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Does the insurance effect of public and private transfers favor financial deepening? Evidence from rural Nicaragua

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Abstract

The literature suggests CCTs and remittances may protect poor households from income risk. We present a theoretical framework that explores how this 'insurance' effect can change households' decision to apply for a loan via changes in credit demand and supply. Empirical evidence from poor rural households in Nicaragua shows CCTs did not affect loan requests while remittances increased them. The risk protection provided by remittances seems stronger, relative to CCTs, such that improvements on borrowers' expected marginal returns to a loan or on creditworthiness more than offset decreasing returns to additional income. This suggests those transfers that best protect households from income risk favor financial deepening in the context of segmented markets.

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1. Introduction

The outreach of public and private transfers has been growing considerably in the past decade among the poorest living in developing countries. The provision of public transfers through Conditional Cash Transfer (CCT) programs, like the renowned Oportunidades in Mexico and Bolsa Escola in Brazil, continue to expand as they have been shown to encourage investment in education and health among the rural and urban poor. In addition, access to private transfers in the form of remittances has also been expanding among the rural and urban poor as domestic and international migration flows increase. This study explores how access to these types of transfers may affect household participation in rural credit markets, via changes in credit demand and supply, and contributes to the understanding of the possible far-reaching effects they may have on household behavior.

We present a theoretical framework that links the migration and CCT literature with that of rural credit markets in developing countries in a way that explains how access to these transfers may impact credit market outcomes. We empirically test this framework using panel data from poor rural households participating in a randomized CCT program conducted in Nicaragua named *Red de Protección Social*. Many of these households had domestic migrants sending remittances during the same time period, as part of their income risk management strategies. We then evaluate the impact that having access to CCTs and remittances had on the household's decision to request a loan, considering the exogenous nature of the CCT and the endogenous nature of remittances.

The literature that explores the motives and effects of migration is vast and it offers no single element as the cause for migration (Taylor and Martin, 2001). It suggests that migration may be undertaken in order to increase household income and overcome liquidity constraints (Lucas, 1987). It may also be a

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way for households to reduce unforeseen income fluctuations. In turn, this protection from income risk may lead to changes in investment and consumption decisions that would have not occurred had migration not taken place (Stark, 1991). This is the view of the New Economics of Labor Migration (NELM) literature, which explains migration as an inter-temporal household strategy that reduces income risk by spatially diversifying the household's portfolio of income-generating activities (Stark and Levhari, 1982). In this context, the migrant is seen as a member of a geographically extended family who acts in coordination with other members to reduce idiosyncratic risk. Therefore, migration can be considered an informal risk-sharing mechanism among the geographically extended family to manage and cope with risk (Dercon, 2002; Fafchamps, 2007).

The literature also suggests that public transfers in the form of CCTs may provide income risk protection, as households may save part of the transfer and use these savings during times of need. There is evidence that CCTs may allow households to cope better with idiosyncratic shocks, such that when they occur households are able to keep children in school (de Janvry et al., 2006); smooth consumption (Maluccio, 2005); and hold on to assets (Alderman and Hoddinott, 2007).

Given the evidence about the insurance effect of remittances and CCTs on poor households, one would expect to also observe an influence on household participation in credit markets, as protection from risk may change household risk management strategies through improvements in their expectations about future states of the world. The literature on credit markets considers these expectations a key determinant of household credit demand and supply. This paper contributes to the literature by exploring this additional and complex link.

Our findings show that CCTs did not have a significant effect on the likelihood of requesting a loan, while remittances increased it. The significant positive effect of access to remittances suggests that the potential reduction in income risk increases the household's expected marginal returns from a loan or the household's creditworthiness as perceived by lenders in a way that more than offsets the decreasing marginal returns caused by the additional income. The net result encourages the decision to request a loan. The limited flexibility of CCTs, relative to remittances, in adjusting to the *magnitude* and *timing* of adverse shocks may explain their weak effect on this household decision. For a positive effect to be determined, the improvements in expectations need to be sufficiently strong to more than offset decreasing returns to additional income. This evidence supports the notion that transfers that best protect poor households from income risk favor financial deepening, something that has been shown to have important implications in the process of economic development (Berthelemy and Varoudakis, 1996; Beck et al., 2007).

The paper is built in the following way. Sections 2 and 3 present a theoretical framework that explains the possible effects of access to transfers on the household's decision to request a loan. Section 4 describes the basic characteristics of the data. Section 5 discusses the main methodological challenges and the results. And Section 6 concludes.

2. The insurance effect of transfers and its implication on credit markets

The literature that studies credit markets in developing countries is quite vast and we highlight its link with the NELM and CCT literature to explain how access to these types of transfers may affect household participation in credit markets. In particular, we argue that the effect on credit market outcomes is through the modification of the borrower and lender expected marginal returns given their ability to respond to the different states of nature that may occur during the credit contract.

Some of the prevailing types of lenders in credit markets in developing countries are relatives and friends, local moneylenders, input suppliers, product traders, microfinance organizations, cooperatives and banks. These lenders coexist because each one has informational and contract enforcement advantages over the others, which allow them to evaluate creditworthiness in a cost-effective manner only for a certain *segment* of borrowers (Conning and Udry, 2007). However, the difficulty for different types of lenders to obtain relevant information about the credit applicant's ability and willingness to repay leads to several forms of *credit rationing*. That is, credit markets may not clear, as some creditworthy borrowers with a legitimate demand for credit may not get a loan or may get a smaller loan than the one desired at the going interest rate due to information asymmetries (Stiglitz and Weiss, 1981), interest rate restrictions set by policy makers (Gonzalez-Vega, 1984) or contract enforcement considerations (Bell, 1988).

In this context, credit demand and supply models such as Kochar (1997) and Gonzalez-Vega (1984) formalize the notion that expectations about the different states of nature during the credit transaction play a fundamental role in credit market outcomes, given the inter-temporal nature of the credit contract. A household decides whether to apply for a loan or not after comparing the household's expected marginal returns from the use of the loan and the expected marginal costs attached to the loan. The latter are driven in part by the lender's expected marginal cost of providing the loan to that particular household.

If access to remittances or CCTs protects the household against income risk, then they may also improve its expectations about being able to successfully cope with bad states of nature or adopt riskier but more productive technologies. This, in turn, may improve the household's expected marginal returns to a loan, increasing the likelihood of credit transactions. If, as the NELM and CCT literature suggest, households with access to remittances or CCTs are better able to smooth consumption and make new investments, there are reasons to believe that this change might be accompanied by an increase in the demand for credit, since credit would facilitate such changes in livelihood strategies.

