IMPACT OF INTERNATIONAL MIGRATION ON HOUSEHOLD

BEHAVIOR IN NICARAGUA[*]

Mónica L. Parra Torrado[+]

First version: June 2006

This version: March 2010

Abstract

This paper looks at the effects of income from international migration on household behavior in the communities of origin. It uses a household 9-year panel dataset from Nicaragua to investigate the effect of income of Nicaraguan migrants to the US and Costa Rica on employment and investment decisions made by households in the sending communities during the 1990s. Using variation in wages at the migrant's destination for identification, it finds that migration income increases the probability of employment of household heads, the effect being stronger for poorer households. This result indicates the value of the empirical identification strategy employed, as it contrasts sharply with those found in earlier literature which did not control for endogeneity of international remittances. With regard to investment decisions, the paper finds that migration income increases the probability of business ownership of households when the head is not a migrant. On the other hand, when the household head is a migrant the effect is negative on business ownership and positive on real estate ownership. Hypotheses interpreting these results are proposed and their validity assessed based on the empirical evidence.

1. Introduction

This paper investigates the effect of income of Nicaraguan migrants to the US and Costa Rica on employment and investment decisions made by households in the sending communities during the 1990s. It contributes to the literature on remittances and migration in three fronts: the identification strategy, the specific findings and the theoretical reasoning used to explain them.

The decision to migrate and the decision to send remittances are likely to be taken simultaneously with other decisions taken by households and individuals, such as the decisions to work, to consume or to invest. Thus, studying the impact of migration and remittances on household behavior poses a real challenge in terms of identification. Existing work on the effect of migration and remittances on labor supply has encountered either zero or negative effect on labor force participation and labor supply of the migrant's male family members. Amuedo-Dorantes and Pozo (2006b), using per capita count of Western Union offices in the previous year interacted with household characteristics as an instrument for remittances, do not find a significant effect on total male labor supply. However, they find a negative effect on formal and self-employed workers while finding a positive effect on informal workers. Acosta (2006), using household migration experience and the percentage of current migrants in the county of birth of the head, in addition to propensity score matching techniques, finds a negative effect on child and female labor supply but do not find any effect on male labor supply. Funkhouser (1992) using Nicaraguan household data estimates a probit model without using any instruments and finds that remittances have a negative effect on labor force participation and a positive effect on self-employment of non-migrants workers, although acknowledging the effect to be small in magnitude.

The identification strategy used in this paper attempts to address the endogenous relation between migration, receiving income from migrants and the households' outcome. Using a nine-year panel dataset for Nicaragua, I use variation in destination wages matched with past migration information at the individual level to identify the impact of income from migration on labor force participation and investment decisions in the originating households. In addition, taking advantage of a panel dataset I estimate a fixed effect model to control for households' time-invariant unobserved characteristics. I find that heads of households who have migrants in the United States are more likely to be employed. This finding contrasts with the literature mentioned above. Comparing the estimates with those yielded by ordinary least squares (OLS), I find the latter to be characterized by substantial biases which would affect most previous estimates in the literature. Regarding investment decisions, I find a significant positive effect of international migration on the probability of business ownership of households when the head is not a migrant. On the other hand, when the household head is a migrant the effect is negative on business ownership and positive on real estate ownership.

The remainder of the paper is organized as follows. Section 2 describes the identification strategy developed in this paper. Section 3 describes the data and presents the main empirical results. Section 4 presents three hypotheses interpreting the findings and an attempt to assess their validity. Section 5 discusses some policy implications and Section 6 concludes.

2. Identification and Empirical Strategy

The identification of the impact of migration and remittances on household behavior is a challenging task. OLS estimates are inconsistent due to the endogeneity of migration and remittances in the estimation equation. The endogeneity arises in at least two different ways: simultaneity and omitted variable bias. Households may decide about migration and remittances simultaneously with the outcome variables. The final objective is to identify how changes in migration income affect changes in labor supply and investment decisions, the outcome variables in this paper. But migration and remittances may also react to changes in

the outcome variables: households may decide to send a member abroad, or the migrant may send more remittances, when someone in the household is experiencing an unemployment spell, for example. Likewise, migrants may remit more so that their family could make investments or remit less because their family's businesses or assets holdings make it unnecessary. Also, families may decide to send members abroad to finance their investments or, on the contrary, decide not to do it because they own businesses and they need the potential migrants to look after them.

The second way in which endogeneity arises in this estimation is due to omitted variable bias. There are household characteristics that might affect both migration income and the outcome variable but that are unobserved to the econometrician. One example of this type of bias could be that households with migrant members have an unobserved characteristic –like being adventurous or certain preferences towards risk– which also makes them prone to making investments. If one fails to correct for these unobserved effects, the estimation will likely to be reflecting this relationship and not necessarily the direct one of migration income and the outcome variable. Another source of omitted variable bias arises when using remittances instead of migration as explanatory variable. Migration is likely to affect outcome variables through other unobserved channels apart from the remittances channel –the fact that a member leaves the household may imply that other member will take over his task, for example. Thus, using remittances as explanatory variable in the estimation equation generates biased results because remittances will be correlated with the error term, which includes these other unobserved channels.[2]

There are several approaches for addressing the endogeneity problems described above. One approach is to use Instrumental Variables (IV) techniques[3]. Finding a suitable instrument is always a challenge. Historic migration has been the most popular instrument in recent empirical work looking at the effects of migration and remittances on household behavior in the sending country. The main idea behind this instrument is that it represents the social networks created at destination places since the beginning of the migration process. Social networks have been recognized among economists and sociologists as one of the main predictors of current migration; these are considered to help lowering the cost of migrating. The main challenge faced is proving that historic migration is exogenous to the outcome variables: proving that given that it has occurred well in the past it cannot affect the outcome variable through other channel other than through current migration[4]. Other variables used as instruments in this literature are the education level of the most educated person in the household[5], the count of Western Union offices[6] and current migration networks[7], among others[8].

---

[2] McKenzie (2006) discusses this type of bias.

[3] The use of natural experiments is another approach commonly used. It is, however, not always easy to find an exogenous shock that helps identify the effect in question. Some examples in the literature of migration and household behavior are Yang (2005; 2006; 2008) who uses variation in exchange rates from different destination countries during the 1997 financial crisis to identify the effect of remittances on poverty, human capital, and entrepreneurship in the Philippines. McKenzie, Gibson and Stillman (2006) estimate the income gains from migration using a lottery used by the New Zealand Government to fulfill a quota established for Tongan migrants.

