterns among urban compared to rural households, which are generally characterized by higher poverty rates. Dividing the sample into an urban and a rural subset shows a large and statistically significant effect of remittances on the ownership of savings accounts for rural households (specs. VI to VIII), while the coefficient is smaller for urban households and statistically significant at a 10%-level only in spec. III. Taking a closer look at different types of institutions shows that the positive correlation between remittances and the ownership of savings accounts within rural households is dominated by non-traditional institutions from the microfinance sector (spec. VIII) because the size and statistical significance of the coefficient is lower for commercial banks (spec. VI).

As mentioned above, 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; probabilities must therefore be interpreted as odds ratios.[8] For example, in the case of ownership of savings accounts among rural households (spec. III in Table 4a), the odds for receivers ($REM = 1$) over the odds of non-receivers ($REM = 1$) is $\exp(1.9) \approx 4$, or 300% higher, holding other variables at a fixed value. Especially among rural households, the effect of remittances on the ownership of savings account is large in size and highly significant compared to other predictors related to the socioeconomic status of households.

With respect to the availability of borrowing options (Table 4b), the effect of remittances is less clear than in the case of savings accounts and the hypothesis that remittances may be accepted as collateral by financial institutions and therefore facilitate access to credit is only supported to some degree by the data. Whereas the coefficient for remittances and its

interaction with the poverty score is statistically significant in the random effects specification (spec. I), the pooled fixed effects specification (spec. II) does not point to a statistically significant relationship when an interaction term is included. In the alternative subsets (spec. III – VIII), a statistically significant effect at a 10% confidence level is found for rural households, where the effect is significant for microfinance institutions, but not for commercial banks. A higher significance of this coefficient for microfinance institutions is plausible because, in general, commercial banks would not be expected to accept income from non-formal income like remittances as collateral for loans.[9]

Table 4a: Logit Regression on the Likelihood of Owning a Savings Account

	Random Effects	Conditional Maximum Likelihood (Household Fixed Effects)						
subset	*pooled*		*urban*			*rural*		
Dep. Variable	*any inst.*	*any inst.*	*any inst.*	*banks*	*mfi*	*any inst.*	*banks*	*mfi*
	I	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VIII*
(Intercept)	-11.29***							
	[.443]							
RUR	-.460***							
	[.085]							
REM	1.371***	2.577***	.532*	.504	.477	1.392***	.929**	2.767***
	[.512]	*[.877]*	*[.272]*	*[.350]*	*[.406]*	*[.388]*	*[.459]*	*[1.044]*
REM*POV	-.017**	-.028**						
	[.008]	*[.014]*						
CON	.711***	.345***	.314***	.357***	.286**	.448***	.682***	.13
	[.043]	*[.070]*	*[.083]*	*[.104]*	*[.134]*	*[.142]*	*[.19]*	*[.242]*
GOV	.108	.293*	.442	.586	.416	.297	.322	.329
	[.105]	*[.169]*	*[.323]*	*[.441]*	*[.465]*	*[.213]*	*[.274]*	*[.353]*
POV	.049***	.016**	.013*	.004	.027**	.018	.031**	.013
	[.003]	*[.006]*	*[.007]*	*[.009]*	*[.012]*	*[.011]*	*[.015]*	*[.018]*
WRK	.313***	.439***	.423**	.194	.843***	.458	.473	.611
	[.082]	*[.162]*	*[.200]*	*[.254]*	*[.320]*	*[.290]*	*[.380]*	*[.498]*
SIZ	.297***	.105*	.092	.152	.079	.205	.274	.108
	[.019]	*[.059]*	*[.068]*	*[.096]*	*[.096]*	*[.131]*	*[.182]*	*[.202]*
state fixed effects	*(yes)*	*(no)*	*(no)*	*(no)*	*(no)*	*(no)*	*(no)*	*(no)*
log likelihood	*-5058*	*-771*	*-560*	*-346*	*-237*	*-199*	*-128*	*-76*
# obs.	*13,374*	*2,233*	*1,719*	*1,083*	*725*	*514*	*342*	*189*
# parameters	*25*	*7*	*6*	*6*	*6*	*6*	*6*	*6*
Hausman Chi^2 (dof)		*110.4 (7)*						

Stars denote significance at 1 percent (***), 5 percent (**) and 10 percent (*). Results are reported for different subsets and definitions of the dependent variable. See Table 1 for the definition of variables. Hausman test statistics are given for spec. II (with household fixed effects) against spec. I (random effects).