Similarly, a reduction in the household's exposure to income risk may modify the lender's expected marginal costs of offering a loan. These marginal costs are composed of the lender's expected loss in case of default plus screening and monitoring costs (Gonzalez-Vega, 1984; Kochar, 1997). If access to transfers indeed reduces the borrower's income risk and if the lender is aware of this change in risk profile, then expected losses in

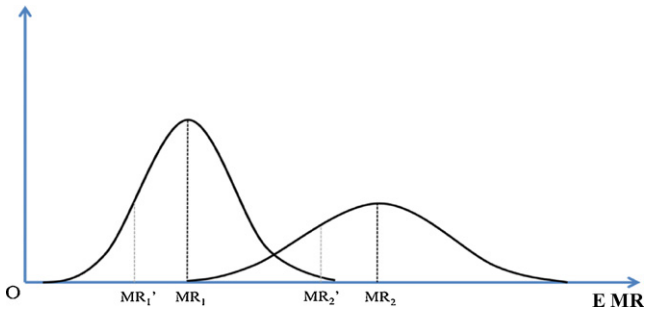

Fig. 1. PDFs for marginal returns obtained by using two different production technologies for a household with a given amount of resources (R).

case of default should decrease, reducing the lender's expected marginal costs of offering a loan amount and making it more likely for the household to apply for credit.

Although access to remittances and CCTs may improve the likelihood of participation in credit markets through a reduction in risk exposure, they may also reduce the household's benefit from a loan, given the assumption to decreasing marginal returns to additional income, as explained in the following section.

3. A theoretical framework

We present a simple graphical analysis that conceptualizes the process through which a transfer that is uncorrelated – or negatively correlated – to household income might affect its decision to request a loan.

The household's marginal returns from the use of its own resources and any other complement, such as a loan or a transfer, depend mainly on the production technology used and the market opportunities available, such as the price for its products or services. However, the final outcome of the production and income-generating process is uncertain, as there are several possible states of nature that may occur and that the household makes an effort to foresee. Therefore, the marginal returns to a given amount of resources (R) may be conceptualized as a distribution with a probability density function (PDF). Fig. 1 shows an example of two PDFs for marginal returns obtained by using two different production technologies that a household with a given amount of resources may use.

In Fig. 1, the PDF with a smaller variance represents all the potential marginal returns that the household would obtain by using a technology that is relatively 'safe' and the probability that each one of these marginal returns may be observed, given all possible states of nature. The technology is 'safer' in the sense that the potential marginal returns are concentrated around their mean value, MR1. However, the expected (mean) returns achieved by using this technology are lower than those obtained when using an alternative riskier technology. In this case, the potential marginal returns are more dispersed around their higher mean, MR2. Assuming that the household's degree of risk aversion is given, the household will choose between these two production technologies (or input combinations) depending on its willingness to tolerate risk (namely, its risk behavior). A household that might not be well equipped to cope with unforeseen states of nature might be inclined to choose the safer technology, at the expense of a productivity loss.

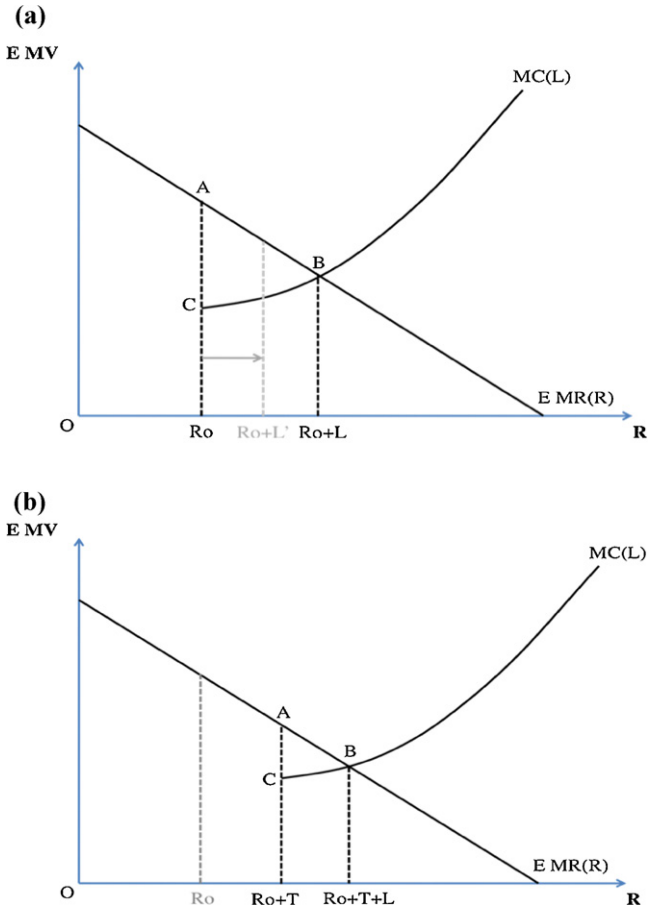

Fig. 2. The household's risk adjusted expected marginal returns, E MR(R), and its marginal costs of a loan, MC (L), before and after the receipt of a transfer, T.

When considering whether to apply for a loan or not, the household compares the expected marginal returns from the use of its resources (plus the loan) to the marginal costs of the loan. Given the choice of a production technology or input mix, a schedule of expected marginal returns, EMR(R), will reflect the expected outcomes from using different levels of resources. This schedule is shown in Fig. 2. In addition, this figure shows the household's expected marginal costs of using different loan amounts, MC(L). Each point along the EMR(R) schedule would be associated with a PDF of potential outcomes, as the ones described in Fig. 1. In addition, the household may also consider the penalties associated with default as well as the probability of this adverse outcome. It is thus possible that a household that is very weary of the risk of default would demand a loan size that is less than the size associated with the expected returns. This risk-adjusted expected marginal returns to resources are given by M1′ and M2′ in Fig. 1, and would determine the position of the EMR(R) curve.

Next, we analyze how the household's risk-adjusted expected marginal returns change as its resource endowment, R, increases due to the receipt of a transfer. In this example, the household has an initial resource endowment equivalent to R_o.

The EMR(R) curve is downward sloping, reflecting the assumption of decreasing marginal returns to additional resources. The area under this curve represents total expected *gross* returns from the use of resources, for a given level of resource use. The position of the EMR(R) curve indicates how profitable the household is. As explained at the beginning of this section, the position of this curve depends on the choice of production technology made, the market opportunities available to the household, and the household's willingness to tolerate risk.

