

The Insurance Role of Remittances on Household Credit Demand

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Abstract:

The economic literature has highlighted how in the absence of income insurance risk averse households may voluntarily withdraw from credit markets, since contract terms may transfer too much risk to the household (Boucher, Carter, and Guirking, 2007). Therefore, households may forgo activities with higher expected income in favor of activities with less income variability across states of nature (Morduch, 1995). Recent literature has also evaluated how remittances provide households with insurance against income shocks (Yang and Choi, 2007; Rosenzweig and Stark, 1989) and how remittances may help households bypass financial intermediaries (Woodruff and Zenteno, 2001; Taylor, Rozelle, and de Brauw, 2003). There has been minimal attention, however, on how access to the potential receipt of remittances affects household participation in financial credit markets. On the one hand, the direct effect of remittances might decrease liquidity constraints at the household level and thus decrease credit demand. On the other hand remittances may provide households with insurance and thus increase willingness to accept credit contract terms. In this paper I estimate the effect of the potential receipt of remittances on credit demand. Potential receipt of remittances is estimated by predicting the household's receipt of remittances and variables that proxy for the strength and vulnerability of migration networks. Results indicate that the predicated amount of remittances received at the household level have a positive effect on credit demand.

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1 Introduction

The role of migration and remittances as a strategy to mitigate and manage risk exposure has been a focus of many empirical (Lucas and Stark, 1985; Taylor et al., 2003) and theoretical studies (Rosenzweig and Stark, 1989). Although there exists a large literature on the effect of remittances at the household level, it generally evaluates the direct effect of remittances. Few studies have investigated how the potential receipt of remittances may alter or change productive activities and perceptions and participation in credit markets. If households can perfectly smooth consumption *ex-post*, they may be more likely to choose economic activities with the highest expected value instead of investing in low-risk and low-return activities (Morduch, 1995). Understanding how remittances affect household resource allocation decisions is an important and timely topic. Remittances has recently been touted as a possible tool in promoting economic development. Proponents of remittances as an economic development tool often cite the multiplier effect of remittances on local economies and the continued growth of remittance flows.

If the potential receipt of remittances can help households overcome insurance market imperfections, can it also increase the willingness of households to accept risky credit contract terms? The goal of this paper is to empirically address if the potential receipt of remittances increases household credit demand. I address this question in the context of rural households located in the southern Mexican state of Oaxaca. Oaxacan households are primarily agrarian and migration and remittances are an important component of household activities. Oaxaca also has an emerging semi-formal financial institutions such that even rural villages may have a small credit union or community bank.

The paper is organized as follows. Section 2 reviews literature on remittances and credit and discusses the theoretically ambiguous effect of remittances on credit demand. On the one hand, the direct effect of remittances might decrease liquidity constraints at household level. On the other hand remittances may provide households with insurance and thus increase willingness to accept credit contract terms. Section 3 describes the data used in this analysis and discusses sample characteristics. Section 4 presents econometric specification and estimations of remittances as insurance. I estimate remittances controlling for household income and consumption shocks, to test for evidence if sample households

received remittances for insurance reasons. Section 5 presents credit demand as a function of the potential receipt of remittances. Potential receipt of remittances is estimated via three methods: 1) predicted receipt of remittances, 2) migration networks variables, and 3) latent variables to proxy for migration networks. Section 6 concludes the paper with a discussion of results and suggestions for future work.

2 Overview of Literature

Many rural and low-income economies have imperfections in both insurance and credit markets (Morduch, 1995). Insurance market imperfections affect a household's ability to smooth consumption in the advent of a negative shock; households may choose to invest in low-risk, but low-return activities, instead of exposing themselves to risk. Therefore missing and incomplete insurance markets encourages households incorporate strategies to mitigate exposure to risk since they cannot manage its effects *ex-post*. Therefore the overall demand for credit is lessened.

Furthermore, credit market imperfections such as interest rate ceilings, large transaction costs for borrowers in applying for loans, and moral hazard problems increase potential for credit rationing (Carter, 1988; Foltz, 2004). A household is credit rationed if it demands more credit than its supply. On the supply side, lenders may restrict loans to households that can signal their credit worthiness via observable wealth criteria, such as collateral. On the demand side, large transaction costs may impede application for loans. Also, on the demand side, imperfections in insurance markets may explain non participation in financial markets (Boucher and Guirking, 2007). The risk of default and increased variability of incomes across states of nature decreases expected utility with a loan and results in a household's voluntary withdraw from the credit market. Imperfections in the insurance market accentuate imperfections in the credit market, and vice versa.

Migration can be a strategy to overcome imperfections in both insurance and credit markets in rural households (Stark, 1991). The higher shadow value of capital may drive migration in credit constrained households. Remittances sent by these migrants are channeled into productive investments in farm or non-farm enterprises (Rozelle et al., 2002; Woodruff and Zenteno, 2007). Migrants help households bypass credit market imperfec-

tions and allow projects to be financed directly with remittances (Stark and Levhari, 1982; Taylor et al., 2003). In deciding whether migrants should be used as financial intermediaries, households must weigh both the negative and positive effects of migration on the household's utility. The positive and negative effects of migration on household activities highlight the endogenous and dynamic nature of household income. In the short run, the loss of family labor to migration will decrease the availability of family labor supply. In the long run, however, migration should provide capital, increase the productive capabilities of the household, and allow the household to pull itself up out of the low wealth and credit constrained class. Migrants as financial intermediaries help households overcome imperfections in the credit market by directly providing them with liquidity.

Mutual insurance contracts with households in the same village and/or household members working in foreign locations (Rapoport and Docquier, 2005) is also a household strategy to manage risk. Mutual insurance contracts with members of the same village, however, will not adequately insure households against covariate risks such as floods, hurricanes, drought or other negative shocks that have a positive covariance between households. For instance, Fafchamps and Lund (2003) found that gift giving and transfers between households living in close proximity were not motivated for risk pooling reasons. Spatial diversification of income sources increases gains of risk sharing if and only if the probability that both the household and the migrant, or member of the insurance contract, have a negative shock is non-positive (Rosenzweig and Stark, 1989). For instance, Rosenzweig and Stark (1989) studied how households mitigate risk for households by developing partnerships with households in villages with low or negative covariance via marriage of children. The use of marriage as an insurance contract is theoretically possible, since when one household faces an adverse shock the other should not, and a transfer would occur from the more to the less fortunate household (Rosenzweig and Stark, 1989).

Several studies have also found that household on- and off-farm labor decisions are a function of managing and mitigating risk exposure. In a study of Indian households, Rose (2001) finds that households with a riskier distribution of rainfall are more likely to participate in labor markets, *ex-ante*, while households increase labor force participation after experiencing negative income shocks. Rosenzweig and Wolpin (1985) also conclude

that family extensions reduces income risk through occupational diversification. Although these papers only evaluate local and domestic labor markets, the importance of spatial diversification is key to results and can be generalized to migration decisions.

The burgeoning literature on the role of migrants to overcome imperfections in insurance and credit markets, does not dispute studies that migration is a result of expected income gains. Instead it provides a more-nuanced and broader understanding of the migration decision. Hoddinott (1994), in an extension of the Todaro's (1969) expected income model, finds that the household and migrant enter into a long term contract. In his model the migration choice has benefits for both the household and the migrant, which results in a long term contract for the receipt of remittances from the migrant to the household.¹ Daveri and Faini (1999) also investigate the dual motivations of migration in a model that analyzes when a migrant would migrate for risk diversification or expected income gains. They find that the decision is a function of the correlation coefficient between the migrant and home income; if the income correlation coefficient is high relative to income uncertainty, migration is driven by expected income gains and not spatial diversification. Azam and Gubert (2006) state in their study of Mali migrants that "in most cases, the decision to migrate is a collective decision made by the extended family, or village, with a strategic view". The strategic view of migration is a key component of the *new economics of labor migration* (NELM). NELM posits that household make decisions in larger units not only to maximize income, but also to minimize risks and loosen credit constraints that are a result of market imperfections (Taylor and Martin, 2001). Due to the benefits of spatial diversification, households may be willing to incur substantial costs of migration if the income earned by the migrant has a non-positive covariance with household income (Chen et al., 2002; Rapoport and Docquier, 2005).

The insurance and spatial diversification theory of migration motivations, generates testable hypotheses for the receipt of remittances; remittances and income should move in opposite directions. Empirical tests of remittances as a form of insurance are numerous.²

¹His model, however, includes motivation for migration and remittances to include not only insurance, but altruism and security for inheritance. It does not necessarily model the role of insurance.

²See Rapoport and Docquier (2005) for a critical review. It is important to note that remittances can be sent for a multitude of reasons, such as altruism, securing inheritance, repayment of migration costs and education, etc. Van Dalen et al. (2005) note that "the inconclusive nature of empirical research is understandable. One cannot expect remittances to be driven by a single motivation." In this paper I am

One of the first studies of motivations for remittances was conducted by Lucas and Stark (1985). They found that migrants were more likely to remit to households engaged in agriculture and cattle activities during times of drought. Gubert (2002) showed that migrants remit to households in Western Mali in response to multiple types of shocks, and not just for negative crop shocks. Yang and Choi (2007) investigated the receipt of remittances at the household level in response to changes in income instrumented by historical rainfall data. They discovered that remittances move in the opposite direction than income, which supports the insurance hypothesis. Furthermore, they could not reject the hypothesis that remittances fully insure households against income shocks. In another study of remittances sent by migrants, de la Briere et al. (2002) found that female migrants are more likely to remit to households for insurance motivations, and a male migration only remitted if he is the sole insurer. Therefore, the gender of the migrant and the number of household migrants play an important role in how and why remittances are sent to households.

All the previous studies investigated the determinants of remittances and its effect on household consumption using the household's actual receipt of remittances. If households have diversified labor spatially in response to risk, how does this strategy affect productive and resource allocation decisions? Does the potential to receive remittances increase investment in productive activities and thus credit demand? A few studies have analyzed how access to remittances, or participation in mutual insurance networks affects household allocation decisions. For instance, Lamb (2003) found that the ability to diversify labor *ex-post* increases fertilizer inputs. Therefore, a household's assets and input decisions are affected by access to off-farm labor markets and migrant networks. Also, Giles and Yoo (2002) showed that households reduce precautionary savings when the "option of expanding labor supply to migrant destinations is less costly".

Central to Giles and Yoo (2002) study is the household's migration network. Massey (1988) defines migrant networks as "sets of interpersonal ties that link migrants, and non-migrants in origin and destination areas through the bonds of kinship, friendship, and shared community origin" (Massey, 1988: 396). Migration networks have been central to understanding why individuals migrate. For instance, migration networks decrease costs of

concerned with one of the multiple motivations for remittances.

migration and increase probability of obtaining employment upon arriving. There are minimal studies, however, on how migration networks affect household decisions as a function of the amount of remittances that could be received. *A priori* the effect is ambiguous.

Consider a household that must allocate productive resources between a secure activity, such as wage labor, or an activity that yields an uncertain return, such as agricultural activities, which require inputs up front before states of nature are known.³ If a household has access to credit markets, it will take out a loan only if the expected utility with credit is greater than under self finance. If the costs of own-liquidity are less than that of interest rates on loan, households with sufficient liquidity will not participate in the credit market. Therefore, households with access to remittances may be less likely to have a positive credit demand. This is the direct effect of remittances. Also, households may voluntarily withdraw from the credit market and invest in the secure activity if the increase in income variability across states of nature decrease expected utility with a loan in comparison to that under self-finance. Therefore, a household may prefer to invest in activities with a smaller expected return since the consumption stream is more secure. The inability to insure against negative income shocks limits productive activities and participation in the credit market. Households that can access remittances, via migration networks, in times of need may increase participation in the credit market with respect to households with no migration networks.

On the one hand, remittances could decrease demand for credit. On the other hand, the ability to insure consumption via access to remittances may increase optimal productive inputs and thus increase demand for credit. The ability of households to use remittances as insurance will depend upon the potential receipt of remittances. If migration networks are strong and not vulnerable to shocks they should provide a secure source of insurance for households. Therefore, the ability to access migrants does not necessarily imply insurance for households. The potential for remittances to serve as insurance is a function of the strength and vulnerability of migration networks. I specifically address the role of migrant networks in the context of credit demand. Can migrants provide enough insurance at the household level to decrease risk associated with credit contract terms and thus increase

³Due to space limitations the theoretical model is not included in this paper. If you would like a copy of the working paper please contact the author.

credit demand? Or do households with migrants not need credit, since remittances overcome liquidity constraints at lower costs and less risk than available in the credit market?