[4] Woodruff and Zenteno (2007) looking at the long term effect of US migration on capital constraints faced by microenterprises in Mexico use distance from the capital of the enterprise owner's state of birth to a train stop on the north-south railway lines as they existed in the early 1900s. Hanson and Woodruff (2003) and Woodruff (2007) use Mexican migration rates to the United States in the 1950s to identify the effect of migration and remittances on educational attainment in Mexico and on investments and employment in Mexican microenterprises respectively. Hanson (2007) also uses migration rates in the 1950s to estimate the effect of migration and remittances on labor force participation in Mexico. Acknowledging the fact that past emigration opportunities may affect labor market experiences and educational attainment of individuals, and may therefore affect current labor market outcomes, Hanson restricts the sample to individuals being born in either high-migration or low-migration states and compares the cross-sectional variation on labor market outcomes between these two groups. Hildebrandt and McKenzie (2005) and McKenzie and Rapoport (2004, 2005) use the Mexican migration rate to United States in 1924 as an instrument for migration in estimating its effect on child health, inequality and education.

[5] Rozelle, et al (1999) and Mendola (2008).

[6] Amuedo-Dorantes and Pozo (2006b) and Amuedo-Dorantes, Sainz and Pozo (2007).

[7] Acosta (2006), Mendola (2007), Amuedo-Dorantes and Pozo (2006a) and Amuedo-Dorantes, Sainz and Pozo (2007). However, using measures of current migration networks as instruments for on-going migration or remittances runs the risk of not satisfying the

In addition to the use of instrumental variables, one can use panel data estimation techniques, such as fixed effects or first differencing transformations to address identification problems. By using one of these techniques, one can successfully control for time-invariant unobserved characteristics affecting the outcome variable and some or all other covariates in the model[15]. Unfortunately, individual-level longitudinal datasets containing detailed migration information are not commonly available in developing economies restricting the use of these tools in this area of research. There are, however, few examples such as Adams (1998) and Schnabl (2007)[16].

In this paper I combine the use of instrumental variables with panel data techniques in an attempt to overcome the issues. Specifically, to identify the impact of income from migration on labor force participation and investment decisions in the originating households I use variation in destination wages matched with past migration information at the individual level and estimate a fixed effect model. In what follows, I explain the identification strategy and argue in favor of its validity.

The panel data employed in this paper comes from retrospective information collected from Nicaraguan households as part of the LAMP project and is described in the next subsection. Unfortunately, the survey does not collect retrospective information on remittances that would allow me to construct a time series of this variable at the household level. Instead, I constructed a variable that simulates the potential income obtained by migrants while abroad to proxy for remittances. In order to construct this variable I use data on wages from the United States and Costa Rica, the most common destinations for Nicaraguan migrants along with and retrospective information from the survey on the jobs performed by migrants in these destinations. Specifically, I matched wages at the destination places to the characteristics of the jobs the Nicaraguan migrants held in the United States and Costa Rica: occupation, gender, location and year[17]. In order to have a proxy of remittances at the household level I construct a measure of household potential income from migration which simply corresponds to the sum of these individual wages at the household level in every year.

exclusion restriction since current migration networks may be correlated with unobservable variables that affect the outcome of interest. For example, current migration networks at the village level may be correlated with the current labor market conditions (wages or labor demand, for instance) that affect the current labor supply of the household members in the village. Likewise, the number of migrants that have recently returned (in the past 2 or 3 years as in Acosta, 2006) may be correlated with the labor force participation decision of their household members. Migration at the household level is correlated with household characteristics – wealth, employment conditions, for instance- that could be persistent over time. Hence, this approach may cast doubts on the use of these variables to identify the effect of migration or remittances on household behavior. (Acosta (2006) also estimates a propensity score matching model finding similar results.)

[8] Lucas (1987) uses a simultaneous econometric model to estimate the determinants of migration of miners from five African countries to South Africa and its impact on labor markets in the sending countries using times series data spanning 1946 to 1978. In one of the techniques employed in the estimations, Lucas uses as instruments the principal components of all the exogenous variables in addition to wages of white miners in South Africa and prices of minerals obtained in the mines. Lopez-Cordova (2005) uses a concentration index of rainfall during the 20th century in the station closest to the municipalities in his sample and distance from these to Guadalajara.

[15] Hanson (2007) estimates the effect of migration on male labor supply to be negative which he finds counterintuitive since wages have increased at the origin high-migration states during the period of analysis. He attributes this result to the fact that he cannot sufficiently address the omitted bias due to unobservable characteristics. Also, suspecting the effects of migration on microenterprises estimated in Woodruff and Zenteno (2007) may be explained by the fact that unobserved characteristics of individuals (entrepreneurship) from high-migration states are correlated with characteristics of microenterprises in these states, Woodruff (2007) uses repeated cross-sections and compares the results of two periods (1992-1994 and 1996-1998). If the relationship between migration and entrepreneurial activities is spurious it should not change over time. But, if it is a causal one then the estimates should increase since migration and remittances have increased during this period. His results suggest that this is the case for male microenterprise owners but not for female owners.

[16] Adams (1998) uses a 5-year panel dataset from poor villages in Pakistan to investigate the effect of internal and international remittances on assets accumulation by households. Adams, though, does not use panel data techniques in his estimations. He exploits the panel structure of the data by constructing accumulated measures of total income and remittances up to one year before the change in assets is calculated. Then, he estimates a tobit of the changes in assets over the full period using the accumulated measures of total income and remittances and other controls as covariates. Schnabl (2007) uses retrospective data from the Mexican Migration Project (MIP) to estimate the effect of migrant demand shocks on business ownership and job choice in Mexican communities.

[17] The next subsection presents a detailed description of the data.

However, as already discussed, remittances and migration are endogenous to household decisions. And even though the migration income variable constructed here depends on wages from abroad that may reasonably be considered exogenous to Nicaraguan household's decisions, this variable still suffers from endogeneity bias since it is based on the characteristics of current migrants. To overcome this problem, I use information on employment characteristics from migrants in the household during the 1980s and match it to current wages associated with those characteristics at destinations in the United States and Costa Rica. There are two reasons to believe that migration during this period is a good instrument for current migration. On one hand, migration during the 1980s was closely related with violence experienced during the Contra War and the devastating economic consequences that it brought about. Hence it is believed that although some households might have fled the country due to political reasons particular to them and not to the whole population, the violence and economic crisis affected the Nicaraguan population in general. Many young males left the country to avoid being taken into the conflict by any of the involved parties. On the other hand, as mentioned in the previous section, it has been shown by sociologists and economists in the literature that the probability of migration increases with the existence of social networks abroad.[18] In view of that, I argue that international migrants during the 1980s motivated by the violent and precarious conditions of the time in Nicaragua, established social networks in the United States and Costa Rica that serve as good predictors of current migration from Nicaragua to these countries.