Fig. 2(a) shows how the household has an upward sloping MC(L) curve which is determined by the lender's expected marginal costs of providing a loan plus the household's transaction costs for applying. The curve is upward sloping because the risk of default increases proportionally more than the lender's expected marginal returns, as the loan size augments. Therefore for the same loan product, larger loans are charged higher interest rates. The household will request a loan of size L_d such that its expected marginal returns equate its expected marginal costs, at point B in Fig. 2. At this point, the household's total expected gross returns from the use of its own resources – represented by the area under the EMR(R) curve to the left of R_o – is complemented with the maximum expected net returns from the use of a loan – represented by the area of the triangle ABC. Notice that the cost of the loan is represented by the area under the MC(L) curve along the segment CB.

What happens when the household receives a transfer, T? Holding all else equal, Fig. 2(b) shows that the household's own resource endowment increases to $R_o + T$. Due to diminishing marginal returns, any addition to the household's use of resources – such as a loan – will contribute less to total expected returns than what it would have done before the transfer. This is represented by the reduction in the area of triangle ABC in the figure. Therefore, if the only change is an increase in the access to resources, the opportunity to increase the household's total expected returns through a loan declines and, if the transfer is large enough, it might even disappear. Thus the receipt of the transfer would discourage the request of a loan.

However, it is possible that transfers such as remittances or CCTs may cause additional changes, as explained in Section 2. If the transfer reduces the household's exposure to income risk and its weariness of credit default, this would imply that the EMR(R) curve would shifts upwards as shown in Fig. 3(a). Notice that, after this shift, total expected returns from the use of a loan increase to the amount represented by the new area ABC and make the loan more attractive for the household.

If lenders are aware that the transfer received by the household lowers its exposure to income risk, then the lenders' expected loss from default should decrease, shifting the MC(L) curve downwards. That is, the perception of the borrower's creditworthiness improves. This is represented in Fig. 3(b). The downward-shift of the MC(L) curve would further increase total expected returns from a loan, to the amount represented by the new area ABC, providing further incentive for the household to apply for a loan. Notice that, given the information asymmetries that exist in credit markets, lenders may not be aware of the effect of the transfer, and therefore the MC(L) may not shift even if the borrower's expected marginal returns to the loan improve.

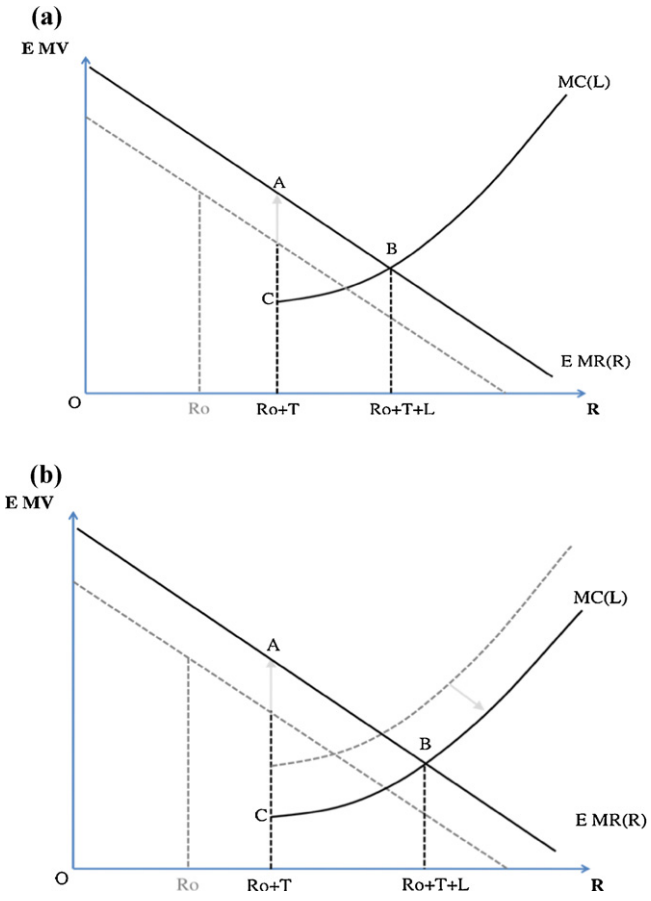

Fig. 3. The possible effect of a transfer, T, on the position of the borrower's E MR(R) curve, and the borrower's MC(L) curve.

In summary, there are three possible effects that a transfer may have on the household's decision to apply for a loan and these have opposite signs. First, the decrease in expected marginal returns to resources after the receipt of the transfer reduces the opportunity to add to the household's total expected returns through the use of a loan. Second, if the transfers were to protect the household from income risk, then this may improve the household's risk-adjusted expected marginal returns to resources, increasing the opportunity to profit from a loan. Third, the latter effect would be reinforced if lenders were able to detect the household's lower risk profile, which would improve their perception of its creditworthiness. Therefore, the effect of such a transfer is theoretically ambiguous and determining the net result of these opposing forces on the household's decision to request a loan is an empirical exercise.

4. The RPS data

To test the theoretical framework we use data from the RPS. This program began with a pilot phase carried out between 2000 and 2002, and it continued with a second phase from 2003 to 2005. The program consisted of the provision of an average cash transfer of US$300 per year to poor rural households in the form of a randomized field experiment. These transfers were given mostly to mothers and were conditional on the

mother's attendance to periodic health workshops, minimum improvements in child health indicators, children's school attendance and children's intake of anti-parasites, vitamins and vaccines (Maluccio and Flores, 2004). This study uses the data collected for the pilot phase. Year 2000 is the baseline year and years 2001 and 2002 are the after treatment periods.

Table A1 in the Appendix shows attrition levels for the control and treatment groups for the baseline and follow-up surveys. Total attrition among treatment and control groups in the balanced panel looks similar, which may favor comparability. However, the randomization of the sample is valid only as long as this attrition is itself random.

5. Data analysis and econometric model

5.1. Verification of randomization and general characteristics of the sample

The first step in this evaluation is to verify if attrition was random. Given that baseline data are available, we can compare attritors with non-attritors, to see if there are systematic differences between them that would bias results. For example, it is possible that those not so poor households that benefited from the program were able to migrate locally to other communities with better job opportunities, which would underestimate impact measures. Alternatively, those households benefiting the least from the RPS may have dropped out, which would imply an overestimation of impact measures.

In order to test whether attrition was random, a mean difference test between attritors and non-attritors, as well as for the control and treatment groups, is made and results are shown in Table 1. The *t*-values are significant suggesting that attrition was likely non-random leaving significant differences between control and treatment groups.