3 Data

The data used in this analysis is from the survey "The Structure and Performance of Rural Financial Markets and the Welfare of the Rural Poor" conducted in March 2005 and 2006, by *Programa de Estudios del Cambio Económico y la Sostenibilidad del Agro Mexicano* (PRECESAM, The Study of the Economic Change and Sustainability of Mexican Agricultural) and the University of California, Davis.⁴ Although a study of the economic role of the potential receipt of remittances would be relevant to many countries, it is especially important for Mexico and its southern state of Oaxaca.

Oaxaca was chosen for the study because of its heterogeneity in agricultural production, land tenure systems, and access to financial services. In 2001, 16% of Oaxaca's GDP was from agriculture and approximately 88% of individuals in poverty were engaged in agricultural activities on family farms (Caballero, 2003). It is the third poorest state in the nation. The high degree of poverty and lack of economic activities has translated into high rates of permanent and temporary outflows of migration to both international and national locations. Oaxaca ranks fifth among the 31 states in terms of permanent out flow of migrants in the 2002 census. An estimated 4% of Mexican immigrants in the US are from Oaxaca, which ranks Oaxaca 16th out of 31 states (Cohen, 2004). Oaxaca also has a large number of informal financial sources, termed Popular Savings and Loans institutions (EACPs, Entidades de Ahorro y Crédito Popular). A recent census by Mexico's national bank, BANSEFI, found that 10.8% of EACPs were located in Oaxaca, second only to the state of Jalisco. Even with the large number of EACPs membership rates are low in Oaxaca in comparison to other states (BANSEFI, 2001).

The sampling frame has a multistage design. First, two mountainous regions, the Sierra Sur and the Sierra Mixteca, were chosen because they share similar agricultural and economic characteristics, but there is enough heterogeneity between them in the crops grown, migration rates, and land tenure systems. Second, based on the 2002 Mexican Census, all

⁴Please contact author for more information and data on survey.

rural communities located in the regions of the Sierra Mixteca and Sierra Sur were identified.⁵ Third, rural villages were stratified according to access to financial institutions. To define access per community interviews at EACPs were conducted in the Sierra Sur and Sierra Mixteca in the months of November, 2004 and January 2005.⁶ From the surveys the percent of the population that was a member of an EACP was calculated. Credit access was stratified by natural breaks in the data. High access communities are those that have more than 40% of their total population as members. The medium access range was defined as having between 20% and 40% member rate. Low access range had less than a 20% membership rate. Finally, a total of 20 villages were randomly selected as follows: five from low, three from medium, and two from high in each region. Thirty households within selected villages were randomly selected for a total sample size of 600. In 2006, only 563 households were relocated in the second round of the survey.

The household survey collected detailed data on consumption, wealth, and investment portfolios, and is similar in design to other living standard measurement surveys (LSMS). The survey also collected detailed information on national and international migration histories, migrant networks, and remittance flows. A contribution of the survey is the ability to evaluate credit rationing mechanisms by directly eliciting information on the supply of and demand for credit of non borrowers. The in-depth credit market module allows direct classification of households as unconstrained or constrained in the credit market and, if constrained, it identifies whether the constraint originates on the supply or demand-side.

3.1 Descriptive Statistics

Tables 1 and 2 illustrate basic characteristics on households according to the location of household migrants and receipt of remittances in 2005 and 2006, respectively. Migrants are classified as any household member over the age of 15 that has lived more than one month outside the state of Oaxaca twelve months prior to the survey. Household members include the head of household, his spouse, any child of the household head and/or spouse and any other individual that is considered a part of the household. Of the 600 households

⁵See Instituto Nacional de Estadística Geografía E Información (INEGI) website for information, www.inegi.gob.mx. Rural communities are defined by INEGI as communities with less than 2,500 citizens. In order for costs and tractability the sample was limited to villages who had at least 500 inhabitants.

⁶Contact author for EACP survey information and data.

interviewed in 2005, 41% of households have a migrant that resides domestically or internationally and 31% receive remittances from national or international sources. In 2006, 28% of households had migrants and 24% received remittances. Therefore there is a large presence of migrants and remittances in sample communities. For instance, in the 2002 national rural Mexican household survey 27% of households received remittances and 20% had an international migrant in the household.⁷

The amount of remittances received and the number of remitters per household depends on the migrants' location. Households with international migrants have, on average 2.62 migrants while households with domestic migrants have, on average, 3.10 migrants. Also, in 2005, only 21.83% of households received remittances from international sources, and 11% received them from national sources. In 2006, 18% of households received remittances from international sources and 20% from domestic migrants. On average, households received 1,478 pesos in remittances, of which the majority came from international locations in 2005. In 2006, the total amount of remittances was higher, 2,158 pesos. Seventy-six per-cent of households with international migrants received remittances, and only 61% of households with domestic migrants received remittances. In 2006, the percentages were lower; 63% and 44% of households with international and domestic migrants received remittances, respectively. All households received more remittances from international sources than domestic sources. If the household received remittances in 2005, however, the amount was larger from national sources. For instance, remittances received from international locations was 3,800 pesos and households with domestic remittances received 5,900 pesos. In 2006, the amount from international sources was larger; households with international migrants received 10,342 and those with domestic migrants received 4,777. Even households with no migrants received remittances, 380 and 590 pesos, on average, in 2005 and 2006, respectively.

The data also reveal several differences between households that had migrants and received remittances. First, non-migrant households have household heads with slightly more years of schooling than other household types. This is striking since one would assume that households with more education have a higher opportunity cost for local labor and would invest in migration for increased economic opportunities. Second, households with

⁷Author's calculation.

domestic migrants and remitters are more likely to farm than households with international migrants. Although, land size is larger for households that have international remittances. It is possible that households with domestic migrants and remitters have a larger labor supply than those with international migrants.

Individual migrant characteristics may also be influential in explaining remittance behavior. Tables 3 and 4 illustrate statistics on household members that are over the age of 15. Of the 2,736 adults in the sample in 2005, 24.45% have migrated to domestic or international migrant locations in the twelve months prior to the survey. In 2006 the number of individuals increased, but only 19.7% had migrated in the twelve months prior to the survey. On average, 10% of individuals sent remittances in 2005, but in 2006 it was 24%. A higher percentage of international migrants sent remittances; 54% (44.65%) of international migrants sent, on average, 1,405.5 (3,000) pesos, and 31.2% (24.82%) of domestic migrations sent, on average, 1,225.12 (724) in 2005 (2006). In 2005 if remittances came from domestic sources, however, it was a larger amount than from an international source. On average, remittances were 2,597.62 per international remitter and 3,879.50 per domestic remitter. In 2006 this is reversed. An international remitter sent on average 7,000 pesos and a domestic remitter sent 3,000 pesos.

The table also reveals several differences between characteristics of individuals in terms of migration patterns and remittances. First, migrants are generally younger than non-migrants, and older than remitters. The younger age of remitters indicates that the length of a migrant's stay increase, there less likelihood for remitting. Older migrants may have families of their own and not have excess liquidity to remit. Second, migrants and remitters have higher education levels than non-migrants. Third, migrants are less likely to be residents of the household, although there is a slightly higher percentage of remitters who are a household resident. Household residents are more likely to remit, or possibly sending remittances makes the individual more likely to be a resident. Finally, national migrants are more likely to be female as opposed to the all individuals, while international migrants are more likely to be male. Also, migrants and remitters are overwhelmingly a son or daughter of the household head. Female migrants are less likely to remit, however.

The next set of tables present information on a household's credit demand, credit ra-

tioning mechanisms, and exposure to risk. If migrants provide insurance or liquidity for households, *a priori* there should be observable differences in credit demand and rationing mechanisms present information on household demand with respect to if a household has migrants or has received remittances (See Tables 5 and 6). Nineteen per-cent of households had an outstanding balance on a loan at the time of the survey in 2005. In 2006 the percentage is slightly lower at 16.7%. The majority of households had loans from the informal sector, but there was on average 6% of households with an EACP loan and 4% in 2006. This statistic is not low for rural Mexican households. For example in the Mexican Family Life Survey only 1.5% of households in rural areas had an active loan from an EACP.⁸ Therefore in general the Oaxaca survey has a large presence of loans.

There are several differences across types of households according to if they had migrants and received remittances. First, 25% percentage of households with international migrants had a loan and 20% had a loan in the informal sector in 2005. In 2006, the percentages are slightly lower and the highest percentage of households with loans are those with domestic remittances. Second, the highest percentage of households with an EACP loan had domestic migrants, 6.25% in 2005 and 2006. Households with the smallest percentage of EACP loans were those with international remittances, 3.81% and 1.98% in 2005 and 2006, respectively. This statistic could indicate that households did not need a loan because they received remittances. Those with international migrants, however, have a larger percentage of EACP loans compared to those with no migrants, which supports the insurance hypothesis of migrant networks. Therefore, there is a possible liquidity effect of remittances on credit demand for households with remittances and insurance effect on households with migrants.

Direct elicitation of credit market participation classified households as supply-side or demand-side constrained for EACP loans. Supply-side constrained households include two types of households. First, partially quantity-rationed are households that had a loan but did not receive the full amount on the loan application. Second, fully-quantity rationed households are those that wanted a loan but had zero supply. Demand-side rationed households include four types of households. First, price rationed with a loan households are those that have an active loan and received full amount. The definition also includes households

⁸Author's calculation

that did not participate because of price, transaction cost, or risk reasons. Households were classified into these last three types via direct elicitation methods⁹

Tables 5 and 6 show credit rationing mechanisms according to household participation in migration and receipt of remittances. The table reveals several differences across household types. First, the majority of households, 57% and 52.35%, are price rationed with no loan in 2005 and 2006 respectively. The highest percentage of households that are price rationed with no loan are those that received international and domestic remittances, 58% and 70% respectively in 2005 and 52.73% and 52.38% in 2006. The lowest percentage of households are for those with international and domestic migrants in both 2005 and 2006. It is possible that households that received remittances are less likely to be liquidity constrained. Second, only 11% and 8.66% of households are risk rationed households in 2005 and 2006, of which the highest percentage are households that have international migrants and remittances. Approximately 14% of households with international migrants are risk rationed compared to only 10% of households without migrants in 2005. In 2006, 10.71% of households with international migrants are risk-rationed compared to 7.62% of households with no migrants. Households with international migrants may be more risk adverse than households that did not spatially diversify labor. Therefore, one must control for unobserved heterogeneity before understanding risk reasons for non-participation. Finally, households with international migrants and remittances were least likely to be transaction cost rationed from the EACP credit market. Households with domestic remittances are least likely to be transaction cost-rationed.

Tables 7 and 8 present information on negative shocks households experienced in the year previous to the survey. Households were directly asked if they have experience a shock in the past year and if any household members were too sick to work. Thirty-three and thirty-eight per-cent of all households had a household resident that was sick in the

⁹In order to classify non-borrowing households, all households stated their perceived credit supply from EACPs. Only EACPs lenders were asked about since that is the *most* formal sector for households. If a household had a positive credit supply but did not have an active they were asked why they did not apply. Categories were classified into three main categories: transaction costs, risk and price. If a household had zero supply, they were asked if they would like a loan. Households that said yes to this question have a positive demand, but are supply-side constrained from the market. Households that responded no were asked why. Reasons for not wanting a loan were classified into three main categories: transaction costs, risk and price. These series of questions allow me to classify each household as being credit constrained or not and reasons for non-participation.

previous year in 2005 and 2006, respectively. The percentage is highest among households with international migrants, 42% in 2005 and among households with domestic migrants in 2006, 43%. Households that received domestic remittances had the highest percentage of residents that were sick for a year, 11%, in both 2005 and 2006. Thirty-seven and 30% of all households had a negative shock in the year prior to the survey in 2005 and 2006, respectively. Households with domestic migrants and remittances were more likely to have had a negative shock, 45% versus 35% of households with no migrants in 2005.

Negative household shocks can also be differentiated by type. First, 29% and 21% of households had an agricultural shock in 2005 and 2006. Agricultural shocks include loss of harvest to pests and natural causes, but also include animal deaths and robberies of tools and equipment. Households with domestic migrants and remittances were also more likely to have had an agricultural shock. Approximately 7% and 10% of households experienced a household death or had a household member that was seriously ill in 2005 and 2006, respectively. Households with international migrants and remittances were more likely to have a shock in this category, 11% and 14% in 2005 and 2006 respectively. Household shocks include damages to home and other assets. Risks can also be categorized as covariate or idiosyncratic shocks. Households were asked if the negative shocks also affected their neighbors, i.e. covariate shocks. Only one percent of households experienced a covariate shock in 2005. The percentage of covariate shocks was a lot higher in 2006, 17%.