Table 4b: Logit Regression on the Likelihood of Having Borrowing Options

	Random Effects	Conditional Maximum Likelihood (Household Fixed Effects)					
subset	*pooled*		*urban*			*rural*	
Dep. Variable	*any inst.*	*any inst.*	*any inst.*	*banks*	*mfi*	*any inst.*	*banks*	*mfi*
	I	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VIII*
(Intercept)	-6.97***							
	[.263]							
RUR	-.344***							
	[.051]							
REM	.729**	.375	.165	-.103	.307	.329*	.224	.346*
	[.318]	*[.476]*	*[.201]*	*[.22]*	*[.216]*	*[.18]*	*[.251]*	*[.193]*
REM*POV	-.009*	-.002						
	[.005]	*[.008]*						
CON	.349***	.228***	.220***	.200***	.254***	.243***	.357***	.19**
	[.026]	*[.044]*	*[.057]*	*[.061]*	*[.066]*	*[.073]*	*[.102]*	*[.084]*
GOV	.056	.049	.367*	.158	.445*	-.079	-.076	-.063
	[.063]	*[.101]*	*[.214]*	*[.258]*	*[.231]*	*[.118]*	*[.163]*	*[.134]*
POV	.032***	.019***	.019***	.016***	.018***	.017***	.023***	.012*
	[.002]	*[.004]*	*[.005]*	*[.006]*	*[.006]*	*[.006]*	*[.008]*	*[.007]*
WRK	.274***	.113	-.041	-.357**	.008	.351**	-.008	.362*
	[.053]	*[.109]*	*[.146]*	*[.162]*	*[.159]*	*[.173]*	*[.222]*	*[.202]*
SIZ	.257***	.347***	.437***	.610***	.305***	.200***	.268***	.144*
	[.012]	*[.045]*	*[.062]*	*[.082]*	*[.061]*	*[.070]*	*[.091]*	*[.079]*
state fixed effects	*(yes)*	*(no)*	*(no)*	*(no)*	*(no)*	*(no)*	*(no)*	*(no)*
log likelihood	*-8110*	*-1761*	*-1122*	*-902*	*-891*	*-598*	*-353*	*-457*
# obs.	*14,572*	*4,402*	*3,088*	*1,945*	*2,108*	*1,314*	*623*	*961*
# parameters	*25*	*7*	*6*	*6*	*6*	*6*	*6*	*6*
Hausman Chi^2 (dof)		*40.2 (7)*						