Using these constructed variables, I use IV with household fixed effects to estimate the effect of income from migration on employment and investment decisions made by households in Nicaragua. I estimate effects on four different outcome variables: dichotomous variables taking the value of one if the head of household is employed, if the spouse is employed, if the household owns businesses or if it owns real estate. The coefficient of interest is the one accompanying the constructed variable of potential income from migration, α_1. I include as additional covariates individual and household characteristics such as age, working experience, occupation, number of children 14 years-and-younger in the household, and household's land holdings as a proxy for wealth. Controlling for individual and household characteristics like occupation and wealth is of particular importance to ensure that the effect of migration on household behavior is not reflecting persistence in these variables. I also include community-time dummies and time effects. The inclusion of community-time dummies helps control for unobserved characteristics at the community level that could be affecting the employment or investment decisions of households or even the migration decision.

In order to control for the endogeneity of current migration income (summation at the household level of current wages at the destination matched to current migrant's characteristics in the household) I use the migration income variable constructed based on 1980s migration (summation at the household level of current wages at the destination matched to 1980s migrant's characteristics in the household), as shown in equation (2).

---

[18] Massey (1988), Munshi (2003), McKenzie and Rapoport (2004), among others.

$$Outcome_{ht} = \alpha_0 + \alpha_1 \sum_D \sum_o \sum_g \left(W_{ogt}^D \cdot M_{oght}^D\right) + \alpha_2 X_{ht} + \eta_h + \delta_t + \varsigma_{ct} + \xi_{ht} \qquad (1)$$

$$\sum_D \sum_o \sum_g \left(W_{ogt}^D \cdot M_{oght}^D\right) = \beta_0 + \beta_1 \sum_D \sum_o \sum_g \left(W_{ogt}^D \cdot M80_{ogh}^D\right) + \beta_2 X_{ht} + \mu_h + \tau_t + \sigma_{ct} + \vartheta_{ht} \quad (2)$$

$Outcome_{ht}$:   Dummy variable equal to one if employed, or if owns business or if owns real state.

W_{ogt}^D :   Wage for occupation o, gender g, in time t at destination D.

M_{oght}^D :   Number of migrants in household h, of gender g, working in occupation o, in time t at destination D.

$M80_{ogh}^D$:   Number of migrants in household h, of gender g, working in occupation o, in the 1980s at destination D.

X_{ht} :   Household characteristics at time t

η_h, μ_h :   Household fixed effects for equation (1) and (2) respectively.

δ_t, τ_t :   Time effects for equation (1) and (2) respectively.

ς_t, σ_t :   Community-time effects for equation (1) and (2) respectively.

ξ_{ht}, ϑ_{ht} :   Error terms for equation (1) and (2) respectively.

        Observe from the equations above that the identification of the effect of income from migration on household outcomes comes entirely from the variation in wages at the destination which is exogenous to household decisions in Nicaragua. The number of migrants and their characteristics is set equal to the number of migrants in the 1980s and their characteristics. For example, if families did not have migrants in the 1980s the income from migration will be zero in the instrument set even if they have migrants during the current period. If families had migrants in the 1980s, the instrument would be the potential wages earned by those migrants in their specific occupations, while the current migration income (the endogenous variable) would be the potential wages earned by the current migrants in their current occupations. Thus, the identification is coming from the fact the temporal changes in wages by occupation in the United States (at the state level) and Costa Rica are uncorrelated with any current event affecting households in Nicaragua other than through the fact that they are more likely to have current migrants in specific occupations now given that they had migrants in the 1980s in those occupations, and current changes in wages at the destination are relevant for current migrants. My identification strategy also addresses the problem of possible measurement error in remittance incomes.

3. Data and Main Empirical Results

3.1. Data

The data employed in this paper comes from three sources: the Latin American Migration Project, a household survey that collects information on migration at the individual level; the US Current Population Survey and the United Nations global database LABORSTAT. Next I explain how these datasets are used and describe the sample employed in the estimations of equations (1) and (2).

LAMP-NIC9

The Latin American Migration Project (LAMP) is a collaborative research project based at Princeton University and the University of Guadalajara, supported by the National Institute of Child Health and Human Development (NICHD). In this paper, I use the LAMP-NIC9 database that compiles data gathered by the Central American Population Center of the University of Costa Rica (CCP: http://ccp.ucr.ac.cr), in association with the Latin American Migration Project (LAMP: http://lamp.opr.princeton.edu)[19]. Although the LAMP-NIC9 dataset has information on a small sample of Nicaraguan households living either in the United States or Costa Rica, I only use the sample of households living in Nicaragua.

LAMP combines techniques of ethnographic fieldwork and representative survey sampling to gather qualitative as well as quantitative data. LAMP aims at providing a sample of communities that is diverse in terms of regional, economical and ethnic composition as well as in terms of size. The communities are selected to represent four levels of urbanization: rural areas, towns, mid-sized cities and a neighborhood in a metropolitan setting. Although the communities are not selected based on their migration rates, some initial field work is done to confirm that there is some level of migration present in the communities. Once the communities are selected, random samples are drawn from censuses conducted by the LAMP team in the case of rural and small towns, and from a well-established neighborhood with at least 1200 enumerated dwellings. This method ensures that the samples selected are representative at the community level and in the case of some small towns all households has been interviewed.

The LAMP-NIC9 survey collects information on 1598 households living in nine communities located in the Pacific side of the country, all Nicaraguan nationals. Approximately, 200 households were interview in each community, except for two communities in which only 100 households were interviewed corresponding to two neighborhoods of Managua, the national capital. The interviews were undertaken during March and April of 2000 (communities 1 and 2), January and March of 2002 (communities 3 to 5) and during October and December 2002 (communities 6 to 9). As I describe in more detail below, most of the information of the survey is collected in retrospective form. This feature allows me to reconstruct the history of some of the variables and work with a panel dataset. In addition to collecting household level data, LAMP-NIC9 also collects information at the community level without disclosing their exact location. In Table 1 below I present a summary description of the communities[20].

---

[19] The Mellon Foundation and the National Institute of Child Health and Human Development (NICHD) provided financial support to the LAMP-NIC9 project.

[20] A complete description of the LAMP project, including the methodology and the sampled communities can be found in http://lamp.opr.princeton.edu.