Table 1 also offers a general idea of the level of poverty of households in the sample. Households in control and treatment groups have young adult members. The average age of all members 15 years old or older was 23 years. Around 17 percent of the households applied for a loan during the 12 months before the baseline survey. The proxy we use to represent credit market outcomes is whether the household applied for a loan or not. This request is influenced by both the household's demand and supply of credit, which is of interest for our analysis as it also considers the characteristics of those households that decide not to apply for a loan.

In addition, the survey asks whether the loan was requested from formal sources (banks, NGOs or credit cooperatives) or informal sources (such as relatives, neighbors, friends, money lenders, input suppliers, crop buyers, and the like), which cover most of the places where the households may seek a loan.

Although there is great heterogeneity among the types of credit suppliers that reach the poorest population in rural Nicaragua, loans from the available sources are characterized by short terms to maturity. Dauner (1998) is perhaps the most comprehensive analysis of the characteristics of rural financial markets in Nicaragua. She reports that 90 percent of the loans granted during 1995 to a representative group of rural households had a repayment period of less than a year. Among the poorest sector of the rural population, the only use reported for these short-term loans were for consumption and the purchase of fertilizer and seeds.

In 2000, about seven percent of the households in the RPS reported having access to remittances – where access refers to having a migrant who is able to send them remittances either periodically or just in case of an idiosyncratic shock. The concept of remittances used in the survey was that of some assistance, either in cash or in kind, from relatives or friends that emigrated domestically or internationally.

Migration flows for the household sample are mainly *temporary*. Only 1.3 percent of households that reported access to remittances had this benefit during the three years observed. In addition, 86 percent of these recipient households reported that remittances came only from *domestic* migration, while 9 percent reported remittances from international migration, and 5 percent from both types of migration. Looking at the households that reported the receipt of remittances, the frequency with which these are received varies. Although most remittances are sent on a monthly basis, as shown in Table 2, some households report receiving them once every semester or once every year.

There is a distinction between *access* and actual *receipt* of remittances that is relevant in our analysis. Sample households that have access to remittances are later asked if, by the time the survey was conducted, they had actually received any remittances and their value. Because many households seem to receive remittances sporadically depending on idiosyncratic shocks, there are many households that had not received remittances by the time of the survey, although they report having access to these transfers. It is then the ability to access remittances should future shocks occur, not whether the household had received remittances by the time of the survey, what is being captured in our the analysis.

In summary, these rural households are characterized by having young members. They make little use of credit and few of them have access to remittances mostly from temporary and domestic migrants. They would be categorized as very poor when using as a threshold an average per capita consumption of less than a dollar a day. These characteristics coincide well with the livelihood of the poor in many parts of the world as described by Banerjee and Duflo (2006).

5.2. Impact estimates for access to CCTs

In Section 5.1, we present evidence of intrinsic observable differences between treatment and control groups in the balanced panel, despite randomization, which violates the conditions under which OLS impact estimates are valid. Previous studies analyzing the RPS have argued these differences may be time–invariant and, under this parallel trend assumption, the double difference (DD) of means between groups would yield unbiased impact measures (Maluccio and Flores, 2004). In addition to using the DD technique, we explicitly account for the selection bias caused by non-random attrition using a Heckman two-step model (Heckman, 1979), which allows us to explicitly account for attrition in the presence of time–variant differences.

Table 1
Mean difference test for non-attritors and attritors and for control and treatment groups in the baseline survey (year 2000).

	Non-attritors $n = 1359$		Attritors $N = 222$	Control $n = 653$		Treatment $N = 706$
Average age of adult members (those 15 years old or older)						
Mean	24.45		24.63	22.77		24.84
t-Statistic		−0.45			−2.62***	
p-Value		0.65			0.01	
Percentage of households that requested a loan						
Mean	17.9		15.3	19.91		16.0
t-Statistic		0.97			1.87*	
p-Value		0.33			0.06	
Percentage of households that report having a microenterprise						
Mean	12.29		13.06	11.48		13.03
t-Statistic		−0.32			−0.87	
p-Value		0.75			0.37	
Percentage of households participating in community organizations						
Mean	20.60		15.31	20.50		20.68
t-Statistic		1.99**			−0.07	
p-Value		0.05			0.94	
Per capita value of durable goods (Cordobas)						
Mean	399.16		297.54	375.11		421.41
t-Statistic		1.70*			−0.80	
p-Value		0.09			0.42	
Per capita annual consumption (Cordobas)						
Mean	3885.08		3854.27	3738.24		4020.90
t-Statistic		0.14			−1.83*	
p-Value		0.89			0.07	
Average number of members living in the household						
Mean	6.18		5.94	6.31		6.07
t-Statistic		1.02			1.46	
p-Value		0.31			0.14	
Percentage of households that received benefits from social programs other than RPS						
Mean	47.83		27.93	50.07		45.75
t-Statistic		6.01***			1.59	
p-Value		<0.01			0.11	
Percentage of households with access to remittances						
Mean	0.06		0.09	0.07		0.06
t-Statistic		−1.08			0.93	
p-Value		0.28			0.35	
Value of remittances per year (Cordobas)						
Mean	131.08		166.46	121.77		139.69
t-Statistic		−0.37			−0.23	
p-Value		0.71			0.81	

* Significant at the 90% confidence level.
** Significant at the 95% confidence level.
*** Significant at the 99% confidence level.

Table 2
Frequency of remittances sent by migrants during 2000, 2001 and 2002.

	2000 (%)	2001 (%)	2002 (%)
Biweekly	17.1	11.2	10.9
Monthly	25.0	32.5	44.5
Trimester	26.3	18.7	13.9
Semester	21.0	16.2	17.8
Annually	10.5	21.2	12.8
Number of migrants sending remittances to households back home	76	80	101
Number of households that received remittances during the year	52 (60)	63 (76)	88 (100)

All numbers are percentages, except for the last two rows, which refer to number of households. The numbers in parenthesis are the percentage of households that received remittances from the total that reported access to remittances.

Despite distributional assumptions regarding the error terms, this method for identifying attrition mechanisms has been shown to yield point estimates that are consistent with those obtained with semi-parametric and non-parametric methods in the context of randomized control trials that suffer non-random attrition (Grasdal, 2001).

Following Duflo et al. (2007), the specification we use to estimate the DD impact estimate is given below:

$$Y_{it} = \alpha + \beta t_1 + \phi t_2 + \gamma P_i + \delta_a t_1 P_i + \delta_b t_2 P_i + \varepsilon_{it} \quad (1)$$

where Y_{it} is equal to 1 if the household requested a loan and zero otherwise; t_1 and t_2 are dummies for the years 2001 and 2002, once the program was implemented. P_i has a value of 1 if the household was assigned to the treatment group, and zero otherwise. The parameters of interest are δ_a and δ_b, which

Table 3
CCT impact estimates on credit request obtained through the double difference (column I) and the Heckman two-step selection model (column II).