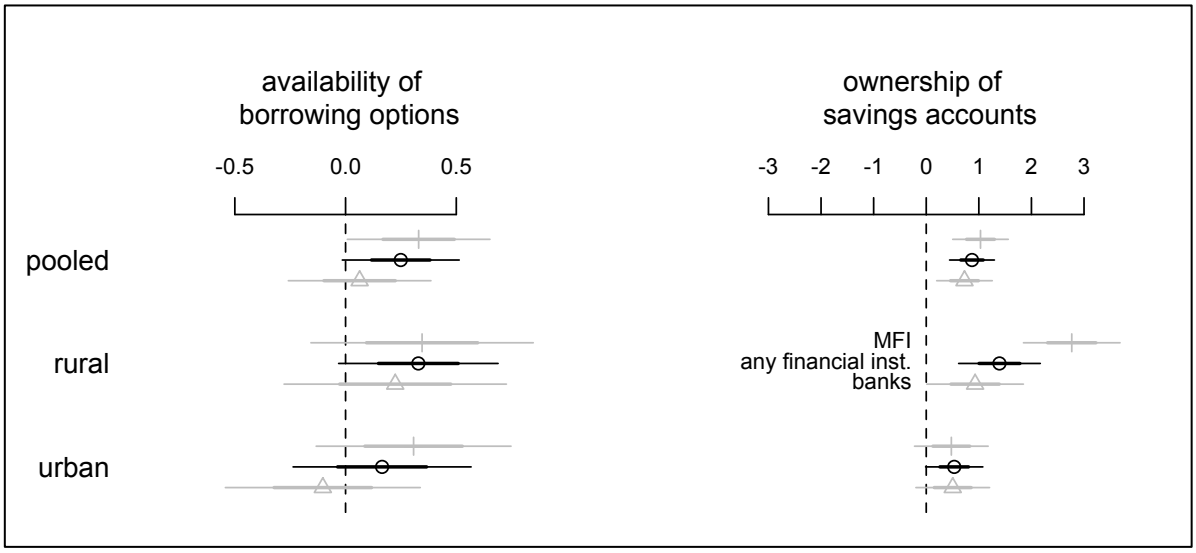
Stars denote significance at 1 percent (***), 5 percent (**) and 10 percent (*). Results are reported for different subsets and definitions of the dependent variable. See Table 1 for the definition of variables. Hausman test statistics are given for spec. II (with household fixed effects) against spec. I (random effects).

In addition to the regression outputs in Tables 4a and 4b, Figure 1 plots coefficients and 95% confidence intervals for remittance-receiving status in order to graphically summarize how remittances affect the availability of borrowing options (left graph) and the ownership of savings accounts (right graph) for different subgroups and for different outcome variables. Coefficients are given for the pooled model (at the top, as spec. II without the interaction term on poverty), for the rural subset (at the center, as spec. III to V), and the urban subset (at the bottom, as spec. VI to VIII). Black lines within each set of coefficient lines are based on a regression on all financial institutions. Upper grey lines show regression results on non-traditional banking institutions only (credit unions, savings banks, and other institutions from the microfinance sector), and lower grey lines refer to commercial banks only.

As discussed, Figure 1 reveals a stronger effect for savings accounts than for borrowing options, and a stronger and more significant effect for the rural subset and for the specifications based on microfinance institutions only. Linkages between remittances and the financial sector are more important for non-traditional financial institutions from the microfinance sector than for the commercial banking sector. These results support the argument made by Orozco & Hamilton (2005), Hastings (2006), and Orozco (2008), among others, that institutions from the microfinance sector are often 'closer' to remittance-receivers, both socially and geographically, and are therefore better positioned to link remittances with further financial services. It seems that remittances function as a 'catalyst' for financial access, especially for rural households from lower income groups, who tend to use non-traditional financial institutions from the microfinance sector more than

commercial banks. This confirms the first impression from the simple data description in section III (Table 2) after a more thorough statistical analysis.

Figure 1: Estimated Coefficients for Remittance-Receiving Status, for Different Access Indicators and Subgroups



The graph plots the estimated coefficients for remittance-receiving status on the ownership of savings accounts and the availability of borrowing options with 50 percent and 95 percent confidence intervals for all (upper plotted lines), rural (middle) and urban (lower plotted lines) households. The black lines in the middle of each set of plotted lines show estimates and confidence intervals for the regression on all types of financial institutions. Alternatively, I also provide estimates for a regression on microfinance institutions only (upper grey lines) and on commercial banks only (lower grey lines). Estimates are given in logit scale.

The model has been estimated from variation within households, controlling for time-constant heterogeneity. Results should therefore not be biased due to unobserved differences across households, such as motivations and skills, which is a common concern in migration research. Two arguments could still be brought forward against a causal interpretation of the results. Fist, migration might be financed through loans from financial

institutions and therefore be correlated with remittances. However, financial institutions are not only an improbable source of financing largely informal migration, where repayment is difficult to enforce. Also, the conditional fixed effects logit uses information from households only with variation on the dependent variable. Households with financial access prior to receiving remittances do not report changes on this variable and therefore drop out of the likelihood function.