4 Are Remittances Insurance for Negative Income Shocks?

The first step in understanding how the potential receipt of remittances affects household credit demand is to investigate if remittances insure sample households against negative shocks. Remittances include both money transfers sent to the household, either formally or informally, and the monetary value of goods given to the household from migrants residing domestically or internationally. Remittances can be measured as the amount each individual migrant remits or the total amount of remittances received by the household.

At the individual level, remittances are the monetary amount of transfers sent to the household from a migrant in the household. A migrant is defined as a household member, 15 years or older, that lived for at least one month outside of the household. Household

members include the household head, his spouse, children of the household head and/or spouse, and any other individual the household considers a member. In this paper I do not control for the household decision to diversify labor spatially since I do not want to make a general statement on the population (Gubert, 2002; Hoddinott, 1994).

At the household level remittances are measured as the total amount of money and the monetary amount of in-kind transfers received from national and international sources. Measuring remittances at the household level has two advantages over the individual level. First, many households receive remittances from individuals that are not household members. If remittances are measured at the migrant level, it does not include money received from non-household members. Second, many households receive remittances from more than one individual. In the theoretical framework and discussion the extent that remittances insure households is a function of the total receipt of remittances. Therefore, the determinants of the total amount received is essential for understanding how remittances smooth household and income shocks. There are advantages, however, to estimating remittances at the individual migrant level. For instance, the individual migrant estimates can control for migrant characteristics and earning capabilities, such as the relationship to the household head, gender, and location of the remitter. These are important variables in the motivation to remit (Davies, 2007) and are not included in the household remittance equation.

In estimating remittances, independent variables must include a set of variables that identify shocks to household income. Income shocks are estimated with caution, since there may be reverse causation between remittances and insurance. On the one hand, remittances can be used to finance productive activities at the household level. Therefore, there may be a positive interaction between remittances and income. On the other hand, if the insurance motivation of remittances holds a positive income shock would decrease the level of remittances (Yang and Choi, 2007). Many studies have used deviations from historical rainfall data as an instrument for changes in income (Yang and Choi, 2007) and migration networks (Munshi, 2003; Giles and Yoo, 2002). In the Oaxaca sample area there are minimal weather stations and many villages are located in the same weather station district. Furthermore, sample villages are in a mountainous area which has many micro

climates. Therefore, using data from a weather station is unsuitable for identification of income shocks and agricultural production. Instead I use three methods: 1) observable shocks, 2) transitory crop production, and 3) transitory changes in income.

First, observable shocks were collected in each year of the household survey by directly asking households about any negative events that occurred to crop production, wage employment, and to the household and its members. For example, households were asked how many days each member could not work in the previous year because of illness or how many had died. Households were also asked about losses to livestock, crop production and other agricultural activities. These questions identify not only if the household had a negative shock but also how many negative shocks over the past five years. The survey asked households if they had a shock in the past five years. Therefore, shocks that occurred before the household survey are used in the analysis, since the timing of remittances are not known. There are several advantages to using observable shocks; they are subject to less measurement error and they can incorporate shocks that impact both income and consumption (Fafchamps and Lund, 2003; Gubert, 2002).

Second, I identify transitory income via three methods following Gubert (2002).¹⁰ I identify a permanent component of the value of agricultural crop production and use deviations from it as a measure of transitory agricultural value. The first method to identify permanent and transitory crop incomes is to estimate the total value of agricultural production in pesos:

$$\log y_{it} = \alpha_o + \beta_o X_{it} + \varepsilon_{it} \quad (1)$$

where y_{it} is total value of crop production in pesos, X_{it} is a vector of household farm characteristics and assets that affect agricultural production. Residuals, ε_{it} , measure transitory crop production. I label this crop Crop Income Shock 1. The second method is to estimate the value of crop production using the panel to control for household unobservable heterogeneity:

$$\log y_{it} = \alpha_1 + \beta_1 X_{it} + \lambda_i + \varepsilon_{it} \quad (2)$$

where λ_i is the household fixed effect. Residuals measure transitory income and are termed

¹⁰Please contact author for regressions results and calculations of all three crop income shocks.

Crop Income Shock 2. The final method is to measure the deviation in the value of household agriculture production in kilos from the average production in 2005 and 2006. This is termed Crop Income Shock 3.

Household income, however, comes from various sources and not just from agricultural production. Measurement of transitory crop income might not accurately capture all income shocks. Therefore, the final measurement of income shocks is to estimate transitory income shocks. I measure transitory income shocks in the same three ways that it is measured for value of crop production.¹¹

All six measurements of transitory shocks produce two variables; one for positive shocks and another for negative shocks. These measurements must be considered with caution, however, since remittances may have affected current and future crop production. For instance, remittances sent in 2005 may be used to fund agricultural production in either 2005 or 2006. Since the timing of remittances is not known, remittances could have been sent before or after a shock to agricultural income.

Independent variables must also control for migrant and household characteristics. A migrant's income will determine if they can remit and how much. In the survey households were asked to state how much each migrant earned, but few households were able to answer this question. Therefore, to proxy for migrant earnings, I use the migrant's age, gender, years of schooling and employment sector. The migrant's relation to the head and if the migrant is considered a resident of the household are also included. A migrant that is a close relative to the household head and is a resident of the household will be more likely to remit than migrants who are not.

The next category of independent variables are household level characteristics. Household income level and number of migrants in household are included. As mentioned household income is likely to be correlated with remittances, since remittances affect household choices of economic activities and labor supply. Therefore, I proxy for household income via two methods. First, I predict domestic income as a function of household characteristics, such as human capital and productive assets, and proportion of household residents that are economically active.¹² Second, I proxy for household wealth by controlling for assets

¹¹Please contact author for regressions results and calculations of all three crop income shocks.

¹²Contact author for regression results.

that were inherited from the parents of the household head or spouse.

Finally a set of village level characteristics are included, such as region, access level, and altitude. Variable definitions and means are in Tables 9 and 10.

4.1 Econometric specification of Remittances

There are three ways to specify the econometric model of the decision of a migrant to remit or not and the household level of remittances. First, it can be modeled as a discrete choice via a probit model. Data from the two years of survey are first pooled together to estimate a pooled probit model. Second, I can control for random effects with a probit model. In order to control for unobserved heterogeneity via fixed effects the model must be estimated with a logit model (Cameron and Trivedi, 2005; Hamerle and Ronning, 1995). Identification, however, is identified by variation of remitting behavior at the individual level. Therefore, only individuals that switched from remitting to non-remitting, or vice-versa, are included in the estimation. This drastically decreases the number of observations in the sample and the fixed effects logit model cannot be estimated.

Second, if remittances are a one-stage process a Tobit maximum likelihood is estimated. An ordinary least squares (OLS) regression would result in biased and inconsistent estimates since remittances are censored at zero (Greene, 1997). A one-stage process is correct if the migrant simultaneously decides to remit and how much. The likelihood of remitting and the decision of how much to remit are closely related and the appropriateness of a Tobit model can be examined by comparing the sign and magnitude of explanatory variables that are different from zero to those in the probit model (Amuedo Dorantes and Pozo, 2006). It is difficult, however, to conceive of variables that can identify the decision to remit but not the level of remittances (Amuedo Dorantes and Pozo, 2006). There is no sufficient statistic that allows unobserved heterogeneity to be conditioned out of the cumulative distribution function. Therefore, the tobit can only be estimated using random effects.

Finally, I estimate remittances with OLS. This step is taken to compare sign and magnitudes of explanatory variables that are different from zero with those estimated in the Probit and Tobit models.

4.2 Discussion of Results

Individual remittance estimations are presented in Tables 11 through 14. Table 11 presents results from all econometric specifications controlling for migrant and household variables. Results are consistent across all models and there is no statistically significant sign changes. There are several notable observations. First, the age of the migrants increases the propensity to remit and the level of remittances. Second, international migrants have a positive and significant effect on remittances. Third, males are more likely to remit than females, which supports the previous descriptive analysis. Finally, as the number of migrants increases in the households the level and propensity to remit decreases.

Results of models controlling for household shocks are included in Tables 12 through 14. The signs of coefficients are consistent across all models and in general negative shocks do not significantly explain individual remittance behavior. There are several notable observations. First, the sign of the coefficient for covariate shocks is negative and it is positive for idiosyncratic shocks. This is opposite than that predicted from theory. Second, signs for negative crop shocks is positive and negative for positive crop shocks, which is consistent with theory. These coefficients are statistically different from zero in the Tobit model. Therefore, some variables are significant but majority are not.

Household level remittance estimation are in Tables 15 through 18. In Table 15 there are several notable results that are consistent across all the models. First, age of the household head has no significant effects on remittance level. This is striking because *a priori* one would expect that older households should receive more remittances if children or other relatives are taking care elderly that remain in Mexico. Second, education has a quadratic result. As the education of the household head increases remittances decline, but it is not statistically significant from zero. Third, female heads of households are more likely to receive remittances. It is possible that female household heads are widows and are relying on remittances from migrants since economic opportunities are limited for females. Finally, as the number of migrants increase the level of remittances and likelihood of receiving remittances increases. This is in contrast to estimation of remittances at the individual level. At the household level an extra migrant increases remittances, but it will decrease the propensity to remit and amount of remittances of an individual migrant.

Tables 16 through 18 present results when controlling for household income and consumption shocks. Results are similar to that for individual level remittances equations. There is one noticeable difference, however, idiosyncratic shocks are significantly positive in the Probit and Tobit pooled models. Also crop shocks are of the predicted signs. The majority of variables, however, are insignificant in explaining remittance receipt.

5 Potential Receipt of Remittances and Household Credit Demand

Coefficients on variables that proxy for income and crop shocks were of the predicted signs, but the majority were insignificant. Remittances may be a form of insurance for households, but individual and household level characteristics were more likely to explain remittance behavior. The estimation strategies, however, only controlled for the actual receipt of remittances and did not evaluate the strategic behavior of migration. If the household does not receive remittances this does not necessarily mean that they cannot access remittances via migrant networks in times of need. Furthermore, if remittances are sent on a consistent basis then it may be more likely that credit demand would increase, since it is a secure income source. The question that I address in this section is: Do households with the potential to receive remittances have a positive credit demand in comparison to those that do not?

Traditionally credit demand is defined as the amount of credit that the household received from the lender. In other households have a positive effective demand if they have an outstanding balance on a loan. The loan amount is defined as the household's effective demand for credit. Households with positive effective demand are either price rationed with a loan or quantity rationed.

Effective credit demand is a function of a number of socio-economic factors as well as credit contract terms. A main determinant of positive effective credit demand is if the expected return with loan funds is greater than with self-finance. Variables that affect demand for productive purposes are those that decide whether a household will expand activities by investing in capital.

Effective demand is also be function of credit contract terms. Credit contract terms, such as costs of application, interest rates and other requirements effect the expected return. Variables that identify costs of application, are the distance to the nearest financial institution and if they had a previous loan with the lender. Also costs may be higher for households that speak an indigenous language. Specific credit contract terms affect the level of risk imposed on the borrower, however these terms are only available for households that have a positive effective demand.

The first step in identifying effective demand is to estimate if the household applied for a loan or not:

$$P(APPLY > 0) = f(I, H, E) \tag{3}$$

where I equals a vector of characteristics that identify the household head such as age, gender, education, wage labor and migration status. H is a vector of household characteristics, such as the dependency ratio, number of hectares, participation in wage labor, and business ownership. E is a vector of household endowments that identify household productive capabilities, such as value of land, collateral, and inheritance. Once application is controlled for, effective demand is estimated:

$$Loan\ Size = f(I, W, E, L|Apply = 1) \tag{4}$$

where L stands for repayment ability, e.g. wealth factors that affect the lender's loan decision. For instance, a household that is a member of a EACP or has a land title will have a higher probability of being accepted. These variables are observable to the lender and provide signals that the borrower is low-risk.