Selected parameters[a]	Credit request (I)	Credit request (II)
T_1	−0.047** (0.021)	−0.107*** (0.040)
t_2	−0.083*** (0.019)	−0.168*** (0.045)
P_i	−0.039** (0.020)	−0.046* (0.025)
δ_a	0.016 (0.027)	0.018 (0.036)
δ_b	0.027 (0.025)	0.050 (0.032)
Inverse Mills' ratio	–	−0.591** (0.298)
Number of observations	4077	4077
Censored observations	–	215

Bootstrapped standard errors are shown in parenthesis.
[a] Other variables included in the Heckman two-step model include number of men, women and children, average age of members over 15 years of age, dummy for whether the home plot is owned with or without a title, reported value of home, participation in programs other than RPS, participation in community organizations, existence of a microenterprise.
* Significant at the 90% confidence level.
** Significant at the 95% confidence level.
*** Significant at the 99% confidence level.

represent the mean program effects for 2001 and 2002 relative to 2000. The random error of the estimated equation is given by ε_{it}.

An important consideration in this case, is the fact that the RPS randomized treatment at the *comarca* level, not at the household level. Comarcas are administrative areas that include several communities and are determined by the National Institute of Statistics and Censuses. This randomization procedure creates a problem of grouped error terms that may cause the variance covariance matrix of the OLS estimation of DD estimates to be block-diagonal with correlation among error terms within each comarca cell. To get an improvement in the estimation of standard errors we use block bootstrapping as shown by Efron and Tibshirani (1994), which has been shown to better account for the possibility of serial correlation in addition to error clustering.[4]

Throughout, a linear probability model is used because it allows for parameter estimates that are more tractable, easier to interpret and flexible in handling unobserved heterogeneity relative to tobit or logit models (Hyslop, 1999; de Janvry et al., 2006).

The results presented in Table 3 show that both the DD and the Heckman two-step impact estimates are statistically insignificant, although positive. The significance of the inverse Mills' ratio in the selection model suggests attrition bias is present and is accounted for.

In the context of our theoretical framework, results suggest that even if the RPS improved marginal expected returns to a loan or the household's creditworthiness as perceived by lenders, these effects were largely offset by the decrease in expected marginal returns to additional income caused by CCTs. The possible reasons for this likely relate to the characteristic of the transfer. It has been shown that RPS households used part of the transfer to make investments related to education, health and nutrition that they would have not otherwise made. Therefore from the fixed transfer amount received periodically, a fraction is saved in order to cope with future negative shocks. However this saving does not necessarily coincides with the timing or the magnitude of future negative shocks, which represents a limit in the level of risk protection that CCTs may offer.

Another possible explanation for the lack of influence of CCTs on loan requests may relate to the fact that the RPS provided transfers mostly to women. We argue that gender-differentiated use of transfers and credit can be ruled out in the following section, as we gain further insights on the household's use of remittances. In addition, the perceptions about the permanence of the RPS might provide some explanation of results. If the households do not know how long they will be able to receive the program's benefits it is unlikely that household expectations about the future will suffer major changes. As it is common in impact studies, the mechanisms that produce net results are not easy to isolate, and we can only discuss the several possible causes and rule out unlikely scenarios.

5.3. Impact estimates for access to remittances

Contrary to CCTs, migration and consequently access to remittances is the result of a household strategy. To control for the self-selection problem this entails we use two-stage least squares (2SLS) with an instrumental variable (IV) to estimate the impact of access to remittances on the decision to request a loan, as shown by Angrist (2001). In the household sample used, remittances come mostly from *temporary* and *domestic* migration. Thus any inference is limited to this particular migration typology, which seems prevalent among the poorest rural households in developing countries (Banerjee and Duflo, 2006; Mendola, 2008).

We take the household as the unit of analysis, *including* all migrant members. This follows the NELM theoretical framework that conceptualizes migration as a strategy of the whole spatially diversified family. Then we estimate the following system of equations:

$$\begin{aligned} Y_{it} &= \alpha_s h^s + \alpha_1 t_1 + \alpha_2 t_2 + \delta_a t_1 P_i + \delta_b t_2 P_i + \alpha_3 X_{it} + \alpha_4 M_{it} + \varepsilon_{it} \\ M_{it} &= \omega_s h^s + \omega_1 t_1 + \omega_2 t_2 + \mu_a t_1 P_i + \mu_b t_2 P_i + \omega_3 X_{Mit} + \omega_4 Z_{it} + \varepsilon_{Mit} \end{aligned} \quad (2)$$

where α_s are household fixed effects to capture observable and unobservable time–invariant heterogeneity; $t_{1,2}$ are year dummies for 2001 and 2002 that capture contextual variables common to all households; δ_a and δ_b are the impact estimates of CCTs on the decision to request a loan in 2002 and 2003, which we include as a robustness check of DD estimates; X_{it} are a set of

[4] Block bootstrapping was found to yield robust standard errors relative to clustering techniques, given that is accounts for the possibility of serial correlation common in data with large time series (Bertrand et al., 2004). In practice we take 200 random household samples with replacement from each comarca matrix and, for each household, we keep the entire time series of variables and time and household dummies. For every random sample we compute our estimated parameters, $\hat{\beta}_j$, where j is the independent variable of interest. We then compute the bootstrapped standard error as: $Se_{boot}(\hat{\beta}_j) = \sqrt{(1/200-1)\sum_{n-1}^{200}(\hat{\beta}_{j,n} - \bar{\beta}_j)^2}$ where $\bar{\beta}_j$ is the usual sample mean $\bar{\beta}_{j=1/200}\sum_{n=1}^{200}\hat{\beta}_{j,n}$.

time–variant observable characteristics influencing the decision to request a loan; and ε_{it} is the random error of the estimated equation.

The 'first stage' equation determines the endogenous variable M_{it} equal to 1 if household i has access to migrant remittances during year t and zero otherwise; ω_s and $t_{1,2}$ are, again, household and time fixed effects; μ_a and μ_b are CCTs impact estimates on access to remittances in 2002 and 2003; X_{Mit} is a set of observable time–variant characteristics that influence access to migrant remittances; Z_{Mit} is an exogenous variable used as an instrument; and ε_{Mit} is the equation's random error term. The parameter estimate α_4 is the one of interest, as it represents the impact of access to remittances on the decision to apply for a loan. A linear probability model is used to determine Eq. (2), given the ease of interpretation it provides and its flexibility under unobserved heterogeneity (Angrist, 2001; Hyslop, 1999). The set X_{Mit} has a union with set X_{it} and both sets are selected based on the migration and financial literature, as shown in Table 4.