A second possible objection to a causal interpretation of the findings is that access to financial services makes receiving remittances easier. This is not a very strong concern because transfers are in most cases cash-based and do not require bank accounts. Moreover, the strongest effect is found for microfinance institutions, which are usually not integrated into global payment systems. The assumption that remittances are not driven by changes in financial access can be tested empirically, taking the existence of close family relationships across borders, which have been identified as a good predictor for sending remittances in a large number of studies (Carling 2008, p.588) as a proxy for remittances. Table 5 shows results for the likelihood of owning a savings accounts or of having borrowing options with a financial institution, replacing remittances with a variable on the existence of close relatives (either a parent, child, spouse, or sibling) in the US. Again, results from the fixed effects specification are given for the urban and the rural subset next to a pooled specification on all households, and alternatively for the ownership of savings accounts and for the availability of borrowing options. Results using a proxy variable for remittances confirm the general findings. Also, in this case, the correlation is more relevant for savings accounts and stronger for rural households compared to urban households. Coefficients are smaller than in the direct regression on remittances, which is plausible considering that the

number of observations with close relatives in the US (around 34 percent) is considerably larger than the number of remittance-receiving households (around six percent).

Table 5: Logit Regression on the Likelihood of Having Financial Access, Using the Existence of Close Relatives in the US as a Proxy for Remittances

	Conditional Maximum Likelihood (Household Fixed Effects)					
Dep. Variable	*ownership of savings accounts*			*availability of borrowing options*		
subset	*pooled*	*urban*	*rural*	*pooled*	*urban*	*rural*
	I	*II*	*III*	*IV*	*V*	*VI*
MIG	.549***	.464***	.899***	.088	-.102	.43***
	[.131]	*[.153]*	*[.282]*	*[.084]*	*[.104]*	*[.148]*
CON	.353***	.312***	.479***	.233***	.225***	.254***
	[.070]	*[.083]*	*[.140]*	*[.044]*	*[.057]*	*[.073]*
GOV	.364**	.513	.421**	.053	.365*	-.074
	[.169]	*[.325]*	*[.215]*	*[.101]*	*[.214]*	*[.118]*
POV	.013**	.011	.020*	.018***	.019***	.016***
	[.006]	*[.007]*	*[.011]*	*[.004]*	*[.005]*	*[.006]*
WRK	.355**	.406**	.189	.111	-.042	.342**
	[.161]	*[.199]*	*[.291]*	*[.109]*	*[.146]*	*[.173]*
SIZ	.069	.069	.121	.346***	.444***	.200***
	[.058]	*[.068]*	*[.122]*	*[.045]*	*[.062]*	*[.070]*
log likelihood	*-771*	*-560*	*-199*	*-1761*	*-1122*	*-599*
# obs.	*2,233*	*1,719*	*514*	*4,403*	*3,088*	*1,315*
# parameters	*6*	*6*	*6*	*6*	*6*	*6*

The variable 'MIG' is a binary variable that takes the value '1' for households where at least one member had a close relative in the US. The dependent variables 'ownership of savings accounts' and 'availability of borrowing options' refer to any kind of financial institution (commercial banks or MFI). Stars denote significance at 1 percent (***), 5 percent (**) and 10 percent (*).

6. Conclusion

This study contributes to the understanding of how remittances influence economic development in receiving countries by focusing on a relatively neglected research topic, the impact of remittances on access to financial services. The results are important because they underline some of the indirect effects of remittances on receiving countries, while focusing solely on the spending of remittances misses an important part of the picture.

As the results show, remittances have an important effect on the ownership of savings accounts among receiving households in Mexico and, to some degree, on the availability of borrowing options. The presented evidence based on household data confirms that previously found correlations between remittances and financial development using either municipal level bank data (Aslı Demirgüç-Kunt et al. 2011) or cross-country central bank data (Aggarwal et al. 2010; Gupta et al. 2009) are not (or not only) due to externality effects in the local economy, but that remittances affect the financial sector directly through better access among receiving households. Remittances are the most important as a 'catalyst' for financial access for poorer households from rural areas, while they make little difference to wealthier households from urban areas.