Even though a household does not have a positive effective demand it does not imply that they have zero demand or are credit constrained from the credit market. For instance, a household may choose not to apply because there is a high probability of rejection. Households that had zero credit supply were asked if they would want a loan if offered. If a household said yes they are identified as having a positive notional demand (ND1). These subjective questions were only asked for EACP lenders. This type of demand includes household with positive effective demand and those that are fully quantity rationed from

the credit market. Notional demand does not take into account the household's repayment abilities. Notional demand is measured as:

$$P(ND1 > 0) = f(I, H, E) \tag{5}$$

The final type of demand includes individuals that do not participate for non-price reasons. With perfect markets households should only be price-rationed from the credit market, either with or without a loan. Therefore, notional demand two (ND2) is a measure of demand in perfect markets. The definition includes all households that have positive ND1 and households that are risk and transaction-cost rationed from the credit market. Households that would not accept an EACP loan were asked why they would not accept it. Only variables that affect a household's socio-economic characteristics and productive activities should be significant in determining demand under perfect markets. *A priori* potential receipt of remittances should not effect household ND2, since it reflects a household's underlying productive capabilities.

Summary statistics for demand equations are in Table 19.

5.1 Identification of Potential Receipt of Remittances

In each credit demand estimation I include variables that identify a household's potential receipt of remittances via three methods: 1) predicted receipt of remittances, 2) proxies for strength and vulnerability of migration networks, and 3) latent variables for migration networks. A household's migration network is crucial for determining its ability to access remittances either for liquidity or insurance purposes.

First, the previously estimated remittances equations are used to identify predicted receipt of remittances at the household level. I first estimate the total amount of remittances each migrant would send to the household. Individual remittance estimates are then totaled to the household level. The identification strategy is to use the remitter's education, age and gender. These variables should only affect household credit demand via the amount remitted and not directly impact household credit demand. A second method of estimating remittances is to estimate total amount of remittances received at the household level.

Second, proxies for the strength and vulnerability of a household's migration network

are controlled for via three sets of variables: 1) family migration experience, 2) migrant job security and 3) village migrant networks. First, a household's strength or experience in migration is controlled for with the number of household members that are international migrants and the number of international migrants that are male. These variables increase the potential of the household to receive remittances. I also control for the total number of trips household members have made to the US. As the number of trips increase the transaction costs of crossing the border decrease and make access to ex-post labor in the US easy for the household. I also control for if the household has any international migration experience. International migration experience increases access to migrant labor opportunities, but it may also indicate access to friends and relatives that are currently migrants. The second set of variables proxy for a migrant's job security, which is an important factor in determining the ability of the migrant to respond to household economic needs, and thus potential receipt of remittances. Amuedo-Dorantes & Pozo (2006) identify migrant income risk via variables such as migrant legal status, availability of social networks, work experience in migrant location, and length of residence since last trip. I identify for migrant income risk by controlling for if migrants have legal status and employment sector choice. I hypothesize that migrants with legal status and working in the non-agricultural sector have more job security. The final set of variables control for village migration networks. Village migration networks indicate the availability of social networks and thus possible access to remittances. Village migration networks are identified by controlling for the number of households in villages with migrants, not including household i , and the total number of village migrants, not including migrants from the ith household. These variables are calculated for both national and international migrants.

It is difficult, however, to identify how variables included in the three sets of variables interact and determine a household's overall potential receipt of remittances. Factor analysis decreases the number of variables used in the estimation of demand by explaining observed correlation among variables. It allows the researcher to define the underlying characteristics of the variables and to calculate a latent variable. The latent variable identifies the composite effect of a set of variables. The final strategy is to use factor analysis to identify

latent variables for each of the three sets of migration network variables.¹³ Five variables are extracted using this method.

Summary statistics for potential receipt of remittances variables are presented in Table 20.

5.2 Results of Demand Estimations

In order to test for the effect of the potential receipt of remittances on household credit demand, I first estimate the likelihood of loan application controlling for basic characteristics of the household head, household, and village. Since the majority of applications were accepted, estimations are basically of having positive effective demand. Table 21 presents results from estimating the probability that a had a positive loan from any lender, from an EACP, and from an informal source.¹⁴ Estimations are done using pooled and random effects probit. There are no statistically significant sign changes between the estimated models. Notably few variables are significant in explaining credit market participation. Education is positive and significant in explaining participation, and it exhibits a quadratic effect. A household that has higher years of schooling will have lower transaction costs of loan application and also have a higher earning potential. The number of residents in the household have a positive effect on having an EACP loan, but as the number of residents increase probability of having a loan decreases. The number of household residents has no effect on positive effective demand for informal lenders. Households with a businesses are more likely to have a loan from all lender types. Households with businesses may have a higher demand for capital to invest in their local enterprise. Furthermore, households with employment in the local wage sector are more likely to have a loan from an informal lender. Finally, households that are EACP members are more likely to have a loan from an EACP. Being an EACP member decreases transaction costs of loan application for households, but it may also indicate that households wanted a loan and thus joined an EACP to facilitate this process.

Tables 23 and 25 present results from the likelihood of having a loan with the addition

¹³Please contact author for full results of factor analysis.

¹⁴Note village, income and other households characteristics were included in estimating the probability of a positive loan amount. Please contact the author for full results of estimations .

of proxies for the potential receipt of remittances. There are several notable observations. First, in Table 23 the potential receipt of remittances is controlled for by estimating remittances at the individual level and the household level. Coefficients are all positive and significant for remittances received at the household level for informal and any type of lender. Although the coefficients are extremely small, remittances are received in thousands of pesos. Therefore, a one thousand peso increase in remittances received increases the likelihood of applying for an informal loan by 6.29% and any loan by 4.54%¹⁵ Also, since remittances are likely to have a liquidity effect on households the coefficient should have a downward bias. Therefore, the finding of a positive and significant sign on predicted remittances indicates that remittances do have some positive effect on loan application. Surprisingly, the coefficient is not significant for EACP loans. A plausible explanation is that since EACP membership is highly significant and EACP membership is more likely for households with remittances the interaction between these two variables is difficult to disentangle. Therefore, understanding reasons for EACP membership will be crucial to understanding the role of remittances in EACP loan application.

Table 25 presents results for estimates of effective demand controlling for migration networks. Several variables that control for family migration experience are significant. For instance, the number of trips households have made to the US and the number of males in international migration decreases the likelihood that a household will have an EACP loan. The former variable indicates that households have significant experience with crossing the border. This experience should lower transactions costs and increase a household's ability to migrate and access remittances in times of need. Household experience, however, has a positive and significant effect on the probability of having an EACP loan. Therefore, households with experience may be able to access remittances from current migrants in times of need. The second set of variables control for migrant job security. If migrants have legal status in the US, it increases the probability of having an EACP loan. Furthermore, households with migrants that reside within Oaxaca and have a wage job are more likely to have positive effective demand for a loan from any lender type. The final set of variables control for village migration networks; however, they do not have a significant effect on

¹⁵These estimates were made using marginal effects of the random effects probit model. The percentages are smaller for the pooled probit model, 1% for both an informal and any loan.

positive effective demand.

Table 25 also controls for the three sets of migration network variables compressed into five latent variables. The latent variable for family migration decreases likelihood of positive effective demand for an EACP loan. A negative sign for family migration variables are intuitive. For instance, if a household has ready access to migrants or has low transaction costs of migrating, then remittances are easy to access in times of need. Job security increases effective demand for any type of loan. A migrant's job security should decrease income risk and thus increase the migrant's potential to remit and thus provide insurance. Village networks decreases effective demand for any type of loan. The effect of village migration networks is harder to interpret. For instance, an increase in village level migration could decrease economic potential in the area. Also it could increase the availability of liquidity within the village. However, one would expect an increase in liquidity to increase probability to participate in the informal loan sector.

Table 22 presents results from estimation of continuous effective demand for EACP loans; how much the household received from an EACP lender. Continuous effective demand is estimated via two methods. First, I estimate the Tobit model of household demand. Second, I estimate pooled, random effects and fixed effects models of OLS corrected for selection bias. Once again there are few variables that significantly explain loan size. In the Tobit model age exhibits a significant quadratic effect on loan size. Furthermore, farming decreases loan size, although being an EACP member increases it. There are no significant variables for the pooled and random effects OLS models, however there are significant sign changes on coefficients between the OLS FE model that are corrected for selection bias or not. Many variables are negative that were previously positive, such as business ownership, local wage, and land title. However, farming has a positive effect on loan size. It is possible that once the selection bias is controlled for households engaged in farming need more liquidity than households that have wage labor or businesses.

Table 24 presents results controlling for predicated amount of remittances for continuous effective demand. Predicted remittances have no effect on size of loan. This is plausible since potential receipt of remittances should affect having a positive demand but not how much the lender offers, since lenders cannot estimate a household's remittance potential.

Table 26 presents results when controlling for migration networks. There are no significant variables included in the sets of variables for family migration experience and migrant job security. Village level migration networks, however, do contain a few variables that are significant. An increase of households with international migrants increases demand, while the number of members decrease effective demand in the pooled probit and OLS models. In the OLS with random and fixed effects there are few significant variables. Table 27 presents results with latent variables; the only variable that is significant is the family migration variable, which is negative.

The final set of estimations are for two types of notional demand; notional demand one (ND1) and notional demand two (ND2). ND1 is positive if a household has positive effective demand or if a households wants a loan, but does not apply because of a perceived credit supply of zero. ND2 is positive for households that are non-price rationed from the EACP credit market. ND2 includes households with positive ND1 and also households that are either transaction cost or risk rationed from the EACP credit market. *A priori* migration networks should not effect likelihood of having ND2 since it is the household's underlying propensity for productive activities. Table 28 presents results of probit model estimations of positive notional demand. Once again there are relatively few variables that are significant in determining the likelihood of having positive notional demand. Being an EACP member, however, is positive and highly significant for both ND1 and ND2 estimations.

Table 29 presents results for estimations that control for the potential receipt of remittances. Predicted remittances at the individual and household level were not significant and are not included in the table. In the set of variables that proxy for family migration experience, working in the Oaxaca at a wage job and having legal US status has a positive and significant effect on ND1. Therefore, having a stable wage job increases notional demand for a an EACP loan. For both types of notional demand, the number of households that have international migrants decreases likelihood of positive notional demand, although the number of households with national migrants increases it. The opposite is true of those when estimating the number of village migrants; number of international migrants has a positive effect and the number of national migrants has a negative effect. None of the latent variables are significant.

6 Conclusions

The goal of this paper is to empirically address if the potential receipt of remittances increases household credit demand. The role of migration and remittances as a strategy to mitigate and manage risk exposure has been a focus of a large economic literature. Even so, few studies have investigated how the potential receipt of remittances impacts a household's participation in credit markets. For instance, if households can perfectly smooth consumption *ex-post*, they may be more likely to accept credit contract terms *ex-ante*. This is a timely topic since policy makers and governments are seeking ways to increase the economic potential of remittances. Furthermore, the increased insecurity of immigrants in the US may affect the ability of households to count on future flows of remittances and thus decrease credit demand and investment in productive activities.

I argue that the overall effect of remittances and migration networks on credit demand is theoretically ambiguous. On the one hand, remittances may loosen household liquidity constraints. On the other hand, remittances may provide insurance for households and increase the willingness to participate in productive activities and thus accept risky credit contract terms. The overall effect will depend on the strength and vulnerability of a household's migration networks.

I first estimated remittances at the household and individual level controlling for agricultural and household shocks. The main determinants of remittances were characteristics of the household and migrant. Although, household and crop shocks were of the predicted sign, they were not highly significant. Therefore, remittances may be sent for insurance reasons, but they are generally a function of a migrant's and household's characteristics. This finding potential increases the positive interaction between remittances and credit demand. If households know they have a steady stream of remittances than they may be more likely to accept credit contract terms. Furthermore, if households can strategically choose which individual migrates, they will choose individuals with the highest likelihood to remit.

Second, I estimate credit demand as a function of household and village characteristics and variables that identify a household's potential receipt of remittances. There are several notable observations from credit demand estimations. First, predicted household receipt of remittances have a positive effect on effective demand for a loan from any lender and

from informal lenders. This is a significant finding, since there is potential for downward bias on predicted remittances. Second, EACP membership is crucial to determining effective and notional demand. This is not surprising since participation in financial services decreases transaction costs of application and may indicate an underlying desire to have a loan. Households with remittances, however, are generally more likely to participate in financial services. Delineating these two effects are crucial in understanding likelihood of positive effective demand. Third, variables that control for migration experience are negative, in general. The negative effect of migration experience indicates the liquidity effect of remittances on household demand. If households have significant migration experience, they have easier access to migrant labor markets and off-farm income. Fourth, job-security variables positively impact credit demand. The positive effect of a migrant's job security indicates the insurance role of remittances and the ability for household to access remittances on a consistent basis.