The key part of our analysis is finding an instrument, Z_{Mit}, that is highly correlated with access to remittances but not correlated with the household's decision to request a loan, such that the influence of remittances on this decision is obtained only through this instrument. The IV procedure would allow for consistent estimates by taking into account the correlation in the disturbances across the two equations in (2) (Angrist, 2001).

The instrumental variable proposed is the percentage of households within the community with at least one migrant. This IV serves as a proxy for migrant networks, which have been shown to facilitate migration through a reduction of transaction costs, the creation of job referrals, and acquiring knowledge about economic opportunities outside the community (Massey and Espinosa, 1997; Munshi, 2003). But the initial *formation* of migrant networks has important determinants that are non-economic. Following the cumulative causation theory of migration, once a member of the community migrates it starts a cumulative process that changes the culture and values towards migration within members living in the origin community (Massey et al., 1993). For example, migration may become a 'rite of passage' of life, and those young men and women who do not attempt to elevate their status through migration to big cities or other countries are looked down-upon. This 'social learning' shapes the household's migration behavior and determines whether or not it has access to remittances. However, given its non-economic determinants, it remains orthogonal to the household's productivity and its expected marginal returns and cost of a loan.[5] We argue the cumulative theory of migration best explains migration behavior in the sample, and that there are no general equilibrium effects within communities. The data allows us to provide evidence supporting this claim.

The orthogonality of the IV with the decision to request a loan should be enhanced by the fact that we are able to control for intrinsic differences between communities through two-way fixed effects. We are able to check the robustness of the 2SLS procedure by adding time-community fixed effects to Eq. (2). This procedure controls for any seasonal systemic shocks common to all households within the community. Since remittances and credit are likely correlated with shocks, it is important to control for these as best as possible. To incorporate time-community fixed effects we modify the proposed IV to represent the incidence of migration at the *comarca* level, which is a larger geographical area than the community.

Table 4 presents the impact estimates obtained. Column I shows parameter estimates for the first-stage regression, which identifies determinants of access to remittances. We find that the proposed IV positively and significantly influences access to remittances, consistent with the migration literature. Another relevant result is that CCTs had a positive effect on household access to remittances only for year 2002, although significant at the ten percent level. It may be that, over time, households receiving CCTs may be able to save a fraction of the transfer to finance the cost of migrating. However, this result is not robust, as estimating the effect through DD and the Heckman two-step selection model yields impact estimates that are not significant, as shown in Table 5.

The second-stage regression, shown in column II of Table 4, identifies the determinants of the household's loan application. Access to CCTs did not seem to influence the decision to request a loan, consistent with the DD impact estimates previously obtained. In contrast, the effect of predicted access to remittances on the decision to apply for a loan is significant and the estimated coefficient has a large positive magnitude. Based on the theoretical framework presented, this can occur only through an increase in household expected marginal returns to a loan or an improvement in loan terms and condition that reduce expected marginal costs of a loan, or both. The positive impact estimates suggests these two forces dominate over the decrease in marginal returns that the household faces, as its liquidity increases with remittances.

The data allow us to explore the validity of the IV used to obtain these results. Column III of Table 4 shows that the incidence of migration at the community level does not explain the decision to request a loan for the sub-group of households that had no access to remittances in any of the years observed. This group of households is presumably excluded from the 'social learning' provided by migrant networks present in their communities, and therefore their decision to apply for a loan is made independently. This would also rule out general equilibrium effects through which migration flows might affect the community's economy as a whole. Given the low incidence of migration and its temporary and domestic nature, this is not surprising. In addition, the Hausman test for endogeneity yields a Hausman statistic of 6.7 with 16 degrees of freedom. Therefore the null hypothesis that both OLS and IV estimates are consistent can be rejected at the 95 percent confidence level. This favors the alternative that the IV estimates are consistent.

We also find evidence for the non-economic determinants of migrant networks in the sample. Further statistical analysis suggests that wealth does not seem to explain the size of migrant networks at the community and *comarca* level during any of

[5] Other studies that exploit the non-economic determinants of migrant networks in order to measure the economic impact of migration on origin communities include Rozelle et al. (1999), Munshi (2003) and Mendola (2008).

Table 4
Determinants of access to remittances and the request of a loan at the household level using two-way fixed effects as shown in Eq. (2).

Parameter	Access to remittances (I)	Credit request[a] (II)	Credit request[b] (III)
μ_a/δ_a	−0.003 (0.019)	0.023 (0.024)	0.020 (0.027)
μ_b/δ_b	0.027* (0.016)	0.023 (0.025)	0.015 (0.029)
Number of men in hh	−0.029** (0.016)	0.004 (0.021)	−0.017 (0.024)
Number of women in hh	−0.009 (0.015)	−0.003 (0.021)	−0.007 (0.024)
Number of children in hh	−0.009 (0.012)	−0.008 (0.017)	−0.006 (0.022)
Average age of hh members	0.002 (0.005)	−0.005 (0.006)	−0.006 (0.005)
Homeownership[c]	0.014 (0.021)	−0.007 (0.027)	−0.012 (0.026)
Self-reported value of home (1000s Cordobas)	0.033 (0.028)	−0.040 (0.042)	−0.060 (0.047)
Shock[d]	0.009 (0.017)	0.028 (0.026)	0.029 (0.026)
Participation in programs other than RPS	0.024** (0.012)	0.029** (0.015)	0.032** (0.016)
Proxy of migrant networks in community[e]	0.075*** (0.008)	–	0.008 (0.007)
Participation in community organizations	0.002 (0.013)	0.058*** (0.02)	0.062*** (0.020)
Existence of a microenterprise	−0.019 (0.017)	0.017 (0.022)	0.058** (0.025)
Access to remittances	–	0.252** (0.108)	–
Number of observations	4077	4077	3387

Note: Bootstrapped standard errors are shown in parenthesis.
[a] Second-stage regression for the decision to request a loan using the complete balanced panel, which includes households with and without access to remittances during each of the years observed.
[b] Second-stage regression for the decision to request a loan for the subgroup of households in the balanced panel that did not have access to remittances in any of the years observed.
[c] Dummy for whether the home plot is owned with or without title.
[d] Whether the household suffered a shock related to theft, lack of work, low yield, presence of drought or flood and bad coffee prices.
[e] The proxy is the percentage of households in the home community or comarca participating in migration.
* Significant at the 90% confidence level.
** Significant at the 95% confidence level.
*** Significant at the 99% confidence level.

the years observed. Tables A2–A4 in the Appendix, show that households living in communities and *comarcas* with the largest migrant networks are no wealthier than those living in equivalent areas with smaller migrant networks. In fact, the lack of relationship between the size of migrant networks and wealth seems to be more robust at the *comarca* level than at the community level. Therefore, migration behavior does not seem to be driven by economic factors. Rather, it seems to be explained by the 'social learning' that occurs through migrant networks, which we proxy with the proposed IV.