Previous studies from aggregated data could not differentiate the impact of remittances according to different types of institutions because non-traditional financial institutions from the microfinance sector usually fall outside banking regulations and are therefore not captured by official data. Nevertheless, they are the most important financial service providers for low-income households in developing countries. At least in the case of Mexico, traditional banks do not seem to be the most adequate institutions for linking remittances with further financial services, though technically better prepared for including

remittances into their product portfolio. Many banks in Mexico do pay remittances: 'Bancomer' alone has an estimated share of 60 percent in the Mexican remittance market (Hernández-Coss 2005). However, in most cases, remittances are sent and received in cash, with bank branches functioning as paying agents to US-based money transfer operators. Commercial banks apparently use their market power only to a limited degree for gaining new clients among remittance-receivers.

Findings support the argument that microfinance institutions are particularly well suited for linking remittances with further financial services, although they face several obstacles in doing so (see Orozco & Hamilton 2005; Hastings 2006; Orozco 2008). These institutions typically have a local focus and are usually not integrated into national, and even less into global, payment systems. They may not often have the institutional capacities for complex cross-border transfers in terms of liquidity management and information management systems, among others, either. Additionally, regulatory constraints regarding activities in foreign currencies or restrictions in offering certain financial services can be an obstacle for MFIs to enter remittance markets (Sander 2008). From a policy perspective, the challenge lies in providing adequate regulatory frameworks for microfinance institutions and implementing policies that help them bridge their local and pro-poor focus with access to global payment systems.

The lack of access to financial services and the concentration of commercial banks on urban centers and high-income neighbourhoods are typical features of many developing countries. Findings from the case study on Mexico may therefore bear lessons for other countries as well, where receiving households belong to rural and/or lower income segments that are typically not attended by the banking sector. Remittances are private

income of transnational households – institutional frameworks that open monetary savings and borrowing options and provide more efficient use of remittances for families are therefore more promising than a paternalistic debate on the 'correct' use of these incomes.

Notes

[1] Research on the impact of remittances on the receiving countries has focused on reducing poverty (Adams & Page 2005), the creation of growth through multiplier effects (Durand et al. 1996; Glytsos 2005), and their ambiguous effects on inequality in remittance-receiving countries (Jones 1998; Koechlin & León 2006; P. Acosta et al. 2008). More pessimistic authors have criticized remittances for reducing incentives for productive investment of resources in the countries of origin (Chami et al. 2003), possibly leading to a loss in international competitiveness through the appreciation of the exchange rate (Amueda-Dorantes & Pozo 2004b; P. A. Acosta et al. 2009), and the fact that money acquired from remittances may be spent on luxury goods with few benefits for the local economy (Lipton 1980; Lazaar 1987; Binford 2003). Recently, more optimistic positions have dominated research. A number of studies have found empirical evidence that receivers of remittances spend a larger share of their income on education (Cox Edwards & Ureta 2003; Adams & Cuecuecha 2010), health (Amueda-Dorantes et al. 2007; Adams & Cuecuecha 2010), and entrepreneurship (Massey & Parrado 1998; Woodruff & Zenteno 2007). Other studies have addressed the impact of remittances on the balance of payments of remittance-receiving countries (Bugamelli & Paterno 2009; Singer 2010; Buch & Kuckulenz 2010). As a-cyclical source of external finance, they help to stabilize the balance of payments and can play a strategic role in the prevention of financial crises. In the wake of the recent global financial crises, remittances have also proven to be more stable than other private capital flows like private lending, foreign direct investment, or portfolio investment (Chami et al. 2009; Ratha & Mohapatra 2009).