There are several directions for future work. First, delineating the interaction of EACP membership and remittances is essential in understanding how remittances affect financial and credit market participation. Second, variables for village level migration networks have both a positive and negative effect on credit demand. Does an increase of migrants in the village create multiplier effects and thus increase a household's ability to invest in productive activities? Or does an increase of migrants in the village decrease the number of economically active individuals and thus the potential for economic activities? Evaluating how village wide economies alter with respect to migration is essential in understanding how it affects household credit market participation and thus rural economic development. Finally, non-participation in credit markets was largely due to price, transaction costs and risks. Analysis of descriptive statistics highlighted that there were notable differences of credit rationing mechanisms across households with and without migrants. Estimating the determinants of credit rationing mechanisms with respect to remittances and migration networks is an important avenue for future research.

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Table 1: Household Characteristics According to Migrants and Remittances Received in Household, 2005

	All		International		Domestic		International		Domestic	
	N=600	Migrants N=355	Migrants n=162	Migrants N=128	Remittances N=131	Remittances N=66	Remittances N=131	Remittances N=128	Remittances N=66	Remittances N=66
Age	48.54	44.64	52.04	59.01	51.24	57.20	51.24	59.01	57.20	57.20
Years Schooling	3.77	4.07	3.57	3.02	3.49	3.06	3.49	3.02	3.06	3.06
Gender (Male=1) (%)	88.17	89.3	88.89	85.16	86.26	74.24	86.26	85.16	74.24	74.24
Farm (%)	72.50	71.83	72.84	77.34	70.99	80.30	70.99	77.34	80.30	80.30
Land Size (has.)	1.77	1.54	1.92	2.32	2.50	1.80	2.50	2.32	1.80	1.80
Own Business (%)	25.50	26.20	27.16	24.22	25.19	24.24	25.19	24.22	24.24	24.24
Local Wage Labor (%)	28.33	29.86	26.54	28.13	22.90	21.21	22.90	28.13	21.21	21.21
Number of Residents	5.45	5.56	5.46	4.71	5.67	4.42	5.67	4.71	4.42	4.42
Number of members	6.87	6.05	8.20	8.35	8.31	7.52	8.31	8.35	7.52	7.52
Migrant (%)	40.83	-	100.00	100.00	93.13	80.30	93.13	100.00	80.30	80.30
Number of Either migrants	1.06	-	2.62	3.10	2.60	2.27	2.60	3.10	2.27	2.27
International Migrant (%)	27.00	-	100.00	35.16	89.31	24.24	89.31	35.16	24.24	24.24
Number of International Migrants	0.57	-	2.10	0.80	2.00	0.45	2.00	0.80	0.45	0.45
National Migrant (%)	21.33	-	27.78	100.00	28.24	74.24	28.24	100.00	74.24	74.24
Number of National Migrants	0.49	-	0.51	2.30	0.60	1.82	0.60	2.30	1.82	1.82
Received Remittances (%)	31.0	5.9	75.9	60.9	100	100	100	60.9	100	100
Total Amount (pesos)	1,478.89	380.39	3,496.58	2,799.45	4,302.95	6,366.21	4,302.95	2,799.45	6,366.21	6,366.21
International Remittances (%)	21.83	2.54	72.22	28.91	100.00	16.67	100.00	28.91	16.67	16.67
International Remittances (Pesos)	830.24	38.70	2,910.53	901.41	3,802.64	469.39	3,802.64	901.41	469.39	469.39
# of International Remitters	.323	.039	1.07	.453	1.48	.303	1.48	.453	.303	.303
National Remittances (%)	11.00	3.66	9.88	38.28	8.40	100.00	8.40	38.28	100.00	100.00
National Remittances (Pesos)	648.65	341.69	586.05	1,898.05	500.31	5,896.82	500.31	1,898.05	5,896.82	5,896.82
# of National Remitters	.165	.053	1.23	.594	.099	1.5	.099	.594	1.5	1.5
Mixteca (%)	50.00	39.72	68.52	65.63	70.23	59.09	70.23	65.63	59.09	59.09
Low (%)	50.00	54.37	48.15	32.81	42.75	31.82	42.75	32.81	31.82	31.82
Medium (%)	30.00	24.23	35.19	42.97	41.98	48.48	41.98	42.97	48.48	48.48

Source: 2005 Oaxaca Survey

Table 2: Household Characteristics According to Migrants and Remittances Received in Household, 2006

	All		International Migrants		Domestic Migrants		International Remittances		Domestic Remittances	
	N=563	N=347	N=142	N=112	N=101	N=44				
Age	49.57	45.64	54.33	59.96	53.30	56.57				
Years Schooling	3.67	4.11	3.13	2.93	3.24	2.80				
Gender (Male=1)	87.39	86.74	88.73	90.18	80.20	79.55				
Farm	77.26	76.08	78.87	82.14	77.23	86.36				
Land Size has	1.99	1.67	2.56	2.65	2.23	2.50				
Own Business	24.51	24.21	23.94	25.00	23.76	27.27				
Local Wage Labor	31.97	32.56	29.58	32.14	29.70	38.64				
Number of Residents	5.72	5.88	5.41	5.19	5.54	5.50				
Number of members	7.20	6.46	8.33	8.89	8.18	8.14				
Migrant	38.37	-	100	100	84.16	79.55				
Number of either migrants	0.98	-	2.62	3.01	2.36	2.11				
Number of Intl. Migrants	0.53	-	2.11	0.78	1.94	0.50				
Number of national migrants	0.44	-	0.51	2.23	0.42	1.61				
Received Remittances	24.33	6.63	62.68	43.75	100	100.00				
Total amount	2157.89	589.17	6281.87	3732.27	10341.88	4777.14				
International Remit	17.94	0.05	59.86	19.64	100	15.91				
International Remit	1822.26	455.63	6111.44	2550.79	10157.72	482.50				
# of International Remitters	0.27	0.06	0.92	0.35	1.49	0.25				
National Remittances	19.89	2.59	7.04	26.79	6.93	100				
National Remittances	335.64	133.54	170.42	1181.48	184.16	4294.64				
# of national Remittances	0.29	0.03	0.77	0.44	0.10	3.70				
Mixteca	50.80	43.80	60.56	67.86	69.31	65.91				
Low	49.02	50.72	48.59	35.71	42.57	43.18				
Medium	30.91	27.38	38.03	41.07	43.56	40.91				

Source: 2006 Oaxaca Survey

Table 3: Individual Characteristics According to Migration and Remittance Status, 2005

	All		Non Migrants		International Migrants		Domestic Migrants		Domestic Remittances	
	N=2736	N=2067	N=355	N=316	N=193	N=99	N=316	N=193	N=99	
Age	36.42	38.27	39.03	31.94	29.35	33.08	47.73	77.84	58.24	
Gender (Male=1) (%)	47.40	44.07	67.75	47.73	77.84	58.24	16.23	31.25	17.58	
Resident (%)	69.02	83.41	28.99	16.23	31.25	17.58	1.05	1.33	.84	
# Months in Household	7.9	9.94	1.45	1.05	1.33	.84	-	7.78	-	
Legal Mig. Status (%)	1.54	-	7.78	-	7.78	-	-	-	-	
Family Status										
Head of Household (%)	22.24	26.37	14.20	3.25	18.18	4.40	0.97	0.57	0.00	
Spouse (%)	18.59	24.00	1.48	87.34	76.14	90.11	0.65	2.27	0.00	
Son of Head (%)	49.76	39.48	78.70	0.65	2.27	0.00	6.17	5.11	5.49	
Sibling (%)	1.00	0.97	1.48	6.17	5.11	5.49	54.22	55.11	53.85	
Education										
None (%)	19.03	22.93	6.80	33.77	39.77	32.97	31.85	100	100	
Primary (%)	51.83	51.72	50.59	33.77	39.77	32.97	31.85	100	100	
Secondary (%)	27.22	23.80	42.01	33.77	39.77	32.97	31.85	100	100	
Sent Remittances (%)	10.5	0	54.11	31.85	100	100	1225.13	2597.62	3,879.49	
Remittances Total (pesos)	321.00	0	1,405	1225.13	2597.62	3,879.49				

Source: 2005 Oaxaca Survey

Table 4: Individual Characteristics According to Migration and Remittance Status, 2006

	All		Non Migrants		International Migrants		Domestic Migrants		International Remittances		Domestic Remittances	
	N=2841	N=2280	N=312	N=252	N=130	N=53	N=252	N=130	N=130	N=53	N=252	N=53
Age	36.13	37.47	28.375	33.54	30.27	32.26	33.54	30.27	30.27	32.26	33.54	32.26
Gender (Male=1)	48.06	45.77	67.86	44.80	73.44	64.15	44.80	73.44	73.44	64.15	44.80	64.15
Resident	74.16	84.08	38.14	28.17	45.38	41.51	28.17	45.38	45.38	41.51	28.17	41.51
Legal status	1.43	-	5.20	-	5.52	-	-	5.52	5.52	-	-	-
# Months in Household	8.22	9.93	1.45	1.04	1.94	1.40	1.04	1.94	1.94	1.40	1.04	1.40
Family Status												
Head of Household	20.52	23.82	9.76	3.67	15.70	7.69	3.67	15.70	15.70	7.69	3.67	7.69
Spouse	17.52	21.48	1.01	1.63	1.65	3.85	1.63	1.65	1.65	3.85	1.63	3.85
Son of Head	53.57	45.66	83.28	87.95	80.62	84.91	87.95	80.62	80.62	84.91	87.95	84.91
Sibling	1.24	1.27	1.68	0.41	1.64	0.00	0.41	1.64	1.64	0.00	0.41	0.00
Education												
None	18.45	21.46	2.56	10.71	3.08	15.09	10.71	3.08	3.08	15.09	10.71	15.09
Primary	49.30	49.41	49.68	47.62	52.31	47.17	47.62	52.31	52.31	47.17	47.62	47.17
Secondary	30.11	26.99	47.44	37.30	44.62	33.96	37.30	44.62	44.62	33.96	37.30	33.96
Sent Remittances	7.26	-	44.65	24.81	100.00	100.00	24.81	100.00	100.00	100.00	24.81	100.00
Remittances Total Pesos	414.83	-	3,062.78	724.67	6,906.41	2,975.62	724.67	6,906.41	6,906.41	2,975.62	724.67	2,975.62

Source: 2006 Oaxaca Survey

Table 5: Credit Demand and Rationing Mechanisms (%), 2005

	All		No Migrants		International Migrants		Domestic Migrants		International Remittances		Domestic Remittances	
	N=600	N=355	N=162	N=128	N=131	N=66						
Positive Loan	19.17	17.18	25.19	17.9	22.9	16.67						
EACP	5.6	5.6	6.2	6.25	3.81	4.54						
Informal	13.1	10.7	20.37	12.5	19.84	12.12						
Credit Rationing Mechanisms												
Price Rationed With loan	5.03	5.10	5.59	5.47	3.85	4.55						
Partially Quantity Rationed	0.67	0.57	0.62	0.78	0	0						
Price Rationed no loan	57.12	57.22	54.6	57.03	58.46	69.70						
Risk Rationed	10.55	9.57	14.29	10.16	14.62	9.09						
Transaction Cost	16.42	17.0	15.33	17.97	13.08	10.61						
Fully Quantity Rationed	10.22	11.05	9.32	8.59	10.00	6.06						

Source: 2005 Oaxaca Survey

Table 6: Credit Demand and Rationing Mechanisms (%), 2006

	All N=563	No Migrants N=347	International Migrants N=142	Domestic Migrants N=112	International Remittances N=101	Domestic Remittances N=44
Positive Loan	16.70	14.99	17.61	23.21	19.80	34.09
EACP	3.55	3.17	3.52	6.25	1.98	4.55
Informal	11.90	10.09	12.68	16.96	14.85	29.55
Bank	0.18	0.29	0.00	0.00	0.99	0.00
<u>Credit Rationing Mechanism</u>						
Price Rationed with loan	8.12	7.92	8.57	9.09	7	14.29
Partially quantity rationed	0.18	0	0.71	0.91	0	0
Rejected Applicant	0.54	0.29	1.43	0	1	0
Price Rationed with no loan	52.35	52.2	52.14	52.73	52	52.38
Risk Rationed	8.66	7.62	10.71	10.91	9	9.52
Transaction Cost	16.43	17.6	12.14	17.27	14	16.67
Fully Quantity Rationed	13.72	14.37	14.29	9.09	17	7.14