Table 1 Sample of Communities

Comm.	Departamento	Distance to Managua	Interviewed households	Main economic activity
1	León	50 Km	200	Trade, stockbreeding , agriculture
2	Rivas	100 Km	195	Tourism and agriculture
3	Estelí	90 Km	202	Food products, flowers, crafts, manufactures
4	Madriz	195 Km (approx.)	200	Agriculture (mainly coffee)
5	Matagalpa	30 Km	200	Commerce, services and limited agriculture.
6	Managua	0 Km	100	Neighborhood of professionals and low and middle income employees.
7	Managua	0 Km	100	Small industries and government offices, commerce of pharmaceuticals, clinical labs, small restaurants (Most important public hospital is in the area)
8	Chinandega	130 Km	201	Liquor production from sugar cane
9	Carazo	40 Km	200	Tourism: festival, craftwork made out of wood, clay and willow

LAMP-NIC9 collects retrospective information regarding the migration experience of current members of the household and of all children of the head even if they now belong to other household and are no longer considered household members.[21] It collects detailed information on the first and last trip and the number of trips undertaken in their lifetime. For this reason, I can only reconstruct the lifetime migration experience of those individuals reporting two trips or less (around 97% of all migrants in the sample). The survey collects information regarding the city where they migrated to, the type of occupation in which they worked while abroad, the wage earned and its frequency, the duration of the trip and, in the case of migration to US, the legal status and information on illegal border crossings. Since I am interested in migrants potentially sending remittances I only considered migrants of age 15 and above, that is, only migrants who could be potentially working. Migrants younger than 15 years old represent less than one percent of migrants going to US or Costa Rica. Although LAMP-NIC9 collects information on domestic migration I focus the analysis on international migration only.

---

[21] This feature of the LAMP allows for a measure of migration at the household level that can be considered very close to actual migration in households. Having migration information on all children of the head and not only to household members decreases the common problem of "missing" migrants. Generally, other surveys collect information on migration experience of household members only living out (missing) the ones that although are no longer household members still maintain a relationship with the household while abroad, for example, by sending remittances. Moreover, even though I do not observe migrants that have moved with their families to the United States or Costa Rica and therefore cannot be interviewed in Nicaragua, feature that generally poses an estimation problem. But I am interested in the effect of migration and remittances on the behavior of households living in Nicaragua so this is not likely to be a problem. Especially because my only interest on these households that have permanently migrated with their families is on the remittances they might be sending to their family members still living in Nicaragua. And I do observe this behavior given that the LAMP survey collects migration information on all children of the household head even if they are no longer members of the household.

LAMP-NIC9 also collects retrospective information on the labor history of the head and the spouse since the time they joined the labor force. It collects information on the type of occupation, the duration of the job and whether it provided social security. It does not collect information on number of hours worked and only collects data on the last salary earned. I restrict the sample to household heads between 25 and 65 years of age. I also exclude head of households who claimed not to be working due to being retired with pension, handicapped or incarcerated. I also dropped from the sample head of households who claimed never to have worked. I apply the same kind of restrictions to the sample of spouses of heads of households.

Additionally, the survey collects information on the lifetime history at the household level of land holdings, real estate and business ownership and how these were acquired. For the estimation of the effect of income from migration on business and real estate ownership I restrict these variables by excluding properties that were acquired as inheritance, or for which they do not have documents. On the other hand, when using a measure of wealth as a control variable in the employment estimations I do not discriminate on how the real estate properties or the land were acquired.[22] Finally, LAMP-NIC9 collects information from all individuals on characteristics like gender, age, education, profession, marital status[23] and place of birth.

Table 2 presents descriptive statistics for the sample of non-migrant household heads, the full sample of household heads and the sample of the spouse.

---

[22] I do not include business ownership in the wealth measure.
[23] For the household head it collects the complete marital history.

Table 2 Descriptive Statistics

	Non-migrant Heads		All Households		Spouse	
	Mean	sd	Mean	sd	Mean	sd
Destination Wages[a] * Current migrants	0.403	2.028	0.544	2.488	0.578	2.768
Destination wages[b] * Migrants in the 1980s	0.240	1.638	0.334	2.158	0.313	2.141
Wages in Costa Rica[a] * Current migrants in Costa Rica	0.083	0.604	0.123	0.734	0.102	0.611
Wages in Costa Rica[a] * Current migrants in Costa Rica in the 1980s	0.023	0.255	0.037	0.403	0.029	0.284
Wages in Costa Rica[a] * Current migrants in the United States	0.319	1.950	0.421	2.399	0.476	2.717
Wages in Costa Rica[a] * Current migrants in the United States in the 1980s	0.210	1.571	0.289	2.088	0.285	2.126
Dummy for head of household being employed	0.886	0.317	0.889	0.314	0.939	0.239
Dummy for spouse being employed	0.495	0.500	0.498	0.500	0.624	0.484
Dummy for Business Ownership	0.287	0.452	0.287	0.452	0.336	0.473
Dummy for Real Estate Ownership	0.514	0.500	0.501	0.500	0.547	0.498
Dummy for Capital Intensive Business	0.086	0.281	0.089	0.285	0.099	0.298
Dummy for Labor Intensive Business	0.185	0.389	0.185	0.388	0.217	0.412
Dummy for Agriculture Related Business	0.015	0.122	0.013	0.113	0.020	0.142
Dummy for Hired-Labor Type of Business	0.070	0.256	0.073	0.261	0.094	0.292
Dummy for Family-Labor Type of Business	0.216	0.412	0.214	0.410	0.243	0.429
Dummy for Irregular Migration	0.030	0.170	0.038	0.191	0.038	0.190
Duration of Migration	0.512	2.259	0.627	2.474	0.571	2.305
Dummy for Migration of Duration of 1 year	0.008	0.091	0.013	0.114	0.012	0.108
Dummy for Migration of Duration of 1 to 3 years	0.021	0.142	0.030	0.171	0.029	0.167
Dummy for Migration of Duration of more than 3 years	0.057	0.232	0.070	0.255	0.067	0.250
Dummy for Migration of Duration of more than 4 years	0.051	0.221	0.062	0.242	0.060	0.237
Dummy for Migration of Duration of more than 7 years	0.035	0.183	0.041	0.199	0.038	0.191
Dummy for Migration of Duration of more than 10 years	0.021	0.144	0.026	0.158	0.021	0.144
Log of land possessions	0.163	0.790	0.162	0.787	0.210	0.870
Dummy for wealth==0	0.282	0.450	0.295	0.456	0.249	0.432
Number of kids younger than 14 in the household	1.566	1.553	1.591	1.563	1.733	1.549
Labor experience	23.924	12.309	23.643	12.085	13.856	10.816
Age	42.290	10.516	41.920	10.425	38.554	9.515
Occup. dummy[b]: CEOs, managers, gov. officials, factories and businesses owners	0.158	0.364	0.160	0.367	0.174	0.379
Occup. dummy[b]: Professionals, university professors, artists, supervisors	0.107	0.309	0.103	0.304	0.051	0.220
Occup. dummy[b]: School teachers, technicians, clerical and other skilled workers	0.434	0.496	0.437	0.496	0.486	0.500
Dummy for occupation in agriculture or animal husbandry	0.106	0.307	0.105	0.306	0.025	0.155
Number of observations	9442		10886		5326	
Number of groups	1152		1334		648	