[2] 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. I classify these households as remittance-receiving households although there is some uncertainty in this classification and some of these transfers might actually be national remittances. Even so, I consider this variable 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 & 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. This was 5.9 percent of households in 2008, with 41.1 percent of remittances going to rural households (based on ENIGH 2008, according to Sánchez Ruiz 2010).

[3] Of course, households with borrowing options can still be denied credit. Even so, I prefer an indicator on the availability of credit to an indicator on the use of credit in order to distinguish financial access from the demand for financial services. I also tested the impact of a change in remittance status on the actual use of credit from financial institutions, see footnote 9.

[4] A relatively large number of interviewees did not answer the questions on financial service usage and borrowing options, which reduces the number of observations available for the regression analysis (see Table 1 on the number of available observations for each of the variables).

[5] While the large variation in remittance-receiving status allows for the exploitation of the time variation of the data, the short time dimension and a relatively small number of households who did not change their status during the time frame limits the possibility of studying the lagged effect of remittances on financial access, in addition to their contemporaneous effect.

[6] The household fixed effects v_i also additionally control for selection bias due to households dropping out of the sample because the propensity to drop out of the sample can be seen as part of v_i.

[7] The strategy consists in finding the joint distribution of the response variable ACC_i conditional on X_i, v_i, and $n_i = \sum_{t=2002}^{T} ACC_{it}$, where n_i can take the values {0,1,2} in the case of two time periods (T=2). It turns out that this conditional distribution does not depend on v_i, so that it is also the distribution of ACC_i given X_i and n_i. Therefore, standard conditional maximum likelihood methods can be used to estimate β (see Wooldridge 2002, p.492 for details).

[8] Probabilities can be expressed in terms of 'odds', which are defined as the ratio of the probability of a positive outcome of an event (in this case, the probability that the indicator for financial access ACC takes the value '1') over the probability of a negative outcome

(the probability that ACC takes the value '0'). The 'odds ratios' for a predictor variable (in this case, remittance-receiving status of households) are calculated as the odds of receiving households against the odds of non-receiving households and can be obtained through exponentiation of the logistic regression coefficients. While less intuitive than an interpretation of probabilities on the original scale, the advantage of odds ratios in logistic regression is that they can be scaled up without running into boundary problems for probabilities between 0 and 1.

[9] As mentioned above, the availability of borrowing options does not mean that households actually obtain loans. I also tested the effect of receiving remittances on actual borrowing and did not find a significant effect. This could point to the possibility that, as discussed above, remittances function as a substitute for credit from formal financial services and that the demand for credit is therefore lower among receiving households.

7. Literature

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8. Annex

Annex 1: Creation of a Poverty Score for Mexican Households, adapted from Schreiner (2009)

	scoring indicator	book	answers	points
1	number of household members aged 0 to 17	C	four or more	0
			three	7
			two	15
			one	22
			none	29
2	highest educational grade among household members	C	college preparatory or less	0
			normal/technical/commercial	4
			professional or graduate	10
3	number of household members with a written employment contract	3a	none	0
			one	7
			two or more	14
4	main flooring type used in residence	C	dirt	0
			cement/concrete	8
			other	12
5	tap water inside the house	C	yes	3
			no	0
6	fuel usually used to cook or heat food	C	firewood	0
			other	5
7	household has domestic appliances (blender, iron, microwave, toaster, etc.)	2	yes	7
			no	0
8	electric appliances used in the household (radio, TV, VCR, computer, etc.)	2	yes	7
			no	0
9	household has other assets like dryer, washing machine, stove, or refrigerator	2	yes	13
			no	0
			maximum value	100

Creation of a 'poverty score' for each household from MxFLS 2002 and 2005: A score of '100' indicates the lowest probability of belonging to a poor household and a score of '0' indicates the highest probability of belonging to a poor household. The scoring is based on Schreiner (2009) and was developed in order to allow a quick and easy assessment of the socioeconomic conditions of households. Questions 7 to 9 have been adapted to the availability of data. Incomplete data on some variables have been imputed using the 'mice' package (Buuren & Groothuis-Oudshoorn 2010) in the statistical software R (R Development Core Team 2009).

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