Source: 2006 Oaxaca Survey

Table 7: Household Exposure to Risks (%), 2005

	All n=600	No Migrants n=355	International Migrants n=162	Domestic Migrants n=128	International Remittances n=131	Domestic Remittances n=66
Household Member sick (%)	32.33	25.9	42.59	39.1	40.46	34.85
Household Member sick for year (%)	6.2	5.6	4.3	9.4	4.6	10.6
Number of members sick	0.51	0.39	0.68	0.6	0.66	0.47
Experienced a shock (%)	37.33	34.9	39.51	45.3	38.9	45.5
Number of Shocks	0.51	0.44	0.586	0.71	0.59	0.64
Types of Shocks						
Agriculture	28.67	26.76	27.78	39.8	27.5	39.4
Emergency illnesses	7.33	5.35	11.11	9.4	11.45	9.1
Household level	1.17	.84	1.85	1.56	2.29	1.5
Covariate shocks	0.33	0	1.23	0.78	1.52	0
Idiosyncratic shocks	37.33	34.92	39.51	45.3	38.9	45.45

Source: 2005 Oaxaca Survey

Table 8: Household Exposure to Risks (%), 2006

	All N=563	No Migrants N=347		International Migrants N=142		Domestic Migrants N=112		International Remittances N=101		Domestic Remittances N=44	
Household Member Sick	38.19	36.60	40.14	42.86	32.67	38.64					
Household Member sick for year	6.04	3.46	9.15	11.61	8.91	2.27					
Number of members sick	66.61	59.94	76.76	83.04	58.42	86.36					
Experienced a shock	29.48	25.36	37.32	37.50	35.64	36.36					
Number of shocks	37.48	30.55	50.00	52.68	46.53	52.27					
Types of shocks											
Agriculture	21.49	18.44	26.06	29.46	24.75	25.00					
Emergency illness	10.12	8.65	14.79	10.71	14.85	18.18					
Household level	1.42	0.58	2.11	3.57	2.97	4.55					
Covariate	17.23	15.27	19.72	24.11	16.83	20.45					
Idiosyncratic	15.81	12.97	21.83	18.75	23.76	27.27					

Source: 2006 Oaxaca Survey

Table 9: Description of Variables for Individual Remittance Equation

Variables	Description	2005		2006	
		All Migrants N=665	Remitting Migrants N=289	All Migrants N=586	Remitting Migrants N=208
Dremit	=1 if remitted	43.45	100	25.49	100
Ind. Remittances	Monetary amount of remittances	1,317.79	3032.31	2028.83	5715.84
Independent Variables					
Migrant Characteristics					
Age	# of years	30.44	30.62	30.68	30.85
Gender	=1 if Female	57.9	71.21	57.30	70.72
Education		6.68	6.57	6.83	6.45
Resident	=1 if resident	22.65	26.1	33.87	44.26
Household head	=1 if household head	8.75	12.87	7.05	13.29
Child	=1 if child	82.9	81.44	85.28	81.87
International	=1 if intl. migrant	53.08	66.09	55.80	70.19
Household Characteristics					
Migrants	Number of migrants in household	1.85	1.79	1.95	1.97
Income	Ln Predicted income level	4.44	4.37	6.33	6.39
House	=1 if household inherited a house	46.25	7.19	5.70	7.10
Livestock	=1 if household inherited large animals	6.72	1.89	2.67	1.09
Agricultural Land	=1 if household inherited ag. land	3.28	46.97	45.45	49.18
Crop Income Pos 1	Positive crop shock	1.31	1.16	1.43	1.47
Crop Income Neg 1	Negative crop shock	-1.09	-1.2	-1.43	-1.37
Crop Income Pos 2	Positive crop shock	1.64	1.36	1.86	1.83
Crop Income Neg 2	Negative crop shock	-1.34	-1.65	-1.7	-1.7
Crop Income Pos 3	Positive crop shock	0.93	1.02	0.44	0.413
Crop Income Neg 3	Negative crop shock	-0.35	-0.357	-0.87	-0.99
Negative	=1 if hh had a negative shock	40.62	39.39	70.23	64.48
Negative	# of negative shocks	.61	0.625	1.72	1.55
Agricultural	=1 if agricultural shock	32.5	29.17	62.92	60.66
Death/Inness	=1 if death or serious illness	10.0	12.12	8.91	5.46
Household	=1 if household shock	1.88	3.4	13.73	8.74

Source: 2005 and 2006 Oaxaca Survey

Table 10: Description of Variables for Household Remittance Equation, 2005

Variables	Description	2005		2006	
		All Households N=600	Remittances N=186	All Households N=563	Remittances N=138
Demit	= 1 if received remitted	31	100	24.33	100
Remittances	Monetary amount	1,478.99	4,770.63	2157.9	8803.6
Independent Variables					
Household Head Characteristics					
Age	# of years	48.54	52.76	49.6	53.9
Gender	=1 if Female	11.83	17.20	12.61	18.12
Education	Years of schooling	3.76	3.37	3.7	3.1
Migrated	=1 if migrated	10.5	21.5	7.46	18.84
Household Characteristics					
International Remittances	=1 if international remittances	21.83	70.43	17.94	73.19
Migrants	Number of migrants in household	1.05	2.42	1.0	2.2
International Migrant	=1 if international migrant	22	66.13	25.22	65.22
Formal Remit	=1 if remittances received formally	15	48.4	14.65	59.78
Income	Predicted income level	4.62	6.32	6.54	6.57
House	=1 if inherited a house	5.67	7.53	5.86	5.80
Livestock	=1 if inherited large animals	1.5	2.15	1.60	1.45
Patio	=1 if inherited residential land	25.0	30.11	25.93	24.64
Ag Land	=1 if inherited agricultural land	38.33	47.3	38.9	44.20
Crop Income Pos 1	Positive crop shock	1.19	1.13	1.53	1.52
Crop Income Neg 1	Negative crop shock	-1.19	-1.34	-1.53	-1.38
Crop Income Pos 2	Positive crop shock	1.48	1.39	1.8	1.89
Crop Income Neg 2	Negative crop shock	-1.52	-1.75	-1.8	-1.69
Crop Income Pos 3	Positive crop shock	0.98	1.04	0.43	0.45
Crop Income Neg 3	Negative crop shock	-0.41	-0.37	-1.04	-1.01
Death/Illness	=1 if death or illness in households	7.3	10.7	10.12	15.94
Agricultural Losses	=1 if agricultural shock	28.6	66.13	21.49	24.64
Household	=1 if household shock	1.17	2.15	1.42	3.62

Source: 2005 and 2006 Oaxaca Survey

Table 11: Individual Remittances, Basic Characteristics

	Probit		Tobit		OLS		
	Pooled	Random Effects	Pooled	Random Effects	Pooled	Random Effects	Fixed Effects
	1	2	3	4	5	6	7
Constant	-1.616* [0.421]	-2.433* [0.625]	-18,778.296* [3,494.726]	-2,635.115+ [1,424.851]	-2,314.65 [1,660.109]	-2,754.25 [1,973.925]	3,964.91 [5,809.839]
Year (=2006)	-0.292* [0.089]	-0.445* [0.111]	-672.037 [730.566]	551.263+ [301.866]	545.815+ [301.363]	551.822** [220.391]	680.838* [216.149]
Age	0.028 [0.018]	0.04 [0.028]	333.409** [165.955]	100.098 [65.407]	91.864 [66.091]	92.199 [75.901]	-200.639 [469.027]
Age squared	0 [0.000]	0 [0.000]	-3.629 [2.247]	-1.21 [0.851]	-1.139 [0.763]	-1.058 [0.832]	2.663 [8.124]
Education	0.005 [0.054]	-0.006 [0.064]	143.996 [350.804]	105.478 [162.887]	98.872 [192.006]	82.833 [209.412]	
Education Squared	-0.001 [0.004]	-0.001 [0.004]	-8.301 [24.049]	-2.223 [11.079]	-2.31 [15.826]	0.097 [17.944]	
Resident (=1)	0.183 [0.126]	0.212 [0.163]	1,777.644** [891.554]	604.883 [416.203]	529.118 [561.171]	677.36 [631.320]	333.13 [1,535.281]
International migrant (=1)	0.850* [0.137]	1.274* [0.201]	6,814.092* [988.983]	1,592.450* [446.677]	1,553.252* [485.643]	1,565.254* [560.232]	1,558.17 [1,073.062]
Gender (1=Male)	0.373* [0.098]	0.566* [0.151]	3,526.620* [783.081]	910.552** [358.167]	891.920* [219.584]	932.088* [259.332]	
Household Head (=1)	0.329 [0.225]	0.564 [0.351]	5,220.408* [1,862.068]	3,032.182* [875.538]	3,097.364+ [1,669.966]	2,577.090** [1,250.041]	
Child (=1)	0.393** [0.178]	0.645** [0.274]	3,086.976** [1,491.916]	521.159 [643.115]	430.149 [454.261]	730.256 [452.919]	
Number of migrants	-0.135* [0.035]	-0.204* [0.044]	-1,254.297* [238.566]	-349.769* [102.897]	-346.136* [108.185]	-314.859** [124.652]	-201.914 [210.786]
Observations	1184	1184	1184	1184	1184	1184	1206
Number of Ind.		797	797			797	819
R-squared					0.068		0.032

Robust standard errors in brackets

+ significant at 10%; ** significant at 5%; * significant at 1%

Table 12: Individual Remittances Risks (Probit Model)

	Pooled					Random Effects				
	1	2	3	4	5	1	2	3	4	5
Agricultural Shock	0.03 [0.136]					0.098 [0.146]				
Death/Illness	0.107 [0.202]					-0.025 [0.226]				
Household Shock	0.385 [0.357]					0.321 [0.494]				
Covariate		-0.042 [0.139]					-0.02 [0.158]			
Idiosyncratic		0.139 [0.155]					0.154 [0.165]			
Negative Crop Shock 1			0.035 [0.029]					0.043 [0.035]		
Positive Crop Shock 1			-0.03 [0.034]					-0.036 [0.040]		
Negative Crop Shock 2				0.018 [0.030]					0.027 [0.032]	
Positive Crop Shock 2				-0.041 [0.035]					-0.054 [0.042]	
Negative Crop Shock 3					-0.027 [0.054]					-0.063 [0.062]
Positive Crop Shock 3					-0.006 [0.047]					0.003 [0.059]
Observations	1184	1184	1184	1184	1184	1184	1184	1184	1184	1184
Number of Ind.						797	797	797	797	797

All regressions control for variables presented in Table 11

Robust standard errors in brackets

+ significant at 10%; ** significant at 5%; * significant at 1%

Table 13: Individual Remittances Risks (Tobit)

	Pooled					Random Effects				
	1	2	3	4	5	1	2	3	4	5
Agricultural Shock	768.56 [892.43]					320.22 [392.7]				
Death/Illness	8.18 [1,346.8]					-356.81 [598.83]				
Household Shock	2,871.0 [2,999.29]					795.89 [1,376.47]				
Covariate		-524.36 [984.7]					-225.66 [425.25]			
Idiosyncratic		1,590.9 [1,003.61]					549.65 [449.01]			
Negative Crop Shock 1			551.8* [212.73]					229.14** [93.05]		
Positive Crop Shock 1			-483.89** [236.25]					-173.06+ [101.70]		
Negative Crop Shock 2				338.69+ [186.84]					162.51+ [83.30]	
Positive Crop Shock 2				-349.8 [243.89]					-60.44 [106.78]	
Negative Crop Shock 3					-144.85 [347.93]					-6.22 [161.05]
Positive Crop Shock 3					-302.99 [326.10]					-136.65 [149.67]
Observations	1184	1184	1184	1184	1184	1184	1184	1184	1184	1184
Number of ind.						797	797	797	797	797

All regressions control for variables presented in Table 11

Standard errors in brackets

+ significant at 10%; * significant at 5%; ** significant at 1%

Table 14: Individual Remittances Risks (OLS)

	Random Effects					Fixed effects				
	1	2	3	4	5	1	2	3	4	5
Agricultural Shock	-47.735 [360.845]					-617.614+ [359.195]				
Death/Illness	-593.792 [461.128]					-1,058.671** [481.040]				
Household Shock	609.282 [1,339.694]					498.596 [1,527.277]				
Covariate		-354.461 [317.762]					-733.843** [361.185]			
Idiosyncratic		236.2 [434.662]					-161.495 [437.643]			
Negative Crop Shock 1			146.289 [90.828]					29.517 [109.359]		
Positive Crop Shock 1			-81.566 [82.427]					81.39 [123.499]		
Negative Crop Shock 2				126.534+ [70.211]					94.36 [87.027]	
Positive Crop Shock 2				-34.317 [94.242]					-62.11 [123.974]	
Negative Crop Shock 3					-27.01 [134.59]					-96.61 [108.830]
Positive Crop Shock 3					-82.89 [119.64]					0 [0.00]
Observations	1184	1184	1184	1184	1184	1206	1206	1206	1206	1206
R-squared						0.044	0.039	0.034	0.034	0.034
Number of ind.	797	797	797	797	797	819	819	819	819	819