CPS and LABORSTA

In order to construct the potential income from migration I use data on wages by occupation and location in the United States and Costa Rica for the years 1991 to 1999. I use data from the March Current Population Survey to generate wages by occupation for the United States at the state level. Specifically, using the 4-digit occupation classification employed by CPS, manually matched to the classification employed by LAMP-NIC9, I calculate the median weekly earnings at the state level for all LAMP occupations in every year. The median earnings were calculated separately for men and women[24].

For Costa Rica, I use information on wages obtained from LABORSTA[25], an International Labor Organization global database on labor statistics, originally reported by the Costa Rican General Directorate of Statistics and Census[26] based on an annual multi-purpose household survey. In this case I use monthly earnings for men and women at the industrial level and match the LAMP classification to the ISIC-2 and

---

[24] The weakly earnings are multiplied by four to obtain monthly earnings comparable to the Costa Rican earnings.
[25] http://laborsta.ilo.org/
[26] DGEC – Dirección General de Estadísticas y Censos

ISIC-3 classifications at 1-digit for all sectors and 3-digit and 2-digit for manufacturing respectively. For Costa Rica, earnings are at the national level only.

3.2 Main Empirical Results

In this subsection I present the main results from estimating the model described in section 2. Although I reconstructed the complete lifespan of the variables of interest, the analysis is done only for the 9-year period between 1991 and 1999. There are two main reasons for restricting the period: first, I am using 1980s data to construct the instrumental variable. Second, while in some communities the interviews were undertaken during 2002; in some communities the interviews were undertaken in early 2000 as a consequence I do not have data for these households in the following years. I start by showing the first stage regression and then I present the results of estimating the effect of income from migration on the probability of employment of the head of the household and the spouse. Subsequently, I present the results of estimating the effect on the probability of the household's business and real estate ownership.

Table 3 presents the first stage results from the IV estimations. The dependent variable is the summation at the household level of potential earnings of current migrants while abroad. The coefficient of interest here corresponds to the variable of potential income of migrants in the 1980s, that is, the summation at the household level of destination wages mapped to characteristics of migrants in the 1980s. As observed from the table, potential earnings from migrants are positively and significantly correlated with potential earnings calculated using information from migrants in US during the 1980s. Also, at the bottom of the table, I present the F-statistic of excluded instruments which rejects the null hypothesis that the effect of the excluded instrument is equal to zero. This positive correlation is explained by the idea that migration in the 1980s, representing social networks created in US and Costa Rica since then, facilitates current migration and makes more likely for households with migrants in the 1980s in specific occupations to have migrants in the current years in those specific occupations.

Table 3 First Stage Estimations

	Potential Income from Migration (Destination wages[a] * Current migrants)	
	Head of Household	Spouse
Destination wages[b] * Migrants in the 1980s	0.803***	0.635***
	(0.089)	(0.128)
Dummy for head of household being employed		0.277**
		(0.115)
Log of land possessions	-0.030**	-0.110***
	(0.014)	(0.030)
Number of kids younger than 14 in the household	-0.010	-0.033
	(0.011)	(0.029)
Labor experience	-0.029^	-0.022
	(0.018)	(0.018)
Labor experience squared	0.001*	0.000
	(0.000)	(0.001)
Age	-0.043	-0.134**
	(0.033)	(0.053)
Age squared	0.001***	0.003***
	(0.000)	(0.001)
Occup. dummy[c]: CEOs, managers, gov. officials, factories and businesses owners	0.036	0.433*
	(0.065)	(0.262)
Occup. dummy[c]: Professionals, university professors, artists, supervisors	0.008	0.118
	(0.034)	(0.212)
Occup. dummy[c]: School teachers, technicians, clerical and other skilled workers	-0.021	0.033
	(0.035)	(0.189)
Observations	9442	5326
Number of households	1152	656
R-squared	0.12	0.06
Partial R-squared of excluded instruments	0.11	0.04
Test of excluded instruments. Head: $F_{(1, 8280)}$; Spouse: $F_{(1, 4659)}$	80.57	24.70
p-value	0.000	0.000

Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$, ^ $p<0.15$

All specifications include time dummies, community-time dummies and household fixed effects

a. Refers to current destination wages mapped to current migrants. b. Refers to current destination wages mapped to 1980s migrants. c. Occupation type excluded: agricultural workers, domestic service workers, ambulatory workers and other unskilled workers.

Employment

   Table 4 presents the estimations of the probability of employment of the head of household and the spouse. The sample used in these estimations corresponds to all heads and spouses that do not have migration experience themselves during the 1990s. Other covariates include labor experience and its square, age and its square, number of kids younger than 14 present in the household, log of land holdings, and type of main occupation.[27] In addition, the estimations include time dummies, community-time dummies and household fixed effects. Standard errors have been corrected for heteroskedasticity.

   Columns (1) and (3) in Table 4 show the OLS estimates and columns (2) and (4) show the IV estimates. The OLS estimates in column (1) show that the effect of the potential income earned by migrants in the United States and Costa Rica on the probability of employment of the head of household living in Nicaragua is not significantly different from zero. On the other hand, the IV estimates in column (2) show a positive and significant effect. In the case of the probability of employment of the spouse, the effect of potential income earned by migrants abroad is negative but insignificant in both the OLS and IV estimations. Notice,

---

[27] When unemployed the occupation is set to the one previously working on.

though, that the coefficient is considerably bigger in the IV estimation.[28]   At the bottom of the table, I reproduce the F-statistics of excluded instruments reproduced from Table 3 and also show the Hansen J-statistics for which I cannot reject the null hypothesis that the models is overidentified. Hence, both statistics are reassuring that the model is well specified and the instruments are valid.