In an effort to control better for unobserved systemic shocks at the community level, we estimate Eq. (2) by adding time-community fixed effects. The positive impact of access to remittances on household loan applications continues to hold, as shown in Table 6. Evidence for the validity of the IV is still found after including time-community effects.

An important consideration for our analysis is that the proxy for migrant networks is time-variant, enabling the inclusion of fixed effects. Table A5 in the Appendix shows that the average incidence of migration at the community and *comarca* level has been increasing over the time period observed. Therefore, the process of 'social learning' about migration seems to be growing over time. Indeed, at the national level, rural to urban and urban to urban migration flows have been growing steadily in Nicaragua during the past decade (Vivas-Viachica, 2007).

5.4. Gender and access to CCTs and remittances

It is possible that the different impact estimates obtained for access to CCTs and remittances are the result of different uses given to them by men and women. As mentioned previously, the RPS provided CCTs mostly to women. Table A6 in the Appendix shows that migration flows observed are dominated by male migrants who send remittances to their spouses or partners. This would suggest that, similar to CCTs, remittances are mostly received by women. This is a tendency that seems to hold at the national level, as census data for 2001 shows men dominate rural to urban and urban to rural migration flows (Vivas-Viachica, 2007). Given that women in the sample tend to receive both CCTs and remittances, it is unlikely that gender-differentiated use of transfers explains the different impact estimates obtained for access to CCTs and remittances.

Table 5
CCT impact estimates on household access to remittances obtained through the Double Difference (column I) and the Heckman two-step selection model (column II).

Parameter	Access to remittances (I)	Access to remittances (II)
t_1	0.006 (0.015)	0.049 (0.038)
t_2	−0.011 (0.015)	−0.095 (0.049)
P_i	−0.012 (0.014)	−0.013 (0.014)
δ_a	−0.017 (0.020)	−0.015 (0.021)
δ_b	0.022 (0.020)	0.036 (0.024)
Inverse Mills' ratio	–	−0.451 (0.309)
Number of observations	4077	4077
Censored observations	–	215

Note: Bootstrapped standard errors are shown in parenthesis.

Table 6
Determinants of access to remittances and the request of a loan at the household level adding time-community fixed effects to Eq. (2).

Parameter	Access to remittances (I)	Credit request[a] (II)	Credit request[b] (III)
μ_a/δ_a	−0.034 (0.028)	0.018 (0.044)	0.074 (0.043)
μ_b/δ_b	0.054* (0.030)	0.015 (0.042)	0.047 (0.044)
Number of men in hh	−0.040** (0.017)	0.022 (0.028)	−0.028 (0.026)
Number of women in hh	−0.013 (0.015)	−0.002 (0.025)	−0.029 (0.027)
Number of children in hh	−0.005 (0.016)	0.015 (0.020)	0.008 (0.019)
Average age of hh members	−0.001 (0.007)	0.002 (0.004)	−0.005 (0.004)
Homeownership[c]	0.006 (0.024)	−0.032 (0.027)	−0.037 (0.028)
Self-reported value of home (1000s Cordobas)	0.038 (0.032)	−0.055 (0.035)	−0.050 (0.049)
Shock[d]	0.006 (0.017)	0.027 (0.025)	0.027 (0.028)
Participation in programs other than RPS	0.027* (0.012)	0.005 (0.018)	0.021 (0.017)
Proxy of migrant networks in *comarca*[e]	0.050*** (0.004)	–	0.006 (0.005)
Participation in community organizations	0.004 (0.018)	0.043** (0.019)	0.041* (0.022)
Existence of a microenterprise	−0.010 (0.016)	0.044** (0.022)	0.064** (0.022)
Access to remittances	–	0.494** (0.242)	–
Number of observations	4077	4077	3387

Bootstrapped standard errors are shown in parenthesis.
[a] Second stage regression for the decision to request a loan using the complete balanced panel, which includes households with and without access to remittances during each of the years observed.
[b] Second stage regression for the decision to request a loan for the subgroup of households in the balanced panel that did not receive remittances in any of the years observed.
[c] Dummy whether the owned the home plot with or without title.
[d] Whether the household suffered a shock related to theft, lack of work, low yield, presence of drought or flood and bad coffee prices.
[e] The proxy is the percentage of households in the home *comarca* participating in migration.
* Significant at the 90% confidence level.
** Significant at the 95% confidence level.
*** Significant at the 99% confidence level.

6. Conclusions

The main purpose of this study is to explore how access to remittances and CCTs may affect household participation in credit markets via changes in credit demand and supply. The induced change in this household decision reveals potential changes in its expected marginal returns to a loan or in its creditworthiness as evaluated by lenders and the literature provides reasons to believe that both, CCTs and remittances, may have this type of effect. Impact estimates obtained suggest that access to CCTs did not affect the household's decision to apply for a loan, while access to remittances increased its likelihood.

Based on the theoretical framework presented, the empirical results supports the claim that the protection from income risk provided by access to remittances seems to improve the household's expected marginal returns to a loan by enabling it to cope better with negative shocks or by favoring the adoption of riskier but more productive technology, as evidenced by the literature. It may also be that lenders perceive the household's lower risk exposure and improve the loan terms and conditions offered in a way that lowers the household's expected marginal costs of a loan. This improvement in expectations favoring the request of a loan seems to more than offset the effect of decreasing marginal returns that the household faces once its liquidity rises after the receipt of remittances. The latter effect discourages the request of a loan.

The positive but statistically insignificant impact estimate obtained for access to CCTs suggests that even though access to these transfers might be causing an improvement in household expectations similar to that caused by access to remittances, this effect seems to be largely offset by the decrease in marginal returns to additional income caused by the receipt of the CCT.

The characteristics of these two types of transfers likely explain their different impact on the household's decision to request a loan. We argue that, by design, CCTs are not as flexible responding to income fluctuations relative to remittances. The amount of the CCT and the frequency with which it is received are set exogenously and do not necessarily coincide with the timing and magnitude of idiosyncratic shocks. Remittances, in contrast, tend to coincide better with household shocks given that they are the result of a household income risk management strategy, as evidenced by the NELM literature. This means that access to remittances should have a larger effect than that of access to CCTs on the household's expected marginal returns to a loan or its creditworthiness as perceived by lenders.