All regressions control for variables presented in Table 11

Robust standard errors in brackets

+ significant at 10%; ** significant at 5%; * significant at 1%

Table 15: Household Level Remittances, Basic Characteristics

	Probit			Tobit			OLS		
	Pooled	Random Effects	Pooled	Random Effects	Pooled	Random Effects	Pooled	Random Effects	Fixed Effects
	1	2	3	4	5	6	7		
Constant	-0.901+ [0.537]	-1.159+ [0.643]	-17,673.826* [5,970.468]	-124.195 [2,089.234]	-261.825 [2,735.623]	-119.61 [2,701.797]	3,217.62 [7,117.158]		
Year (=2006)	-0.220* [0.080]	-0.293* [0.110]	315.329 [1,137.640]	782.851** [349.700]	794.325+ [429.951]	780.367+ [427.064]	660.744 [423.882]		
Household Head Characteristics									
Age	-0.023 [0.019]	-0.028 [0.024]	-183.298 [222.437]	-33.902 [80.755]	-29.537 [129.995]	-33.736 [129.754]	-172.694 [335.950]		
Age squared	0 [0.000]	0 [0.000]	2.58 [2.078]	0.544 [0.773]	0.51 [1.388]	0.542 [1.388]	2.367 [3.409]		
Education	0.044 [0.049]	0.05 [0.056]	557.824 [497.414]	176.916 [168.248]	178.652 [178.715]	173.513 [176.353]	-427.921 [546.293]		
Education Squared	-0.006 [0.005]	-0.007 [0.005]	-52.294 [48.409]	-8.993 [14.897]	-9.137 [18.079]	-8.723 [17.786]	40.692 [42.868]		
Migrant	0.563* [0.212]	0.665* [0.198]	7,262.957* [1,772.770]	1,971.348* [720.887]	2,151.41 [1,451.505]	1,915.82 [1,318.332]	314.434 [1,015.923]		
Female	0.643* [0.166]	0.775* [0.186]	6,169.019* [1,598.369]	934.837 [615.846]	944.398 [579.243]	935.995 [573.082]	-1,082.68 [1,756.039]		
Household Characteristics									
Number of migrants	0.222* [0.056]	0.278* [0.044]	1,780.509* [364.010]	214.594 [147.086]	215.019 [165.633]	215.265 [168.673]	213.316 [365.448]		
International Migrant	1.196* [0.149]	1.504* [0.171]	12,946.254* [1,418.104]	3,155.244* [555.384]	3,097.009* [781.767]	3,146.829* [791.489]	3,794.035* [1,293.323]		
Observations	1163	1163	1163	1163	1163	1163	1163		
Number of households		600		600	600	600			
R-squared					0.087				0.052

Robust standard errors in brackets

+ significant at 10%; ** significant at 5%; * significant at 1%

Table 16: Household Remittances Risks (Probit)

	Pooled					Random Effects				
	1	2	3	4	5	1	2	3	4	5
Agricultural Shock	0.15 [0.135]					0.189 [0.153]				
Death/Illness	0.258 [0.172]					0.242 [0.219]				
Household Shock	1.120+ [0.577]					1.379** [0.650]				
Covariate		0.151 [0.164]					0.195 [0.162]			
Idiosyncratic		0.264+ [0.160]					0.263 [0.171]			
Negative Crop Shock 1			0.017 [0.024]					0.015 [0.034]		
Positive Crop Shock 1			-0.035 [0.040]					-0.041 [0.041]		
Negative Crop Shock 2				-0.014 [0.027]					-0.024 [0.031]	
Positive Crop Shock 2				0.011 [0.039]					0.021 [0.044]	
Negative Crop Shock 3					-0.015 [0.039]					-0.026 [0.054]
Positive Crop Shock 3					0.05 [0.032]					0.064 [0.053]
Observations	1163	1163	1163	1163	1163	1163	1163	1163	1163	1163
Number of Households						600	600	600	600	600

All regressions control for variables presented in Table 15

Robust standard errors in brackets

+ significant at 10%; ** significant at 5%; * significant at 1%

Table 17: Household Remittances, Risks (Tobit)

	Pooled					Random Effects)				
	1	2	3	4	5	1	2	3	4	5
Agricultural Shock	2,109.9 [1,469.48]					500.26 [510.43]				
Death/Illness	1,740.2 [2,164.12]					-295.44 [772.5]				
Household Shock	8,244.4 [5,145.76]					1,878.8 [2,149.1]				
Covariate		961.43 [1,604.29]					-299.27 [552.88]			
Idiosyncratic		3,401.14** [1,632.840]					854.67 [583.54]			
Negative Crop Shock 1			615.21+ [331.05]					193.77+ [107.14]		
Positive Crop Shock 1			-752.48+ [389.98]					-217.30+ [129.28]		
Negative Crop Shock 2				244.24 [294.06]					151.81 [100.27]	
Positive Crop Shock 2				-87.11 [417.81]					-126.66 [142.34]	
Negative Crop Shock 3					-90.28 [513.93]					12.93 [168.3]
Positive Crop Shock 3					244.11 [494.77]					-18.67 [166.55]
Observations	1163	1163	1163	1163	1163	1163	1163	1163	1163	1163
Number of households						600	600	600	600	600

All regressions control for variables presented in Table 15

Standard errors in brackets

+ significant at 10%; ** significant at 5%; * significant at 1%

Table 18: Household Remittances Risks (OLS)

	Random Effects					Fixed Effects				
	1	2	3	4	5	1	2	3	4	5
Agricultural Shock	487.24 [592.93]					223.17 [670.75]				
Death/Illness	-287.63 [1,064.30]					-45.32 [1,159.97]				
Household Shock	1,871.6 [1,797.49]					-80.50 [1,953.51]				
Covariate		-295.66 [590.00]					-281.92 [661.83]			
Idiosyncratic		838.84 [693.52]					688.34 [777.74]			
Negative Crop Shock 1			190.23** [79.209]					73.08 [131.05]		
Positive Crop Shock 1			-213.302+ [123.51]					-78.40 [235.36]		
Negative Crop Shock 2				147.84 [105.66]					28.23 [118.29]	
Positive Crop Shock 2				-122.43 [164.19]					-69.17 [191.02]	
Negative Crop Shock 3					11.981 [118.95]					-11.59 [134.56]
Positive Crop Shock 3					-17.75 [125.62]					0 [0.0]
Observations	1163	1163	1163	1163	1163	1163	1163	1163	1163	1163
R-squared						0.052	0.053	0.052	0.052	0.052
Number of households	600	600	600	600	600	600	600	600	600	600

All regressions control for variables presented in Table 15

Standard errors in brackets

+ significant at 10%; ** significant at 5%; * significant at 1%

Table 19: Description of Variables for Household Demand Equations

Variables	2006			
	2005 Description	All Households N=600	Households with Migrants N=245	All Households with Migrants N=563
Dependent Variables				
Any	=1 if loan	19.17	22.04	16.70
EACP	=1 if EACP loan	5.67	5.71	3.55
Informal	=1 if informal loan	13.17	16.73	11.90
Effective demand	Monetary amount in pesos	1,057.5	2,065.71	1,769.98
DND1	=1 if positive ND1	15.83	14.69	21.30
Notional Demand1	Monetary amount in pesos	2,385.33	2,065.71	3,519.54
DND2	=1 if positive ND2	42.67	42.86	46.36
Independent Variables				
Age	# of years	48.54	54.18	55.88
Gender	=1 if female	11.83	13.47	11.57
Education	Years of schooling	3.77	3.33	2.97
International	=1 if international migrant	27.00	0.67	0.77
Farm	=1 if household farmed	72.50	73.47	77.26
Wage Labor	=1 if wage labor	39.83	46.12	41.39
Dependency Ratio		85.83	59.14	82.01
Expenditures	Natural log of HH expenditures	2.61	4.09	2.56
Assets	Natural log of HH assets	3.80	2.93	2.84
Land	Natural log of land in hectares	0.17	0.21	17.57
EACP member	1 if EACP member	11.33	11.84	8.80
Mixteca	1 if village is in Mixteca	50.00	64.90	50.80

Number of household members under age of 15 and over the age of 65 divided household members between 15 and 65.

Source: 2005 and 2006 Oaxaca Survey

Table 20: Migration Networks

Variables	Description	2005			2006		
		All Households N=600	Households with Migrants N=245	All Households N=563	Households with Migrants N=216	All Households N=563	Households with Migrants N=216
Remittances HH	Predicated Remittances 1	1491.00	3778.34	2144.99	4781.64		
Remittances Ind.	Predicated Remittances 2	1254.35	3014.14	1895.72	1.39		
International Migrants	# of international migrants	0.57	1.39	0.53	0.92		
Male migrants	# of male migrants	0.38	0.92	0.35	0.00		
Ag Laborer	# with ag migrants jobs	0.06	0.15	0.06	0.15		
Non-Ag Laborer	# with non-ag migrants jobs	0.08	0.17	0.08	0.14		
National Wage	national job	4.50	8.57	35.63	8.33		
State Wage	state job	6.17	5.71	5.15	3.24		
HH International Experience	Migration experience	0.82	1.74	0.83	1.45		
Legal Status	# with legal status	0.07	0.16	0.07	0.15		
Number of times migration	# of trips to US	1.43	3.07	1.48	2.49		
Village International	# of HHs with international migrants	14.93	18.20	15.01	17.38		
Village National	# of HHs with national migrants	11.79	14.65	11.96	13.60		
International Migrants	# of individuals migrated in village	31.78	41.41	31.87	38.68		
National Wage	# of individuals migrated in village	26.99	34.38	27.32	31.62		
State	# of individuals migrated in village	14.67	14.30	14.78	14.19		

Source: 2005 and 2006 Oaxaca Survey

Table 21: Basic Determinants of Binary Effective Demand (Probit Model)

	Pooled			Random Effects		
	Any	EACP	Informal	Any	EACP	Informal
	1	2	3	1	2	3
Constant	-2.074*	-2.052*	-2.911*	-2.346*	-2.336+	-3.082*
	[0.578]	[0.781]	[0.647]	[0.750]	[1.339]	[0.813]
Trend	-0.075	-0.152	-0.089	-0.09	-0.187	-0.096
	[0.087]	[0.115]	[0.103]	[0.098]	[0.190]	[0.104]
Age	-0.009	-0.047+	0.008	-0.009	-0.051	0.008
	[0.021]	[0.025]	[0.028]	[0.024]	[0.042]	[0.025]
Age squared	0	0.000+	0	0	0.001	0
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Education	0.069**	0.129*	0.054+	0.078+	0.15	0.058
	[0.035]	[0.049]	[0.032]	[0.046]	[0.091]	[0.048]
Education Squared	-0.003	-0.007	0	-0.004	-0.008	0
	[0.003]	[0.004]	[0.002]	[0.004]	[0.007]	[0.004]
Gender (1=Female)	0.06	0.145	-0.005	0.057	0.15	-0.011
	[0.203]	[0.228]	[0.169]	[0.179]	[0.321]	[0.184]
Number of residents	0.119	0.182*	0.095	0.129	0.202	0.097
	[0.089]	[0.060]	[0.103]	[0.094]	[0.164]	[0.103]
Number of residents squared	-0.006	-0.005**	-0.006	-0.006	-0.006	-0.006
	[0.005]	[0.003]	[0.006]	[0.005]	[0.009]	[0.006]
Business	0.387*	0.321**	0.260**	0.407*	0.357	0.266**
	[0.112]	[0.146]	[0.124]	[0.121]	[0.223]	[0.124]
Farm	-0.018	-0.131	0.078	0.001	-0.141	0.095
	[0.137]	[0.179]	[0.148]	[0.137]	[0.245]	[0.143]
Local Wage	0.295*	0.219	0.352*	0.325*	0.234	0.373*
	[0.097]	[0.233]	[0.099]	[0.114]	[0.211]	[0.117]
EACP Member	0.848*	1.698*	-0.143	0.983*	1.923*	-0.135
	[0.134]	[0.171]	[0.220]	[0.176]	[0.283]	[0.197]
Land title	0.045	0.231	-0.252	0.025	0.252	-0.277
	[0.212]	[0.234]	[0.300]	[0.251]	[0.377]	[0.305]
Observations	1163	1163	1163	1163	1163	1163
Number of Households				600	600	600