Table 4 Impact on Probability of Employment

	Head		Spouse	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Destination Wages[a] * Current migrants	0.001	0.016**	-0.000	-0.008
	(0.002)	(0.008)	(0.002)	(0.020)
Dummy for head of household being employed			-0.030	-0.028
			(0.024)	(0.024)
Log of land possessions	0.014**	0.015**	0.016	0.015
	(0.007)	(0.007)	(0.018)	(0.019)
Number of kids younger than 14 in the household	-0.007**	-0.007**	-0.024***	-0.024***
	(0.003)	(0.003)	(0.006)	(0.006)
Labor experience	0.053***	0.054***	0.061***	0.061***
	(0.007)	(0.007)	(0.005)	(0.005)
Labor experience squared	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Age	-0.057***	-0.056***	-0.040***	-0.041***
	(0.011)	(0.011)	(0.011)	(0.011)
Age squared	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Occup. dummy[b]: CEOs, managers, gov. officials, factories and businesses owners	0.036*	0.035*	0.326***	0.330***
	(0.019)	(0.019)	(0.088)	(0.088)
Occup. dummy[b]: Professionals, university professors, artists, supervisors	0.018	0.018	0.384***	0.385***
	(0.024)	(0.024)	(0.109)	(0.109)
Occup. dummy[b]: School teachers, technicians, clerical and other skilled workers	-0.041**	-0.040**	0.144^	0.145^
	(0.017)	(0.017)	(0.096)	(0.096)
Observations	9442	9442	5236	5326
Number of households	1152	1152	648	656
R-squared	0.04	0.03	0.07	0.07
F statistic of excluded instruments in first stage		80.573		24.702
p-value		0.000		0.000
Anderson-Rubin test (weak-instrument-robust inference)		4.362		0.156
p-value		0.037		0.693

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1, ^ p<0.15

All specifications include time dummies, community-time dummies and household fixed effects

a. Refers to current destination wages mapped to current migrants. b. Occupation type excluded: agricultural workers, domestic service workers, ambulatory workers and other unskilled workers.

Two results from the estimations above are worth highlighting. First, the IV estimates show that heads of households living in Nicaragua and potentially receiving income from migrants in the United States and Costa Rica are significantly more likely to be employed than heads of households who reported not having any migrant member in the family. This result contrasts with results previously found in the literature that found either zero or negative effect of remittances on male labor force participation in the sending countries. Funkhouser (1992), for instance, using household data from Nicaragua in 1989, finds a negative effect on labor force participation for men and women, although finds a positive effect on self-employed men.[29,30]

---

[28] When estimating separately the effect of income from migrants in Costa Rica and in the United States, the effect is negative in both cases and significant at the 5% for Costa Rica. However, a t-statistic from a test on the equality of these coefficients cannot be rejected and a F-statistic from a test on the null hypothesis that both coefficients are equal and equal to zero is rejected at the 10% level of significance. These results imply that the effect of migration income on the probability of employment of the head's spouse is negative but it is imprecisely estimated.

[29] Funkhouser (1992) abstracts from the endogeneity problem of remittances and does not use any specific technique to address it.

Hanson (2007) using cross-sectional data from Mexico finds a negative effect on both male and female labor force participation in households reporting to have migrants in the United States or to receive remittances from the United States. Hanson finds a negative effect on hours of work for men but no effect on the probability of participating. In the case of women, he finds a negative effect in both participation and hours worked. As discussed in section 2.1, the author finds the estimates for males counterintuitive and suspects them to be contaminated by household unobserved characteristics. Second, the results from the IV estimates unveil significant bias in the OLS estimates. Resembling the results from the literature described above, the OLS model estimates a negligible effect on the probability of employment of the household head. In contrast, the IV estimate is considerably larger in magnitude and precisely estimated. Decisions to migrate and remit are taken simultaneously with other household decisions such as supplying labor. If the household head is experiencing a negative employment shock the household might decide to send one member to work abroad to compensate the loss. Similarly, family members that have already migrated will respond to this negative shock, by increasing the amount of remittances. This negative relationship between employment shocks to the household head and the migration decision is reflected in an OLS estimate that is biased downward.

Investment

Next, I present the results from estimating the effects of potential income from migration on investment decisions of the households. For these estimations I used the sample of all households, including household heads that are currently migrating. The first two columns in Table 5 correspond to the estimations for business ownership while the last two correspond to real estate ownership. The dependent variables in these estimations are dummy variables taking the value of one if the household owns one or more of these assets and zero otherwise. In these estimations I include the following household characteristics as controls: age and age squared, a dummy if the head's main occupation is in agriculture-related activities, the log of land holdings and the number of kids younger than 14 in the household. I also include time dummies and community-time dummies. The standard errors have been corrected for heteroskedasticity.

Looking at columns (1) and (3) in Table 5, the OLS estimates show no significant effect on either business or real estate ownership. In contrast, the IV estimates in columns (2) and (4) show a different story. The effect of income from migration on business ownership is negative and significant while it is positive (although not significant) on real estate ownership. Also, notice that the point estimates are substantially bigger in the IV estimations.

---

[30] In Funkhouser (1992) the self-employment sample refers to the sample excluding owners and unpaid workers. I undertook a similar exercise using LAMP-NIC9 data and found the effect of potential income to be positive and significant for non-owners. However, they are relatively less likely to be employed.

Table 5 Impact on Investment Decisions

	Business Ownership		Real Estate Ownership	
	OLS (1)	IV (2)	OLS (5)	IV (6)
Destination Wages[a] * Current migrants	-0.003	-0.022**	-0.001	0.008^
	(0.002)	(0.010)	(0.002)	(0.005)
Dummy for occupation in agriculture or animal husbandry	-0.156***	-0.156***	0.012	0.012
	(0.031)	(0.030)	(0.021)	(0.021)
Log of land possessions	-0.008	-0.011	-0.018***	-0.017***
	(0.012)	(0.011)	(0.003)	(0.003)
Age	0.025***	0.023***	0.046***	0.047***
	(0.005)	(0.005)	(0.004)	(0.004)
Age squared	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Number of kids younger than 14 in the household	0.004	0.003	0.017***	0.017***
	(0.003)	(0.003)	(0.003)	(0.003)
Observations	10886	10886	10886	10886
Number of households	1334	1334	1334	1334
R-squared	0.01	0.00	0.03	0.03
F statistic of excluded instruments in first stage		31.942		31.942
p-value		0.000		0.000
Anderson-Rubin test (weak-instrument-robust inference)		3.967		3.163
p-value		0.046		0.075

Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$, ^ $p<0.15$

All specifications include time dummies, community-time dummies and household fixed effects

a. Refers to current destination wages mapped to current migrants.