Another possible reason for CCTs having no effect on the household loan application is perhaps related to how permanent the CCT program is. If households do not know how long they will be able to receive the program's benefits it is unlikely that these households make significant changes in investment and consumption decisions that require predictions about future states of nature. On the contrary, even if migration is only temporary, like the case of households participating in the RPS, the decision to access remittances is made *by* these households. Therefore the option of accessing remittances may be more permanent than the option of accessing CCTs from the household's perspective. We are able to rule out the possibility of gender-differentiated use of transfers as an explanation for the different impact estimates obtained.

Our findings contribute to understanding how much public and private transfers may change household exposure to risk, and how these changes may have far reaching effects on household decisions, specifically in their participation in rural credit markets. Those transfers that best protect households from income risk seem to favor financial deepening. And this is an externality that has important implications in the process of economic development.

Appendix A.

Table A1
Households participating in the RPS baseline and follow-up surveys (percentage of attrition shown in parenthesis).

	Baseline 2000	Follow-up 2001	Follow-up 2002
Completed interview	1581 (10.4)	1453 (8.1)	1397 (11.6)
Treatment group	810 (8.2)	766 (5.4)	722 (10.9)
Control group	771 (12.6)	687 (10.9)	675 (12.4)
Completed interviews in 3 rounds	1359 (23.0)	1359 (14.0)	1359 (14.0)
Treatment group	706 (20.0)	706 (12.8)	706 (12.8)
Control group	653 (26.0)	653 (10.5)	653 (10.5)

Source: Maluccio and Flores (2004). Both follow-up surveys were targeted for baseline respondents thus there are some households that participated in 2001 but not in 2002 and vice versa, causing the balanced panel to consist of 1359 households instead of 1397.

Table A2
Mean difference test for household wealth indicators present in communities and *comarcas* with migrant networks above and below the median during 2000.

	Communities with migrant networks below the median $n = 695$		Communities with migrant networks above the median $N = 664$	*Comarcas* with migrant networks below the median $n = 733$		*Comarcas* with migrant networks above the median $N = 626$
Per capita annual consumption (Cordobas)						
Mean	3792.27		4045.02	3783.17		3972.12
t-Statistic		−1.72*			1.21	
p-Value		0.07			0.22	
Per capita value of durable goods (Cordobas)						
Mean	363.23		436.76	330.65		439.39
t-Statistic		−1.26			−1.57	
p-Value		0.20			0.14	
Self-reported value of the home plot (Cordobas)						
Mean	12461.03		14793.75	12562.62		14932.79
t-Statistic		−0.58			−0.59	
p-Value		0.55			0.55	
Homeownership dummy						
Mean	0.81		0.82	0.84		0.80
t-Statistic		−0.50			1.62	
p-Value		0.61			0.12	

* Significant at the 90% confidence level.

Table A3
Mean difference test for household wealth indicators present in communities and *comarcas* with migrant networks above and below the median during 2001.

	Communities with migrant networks below the median $n = 729$		Communities with migrant networks above the median $N = 630$	*Comarcas* with migrant networks below the median $n = 705$		*Comarcas* with migrant networks above the median $N = 654$
Per capita annual consumption (Cordobas)						
Mean	3972.32		3717.85	4007.68		3885.73
t-Statistic		1.60			1.61	
p-Value		0.14			0.15	
Per capita value of durable goods (Cordobas)						
Mean	329.83		498.38	380.98		510.30
t-Statistic		−2.10**			−1.55	
p-Value		0.04			0.11	
Self-reported value of the home plot (Cordobas)						
Mean	8409.59		9313.09	8438.94		9547.72
t-Statistic		−1.37			1.72*	
p-Value		0.17			0.09	

Table A3 (*Continued*)

	Communities with migrant networks below the median $n = 729$		Communities with migrant networks above the median $N = 630$		*Comarcas* with migrant networks below the median $n = 705$		*Comarcas* with migrant networks above the median $N = 654$
Homeownership dummy							
Mean	0.82		0.84		0.87		0.86
t-Statistic		−0.99				1.53	
p-Value		0.32				0.15	

* Significant at the 90% confidence level.
** Significant at the 95% confidence level.

Table A4
Mean difference test for household wealth indicators present in communities and *comarcas* with migrant networks above and below the median during 2002.

	Communities with migrant networks below the median $n = 694$		Communities with migrant networks above the median $N = 665$		*Comarcas* with migrant networks below the median $n = 733$		*Comarcas* with migrant networks above the median $N = 626$
Per capita annual consumption (Cordobas)							
Mean	3963.46		3794.76		3782.00		3996.72
t-Statistic		1.09				−1.39	
p-Value		0.27				0.16	
Per capita value of durable goods (Cordobas)							
Mean	453.85		374.39		447.97		376.32
t-Statistic		1.33				1.19	
p-Value		0.18				0.23	
Self-reported value of the home plot (Cordobas)							
Mean	7266.62		8064.15		7125.12		8258.37
t-Statistic		−1.12				−1.59	
p-Value		0.26				0.11	
Homeownership dummy							
Mean	0.86		0.88		0.82		0.85
t-Statistic		1.62				1.59	
p-Value		0.14				0.12	

Table A5
Average incidence of migration within communities and *comarcas*.

Average incidence of migration:	2000	2001	2002
At the community level (%)	6.79 (1.67)	6.83 (1.45)	6.89 (4.90)
At the *comarca* level (%)	6.63 (3.71)	6.85 (4.78)	6.87(2.79)

Standard deviation measures are shown in parenthesis.

Table A6
Migrants' gender and their relationship to the household's head.

Migrant's gender	Migrants in the sample	Migrant's relationship with the head of the origin household				
		Spouse/partner	Daughter/son	Sister/brother	Cousin	Other
2000						
Female	32 (42.10)	1 (3.12)	15 (46.87)	3 (9.37)	2 (6.25)	11 (34.37)
Male	44 (57.90)	23 (52.27)	4 (9.09)	3 (6.82)	2 (4.54)	12 (27.27)
2001						
Female	35 (43.75)	2 (5.71)	19 (54.28)	5 (14.28)	1 (2.86)	8 (22.86)
Male	45 (56.25)	25 (55.55)	7 (15.55)	4 (8.89)	0 (0.00)	9 (20.00)
2002						
Female	49 (48.51)	2 (4.08)	23 (46.94)	5 (10.20)	2 (4.08)	17 (34.69)
Male	52 (51.49)	28 (53.85)	9 (17.31)	4 (7.69)	1 (1.92)	10 (19.23)

Note: Most migrants are males sending remittances to their spouses.
Numbers in parenthesis represent percentage of total value.

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