+ significant at 10%; ** significant at 5%; * significant at 1%

Village, income variables and household characteristics included. Contact author for complete results

Table 22: Basic Determinants of Continuous Effective Demand

	Tobit pooled 1	OLS RE 2	OLS RE 3	OLS FE 4	OLS FE 5
Constant	-7,365.879** [3,714.527]	-5,362.96 [3,511.272]	36,797.068+ [19,761.991]	-8,776.01 [9,489.261]	88,119.276* [31,661.749]
Trend	1,070.991* [369.092]	861.309* [253.035]	3,505.501* [1,246.034]	729.750* [278.288]	5,997.234* [1,666.454]
Age	290.528** [128.886]	182.139 [119.765]	911.251** [356.926]	395.286 [316.168]	1,795.485* [537.717]
Age squared	-2.748** [1.259]	-1.739 [1.177]	-9.245** [3.655]	-4.784 [3.252]	-19.093* [5.507]
Education	124.859 [258.561]	55.132 [257.492]	-2,074.694** [1,015.448]	-781.32 [1,115.230]	-4,921.410* [1,700.429]
Education Squared	21.603 [22.493]	23.754 [22.341]	143.842** [59.743]	-32.676 [80.661]	223.159** [112.999]
Gender (1=Female)	147.86 [968.411]	1,009.90 [938.884]	-1,165.07 [1,377.419]	501.737 [3,587.896]	-3,547.94 [3,775.504]
Number of residents	-9.016 [350.136]	319.577 [339.752]	-2,538.386+ [1,362.501]	1,072.98 [933.334]	-4,557.787** [1,985.667]
Number of residents squared	3.384 [16.061]	-8.744 [15.860]	75.036+ [41.812]	-29.656 [49.774]	133.260+ [70.850]
Business	923.497 [651.737]	-208.199 [559.467]	-5,267.940** [2,396.032]	-823.572 [767.368]	-10,906.994* [3,236.728]
Farm	-1,272.919+ [664.293]	-724.974 [517.712]	1,272.92 [1,055.979]	-515.372 [600.992]	3,450.660** [1,373.429]
Local Wage	-133.079 [521.838]	-177.682 [385.884]	-3,486.572** [1,572.826]	-388.005 [416.496]	-6,977.182* [2,096.888]
EACP Member	10,018.701* [936.406]	6,140.991* [802.186]	-19,057.47 [11,636.194]	1,812.611+ [1,070.104]	-48,176.303* [15,632.518]
Land Title	576.809 [1,108.361]	1,055.10 [808.753]	-2,500.23 [1,828.401]	1,389.96 [862.386]	-5,618.844** [2,348.000]
Selection	No	No	Yes	No	Yes
Observations	1163	1163	1163	1163	1163
Number of households	600	600	600	600	600
R-squared		0.161	0.161	0.054	0.071

Standard errors in brackets

+ significant at 10%; ** significant at 5%; * significant at 1%

Village, income variables and household characteristics included. Contact author for complete results

Table 23: Binary Effective Demand and Predicated Remittances (Probit Random Effects)

Loan Type	Any	EACP	Informal	Any	EACP	Informal
Individual Remittances	1.06E-05 [2.39E-05]	14.25E-05 [5.21E-05]	2.09E-05 [2.39E-05]	4.54E-05+ [2.57E-05]	-4.14E-05 [5.27E-05]	6.29E-05** [2.62E-05]
Household Remittances						
Observations	1163	1163	1163	1163	1163	1163
Number of households	600	600	600	600	600	600

+ significant at 10%; ** significant at 5%; * significant at 1%

Village, income variables and household characteristics included. Contact author for complete results
Results from pooled probit were not significantly different from random effects probit

Table 24: Continuous Effective Demand and Predicated Remittances

	Tobit		OLS		Tobit		OLS	
	Pooled	Pooled	RE	FE	Pooled	Pooled	RE	FE
Household Remittances	1	2	3	4	5	6	7	8
Individual Remittances	-0.008 [0.111]	0.011 [0.071]	-0.059 [0.089]	-0.094 [0.107]	-0.172 [0.128]	-0.128 [0.104]	-0.072 [0.104]	-0.028 [0.127]
Selection	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Number of households	600	600	600	600	600	600	600	600
R-squared		0.161	0.073	0.073		0.162		0.071

Standard errors in brackets

+ significant at 10%; ** significant at 5%; * significant at 1%

Village, income variables and household characteristics included. Contact author for complete results

Table 25: Binary Effective Demand and Migration Networks (Probit Random Effects Model)

Loan Type	Any	EACP	Informal	Any	EACP	Informal
Number of intl. trips	0.002 [0.023]	-0.313* [0.107]	0.019 [0.022]			
Number of intl. members	-0.107 [0.111]	0.006 [0.288]	-0.082 [0.114]			
Number of male members	0.074 [0.140]	-0.789** [0.389]	0.093 [0.142]			
Household experience	0.063 [0.069]	0.506** [0.220]	0.024 [0.070]			
Ag Labor	0.134 [0.160]	0.338 [0.571]	0.205 [0.157]			
Non-Ag Labor	0.011 [0.158]	-9.003 [43,135.5]	0.161 [0.155]			
National Labor	-0.079 [0.268]	0.114 [0.581]	0.188 [0.253]			
State Wage	0.449** [0.206]	0.208 [0.426]	0.297 [0.216]			
Legal Migrants	-0.017 [0.117]	1.068* [0.367]	-0.103 [0.123]			
# HH with intl.	-0.02 [0.027]	-0.517 [0.352]	-0.005 [0.030]			
# HH with natl.	0.034 [0.046]	-0.19 [0.228]	-0.006 [0.050]			
# Village intl. mig.	0.012 [0.009]	0.115 [0.103]	0.005 [0.010]			
# Village natl. mig	-0.019 [0.014]	0.171 [0.135]	-0.004 [0.015]			
# Village state. mig.	0.005 [0.010]	0.446 [0.294]	0.01 [0.010]			
Family Migration				0.014 [0.065]	-0.251+ [0.147]	0.056 [0.064]
Job Security 1				0.025 [0.055]	0.18 [0.130]	0.03 [0.054]
Job Security 2				0.105** [0.050]	0.049 [0.088]	0.041 [0.051]
Village networks 1				-0.011 [0.107]	0.123 [0.247]	0.017 [0.109]
Village networks 2				-0.196** [0.084]	0.474 [0.362]	-0.106 [0.084]
Observations	1163	1163	1163	1163	1163	1163
Number of households	600	600	600	600	600	600

+ significant at 10%; ** significant at 5%; * significant at 1%

Village, income variables and household characteristics included. Contact author for complete results

Table 26: Continuous Effective Demand and Migration Networks

	Tobit		OLS	
	Pooled 1	Pooled 2	RE 3	FE 4
Number of intl. trips	-174.15 [147.390]	-175.445 [140.251]	-139.037 [149.970]	0 [0.000]
Number of intl. members	237.163 [537.903]	414.28 [457.871]	0.66 [433.497]	-343.588 [547.871]
Number of male members	-609.254 [749.060]	-840.356 [686.131]	-207.09 [624.022]	196.974 [845.115]
Household experience	-98.211 [386.895]	-74.343 [211.590]	-44.38 [374.279]	0 [0.000]
Ag Labor	663.427 [799.521]	1,309.79 [1,305.076]	438.795 [596.914]	167.349 [664.734]
Non-Ag Labor	-71.843 [774.654]	-188.474 [784.959]	-166.077 [583.361]	-310.255 [644.015]
National Labor	-979.217 [1,189.981]	-67.001 [1,086.961]	-888.409 [885.894]	-749.307 [1,050.034]
State Wage	252.182 [1,013.114]	610.878 [1,117.412]	636.698 [762.915]	449.652 [842.928]
Legal Migrants	998.236 [758.504]	1,051.95 [1,133.280]	1,066.87 [762.315]	0 [0.000]
Number of hhs with intl.	425.187* [164.238]	264.540+ [130.644]	262.291 [162.396]	-246.027 [911.700]
Number of hhs with natl.	-19.76 [266.849]	124.482 [324.083]	165.614 [267.187]	0 [0.000]
Number of village intl. migrants	-126.518** [55.768]	-74.330+ [39.881]	-73.311 [55.161]	0 [0.000]
Number of village natl. Migrants	-2.128 [80.631]	-50.141 [97.040]	-71.617 [81.041]	-260.413 [797.319]
Number of village state. Migrants	61.723 [52.651]	22.23 [44.670]	28.675 [52.901]	-375.476 [734.979]
Selection	No	Yes	Yes	Yes
Observations	1163	1163	1163	1163
Number of households	600		600	600
R-squared		0.179		0.075
Standard errors in brackets				

+ significant at 10%; ** significant at 5%; * significant at 1%

Village, income variables and household characteristics included. Contact author for complete results

Table 27: Continuous Effective Demand and Latent Variables for Migration Networks

	OLS		
	Pooled 1	RE 2	FE 3
Family Migration	-674.704+	-496.15	-337.148
	[322.882]	[321.135]	[737.466]
Job Security 1	405.782	197.9	-111.338
	[386.411]	[275.212]	[385.115]
Job Security 2	271.53	278.863	217.861
	[197.130]	[173.448]	[197.081]
Village networks 1	622.166	575.614	-4,716.67
	[439.221]	[612.791]	[11,203.388]
Village networks 2	260.662	218.999	-2,342.37
	[352.168]	[496.928]	[10,211.330]
Selection	Yes	Yes	Yes
Observations	1163	1163	1163
Number of households		600	600
R-squared	0.167		0.074
Standard errors in brackets			

+ significant at 10%; ** significant at 5%; * significant at 1%

Village, income variables and household characteristics included. Contact author for complete results

Table 28: Notional Demand Basic Determinants (Probit Random Effects)

	Notional Demand 1	Notional Demand 2
Constant	-0.864 [0.788]	-0.297 [0.508]
Trend	0.332* [0.104]	0.115 [0.076]
Age	-0.025 [0.026]	0.001 [0.017]
Age squared	0 [0.000]	0 [0.000]
Education	0.013 [0.054]	0.002 [0.034]
Education Squared	0 [0.005]	0.001 [0.003]
Gender (1=Female)	0.135 [0.200]	-0.094 [0.129]
Number of residents	0.001 [0.071]	0.004 [0.046]
Number of residents squared	0.001 [0.003]	0 [0.002]
Business	0.054 [0.143]	-0.127 [0.095]
Farm	-0.135 [0.155]	-0.002 [0.105]
Local Wage	0.036 [0.127]	-0.033 [0.089]
EACP Member	1.290* [0.200]	0.478* [0.140]
Observations	1163	1163
Number of households	600	600

+ significant at 10%; ** significant at 5%; * significant at 1%

Village, income variables and household characteristics included. Contact author for complete results

Table 29: Notional Demand: Migration Networks (Probit Random Effects)

	Notional Demand 1		Notional Demand 2	
	1	2	1	2
# of intl. trips	0.005 [0.028]		0.008 [0.019]	
# of intl. members	0.183 [0.117]		0.014 [0.083]	
# of male members	-0.256 [0.164]		0.06 [0.111]	
Household experience	-0.012 [0.078]		-0.042 [0.053]	
Ag Labor	-0.048 [0.193]		-0.058 [0.136]	
Non-Ag Labor	-0.195 [0.198]		-0.153 [0.133]	
National Labor	0.066 [0.296]		-0.176 [0.209]	
State Wage	0.464** [0.230]		0.16 [0.175]	
Legal Migrants	0.267+ [0.141]		0.035 [0.098]	
# of hhs with intl.	-0.066** [0.033]		-0.046** [0.021]	
# of hhs with natl.	0.143* [0.054]		0.109* [0.035]	
# of village intl. migrants	0.022** [0.011]		0.015** [0.007]	
# of village natl. Migrants	-0.034** [0.016]		-0.033* [0.011]	
# of village state. Migrants	-0.004 [0.010]		-0.015** [0.007]	
Family Migration		0.01 [0.079]		0.029 [0.050]
Job Security 1		0.061 [0.066]		-0.024 [0.046]
Job Security 2		0.083 [0.057]		0.059 [0.040]
Village networks 1		0.117 [0.124]		-0.046 [0.078]
Village networks 2		0.15 [0.101]		-0.037 [0.063]
Observations	1163	1163	1163	1163
Number of households	600	600	600	600

+ significant at 10%; ** significant at 5%; * significant at 1%

Village, income variables and household characteristics included. Contact author for complete results