The empirical literature has established strong links between remittances and investment. Some research work has found that remittances are channeled towards investment and, in some cases, compensate for the loss of labor to migration. Lucas (1987), using data from Botswana, Lesotho, Malawi, Mozambique and South Africa, estimates the simultaneous effect on the labor market in South African mines and on crop production in the sending regions. He finds that labor migration decreases domestic crop production in the short run but enhances crop productivity and cattle accumulation in the long run. Along the same lines, Rozelle et al (1999) estimate the effects of rural-to-urban remittances and migration on maize yields in China. They find that negative effects of migration on farm yields, due to a decrease in labor force, are partially compensated by the positive effects of remittances through greater access to capital. Mendola (2008) finds that international migration increases the likelihood of employing high-yield technology in rural Bangladesh. Adams (1998) using panel data from poor villages in Pakistan finds that international migration helps increase investment in rural areas. In contrast, Azam and Gubert (2004) find that migration, seen as an insurance mechanism, has a significantly negative effect on households unobserved level of productive efficiency. They use data from rural households in the Kayes along the Senegal River in 1997 and look at the moral hazard effect of migration on agricultural production by estimating its effect on a measure of technical efficiency.

Another segment of the literature has concentrated on the specific relationship between remittances and business enterprises. Woodruff and Zenteno (2007), using firm level data, find that international remittances from migrants in the United States are responsible for about 20% of investment in microenterprises in urban Mexico. Lindstrom (1996) using data from the Mexican Migration Project estimates a hazard rate model of return migration and finds that existent investment opportunities in the origin communities increase the

incentives for longer migration trips in the United States. On the other hand, Amuedo-Dorantes and Pozo (2006a) use cross-section data from the LAMP project in Dominican Republic and find that household remittances are associated with a lower likelihood of business ownership but find that business owners are more likely to receive international remittances. They argue that the negative effect on business ownership might be related to an increase in the reservation wage of households' heads that receive remittances. But the results presented in this paper (Table 4) of a positive impact of income from migration on labor force participation runs counter to such an explanation. Finally, Yang (2008) finds that increases in remittances due to exogenous exchange rates shocks during the Asian financial crises had a positive impact in the probability of starting entrepreneurial and self-employment activities in the Philippines.

In summary, although the link between remittances and migration with investment has been well established, it is not yet conclusive regarding their causal impact in the context of international migration. Disentangling the two-way causality is not a straightforward task. As discussed in section 2, households are likely to take investment decisions simultaneously with migration and the sending of remittances. Accordingly, OLS estimates presented In Table 5 are expected to be biased. The IV estimates, aimed at solving the endogeneity issue, have indicated a negative effect on business ownership but an imprecisely estimated positive effect on real estate ownership. However, in order to reach more robust conclusions these results require further exploration.

On the other hand, the results from Table 4 show a positive impact of migration income on the probability of employment. These results are at odds with findings and predictions found in the literature. Nevertheless, taking into consideration the multiple advantages of the identification strategy implemented here, these results should be seen as more reliable and deserve further exploration. In the subsequent section, I present hypotheses aiming at explaining these results and provide evidence to assess their predictions.

4. Understanding the Results and Some Extensions

In this section I present three hypotheses aiming at explaining the results obtained in the preceding section. The hypotheses focus on explaining the result of increased employment likelihood of the household head when potentially receiving income from international migrants. Furthermore, the intention is to reconcile this finding with the negative impact observed on business ownership. Once the hypotheses have been laid out and key predictions have been identified, I present evidence to assess these predictions.

4.1 Three Hypotheses

H1. Enabling Hypothesis

In the context of an existent self-enforcing contract between the migrant and the family a positive effect of income from migration on employment and investment may be expected.[31]   Improving working conditions at the destination increase the income potentially earned by migrants and the amount remitted home. Hence, household heads with family members migrating abroad and potentially sending remittances would be more likely to be employed or undertaking entrepreneurial activities than those without any

---

[31] Stark and Lucas (1988) describe such an arrangement in which the migrant receives some benefits from the family (education, sharing of migration costs and initial settlement, emotional and financial security, child care, overseeing and managing assets, among others) and in turn the family receives remittances intended to mitigate risks faced in the local economy. The context in Lucas and Stark (1988) is of rural-urban migration in which remittances allow the family to adopt riskier agricultural activities that would be otherwise discouraged from adopting in the absence of remittances. Similarly, one could think of a scenario of international migrants sending remittances in return from benefits received before or during migration that would allow their family members to run riskier activities, such as starting-up business, that in the absence of remittances they would not have done so. Also, one could think of remittances allowing family members in the home country to incur in transactions costs (commuting costs, job applications, and training are some examples) that have impeded them from taking-up certain jobs.

international migrants. Under this setting, the enabling hypothesis predicts the effect on the probability of employment to be stronger for poorer households. Households without wealth are expected to benefit more from loosened financial constraints resulting from the receiving migration income.[32]

The empirical prediction of this hypothesis in terms of business ownership is that the effect should be positive and stronger for households undertaking riskier investments. Using the LAMP dataset, this prediction may be approximated by looking at the ownership of different types of businesses. One could expect to find a stronger effect on business that require higher capital investments such as setting-up factories, workshops, restaurants and stores compared to businesses that are more labor intensive –personal and intermediary services, for example. Also, the effect is expected to be stronger for businesses that use hired labor apart from family labor. In terms of real estate ownership, the expected effect on real estate ownership should be positive. Under the familial arrangement, the acquisition of housing is one possibility of investment that could benefit the family directly and the migrant indirectly. Finally, regarding investment decisions as well, poorer households should benefit more from having migrants potentially sending remittances and a stronger effect should be expected for this group of households.

H2. Insecurity Hypothesis

Uncertainty regarding future security and the return of migrant members, or the long-term stability of their remittances, may generate greater incentives to work when receiving income from migrants abroad.

In the context of the familial self-enforced contract described above, one may analyze the effects of uncertainty about the migrants' return on the behavior of family members in the home country. In particular, consider the case when the migrants are the children of the household head, which is the case of most migrant families in Nicaragua. Improving working conditions in the host country, which translates into higher potential migration income, make parents concerned about their security in the future. They fear their children are less likely to come back and look after them when older. Children are often young when they migrate but will eventually grow their own family and will face foremost responsibilities as other married migrant children with family do. This is especially true when migrant children settle their own family abroad. Their offspring will grow up in a different cultural and economic environment with better opportunities (e.g., access to higher level education and new technology) that will act as a disincentive for them to return to their home countries. The parents are aware of such natural outcomes of migration and plan accordingly.

Hence, in the context of international migration, self-enforced familial arrangements may become weak or broken.[33] Head of household whose children are migrants may feel more insecure about their future if

---

[32] Lucas and Stark (1988) predict that migrants belonging to wealthier households will remit more. Note that this prediction is still in place under this hypothesis, but the marginal effect of receiving remittances will be bigger for more financially constraint households.

[33] Different types of self-enforcement mechanisms can be found in the literature. Under the familial arrangement described above, children send remittances to their parents motivated not only motivated by altruistic feelings but also by self-interest: *tempered altruism or enlightened self-interest* (Lucas and Stark, 1985). Such type of arrangement between the family and the migrant is shown to be mutually beneficial for both parties. Other theories argue exchange motives (Bernheim et al., 1985; Cox, 1987; Victorio and Arnott, 1993) in which children make transfers to parents in exchange of services such as help with the care of grandchildren or motivated by the possibility of future bequest. Cox and Stark (1995) develop a model (and provide evidence) in which parents demonstrate care towards their own parents in order to inculcate this behavior in their children so that they would look after them when they grow old. Nevertheless, these self-enforcement mechanisms may not hold in some particular settings and international migration may be one of them. The geographical distance between the migrant and the parents may impede the provision of services to the migrant. The demonstration effect may also fail in the context of international migration. It becomes a difficult task to inculcate caring behavior in children when parents, children and grandchildren are separated by migration. In fact, Cox and Stark's demonstration-effect hypothesis requires that transfers are visible, and migration makes this requirement unfeasible or at least very difficult.

their children do not come back. Thus, they would have more incentives to work than those heads whose children live closer to home.

This hypothesis predicts a greater effect on the probability of employment of households that are more likely to face economic insecurity later in their lives. In particular, one should observe a stronger positive effect on households without wealth and those not affiliated to the social security pension system. In particular, households that do not possess any form of wealth will expect a lower probability of return of their children in the absence of bequest motives. Notice that an intrinsic prediction of this hypothesis is that the effect on employment should be stronger for more mature adults compared to younger adults. This prediction is based on the fact that older household heads have a relatively shorter planning horizon compared to younger household heads and their discount rate is generally higher.

Furthermore, any variable that implies a lower expected likelihood of return migration should imply a stronger positive effect on the probability of employment of the household head, due to greater expectations of insecurity. One such an example may be the immigration status of the family members. If irregular immigration decreases the probability of return migration, one should expect household heads with irregular migrant members to react comparatively more and exert more effort. Alternatively, if migrants enjoying legal residence are more likely to stay at the destination than irregular migrants, the effect on the probability of employment of household heads with irregular migrant members should be the opposite.

Regarding investment decisions, this hypothesis predicts that household heads potentially receiving remittances will be less likely to invest in business. They will only engage in low-risk business activities that do not require a considerable amount of work or supervision. For example, in Nicaragua, it is very common for households to see their house as a type of old-age pension. In many cases, they construct their own house in different phases, making upgrades and expansions along the way, with the intention of renting a room or an area in their later years. Hence, one would expect a positive effect on real estate ownership for households potentially receiving income from migrants.

H3. Migration-Chain Hypothesis

Improving working conditions abroad increases the benefits from migration perceived by non-migrant individuals in the sending country and incentivizes work effort to achieve migration.

Consider the case of households with migrants sending remittances. Better working conditions abroad will possibly translate into higher amounts of remittances received. Family members will be motivated to migrate themselves to work and enjoy such better working conditions.

In the case of households that do not have family members working abroad, and that do not receive remittances, improving working conditions in the host country may also stimulate migration. A relative-deprivation type of motivation may be one possible driving force. Families without migration experience may perceive the benefits of migration by learning from success stories of families with migration experience. Thus, they see migration as the means to achieve comparatively higher standards of living, even if it only implies having more choices.

Social networks play a key role for this hypothesis to be feasible. Social networks in the host country increase the probability of new migrants having successful migration experiences. They provide work connections and information. Furthermore, in most cases social networks are primarily composed by relatives and *paisanos* (people from the same community of origin). But, it is also through social networks (in the home country) that non-migrant families learn about migration-experienced families.

Migrating, however, is costly. There is a transaction cost related to the trip itself and for most families it is a considerable cost, for both documented and undocumented migrants. Also, in many cases migrating entails an initial period in which the migrant will not be earning any income while settling in or waiting for a job. It is also very frequent that the first earnings are assigned for paying back migration costs. Furthermore, it is almost a stylized fact that migrants are not drawn from the bottom of the socio-economic distribution but from the lower-middle and up, particularly in the case of international migration.

Consequently, willing-to-be migrants will have incentives to be working and accumulating resources to finance the upcoming migration. If migration is meant to be permanent, they will disinvest in real estate property and businesses, while if migration is meant to be temporary they will likely disinvest only in businesses. Also, while planning their own migration household head will only invest in small businesses that have a lower cost of liquidation (labor-intensive type of businesses). In terms of immigration status, households potentially receiving remittances from undocumented migrants will be less willing to migrate if they consider the risk of migrating without the required documents to be relatively high.

Finally, the migration chain hypothesis predicts the effect on employment probability to be stronger for poorer households since they will have greater need for savings. Alternatively, the effect on social-security holders should be weaker because they have more at stake if they were to leave.

4.2. Assessing the Hypotheses

In this subsection I provide empirical evidence in order to explore the validity of the three hypotheses laid out in the preceding subsection. I will also attempt to distinguish between them by contrasting their predictions with the data.

<u>Wealth and Social Security Pension</u>

In order to test the predictions of the three hypotheses in terms of the probability of employment of the household head, I undertake three exercises: first, I include an interaction of potential income from migration with a dummy variable that takes the value of one if the household does not own land or real estate and zero otherwise. Second, I include an interaction term with a dummy variable taking the value of one if the household head is affiliated with the social security pension system. Finally, I run the estimations restricting the sample to household heads not affiliated to the social security pension system. The IV results of these exercises are presented in Table 6 below. Columns (1) to (5) refer to the same sample of household heads as in Table 4 while Columns (6) to (10) refer to an extended sample of household heads that includes migrants-to-be. The results using this sample will be discussed in the next exercise below.

The estimations presented in Table 6 show that poorer household heads potentially receiving income from migrants are more likely to be employed while household heads potentially receiving migration income and affiliated to the pension system are less likely to be employed. The former result supports all three hypotheses while the second result only supports the insecurity and migration-chain hypotheses. Column (1) replicates the estimates from Table 4 but including the dummy variable of no-wealth. Columns (4) and (5) restrict the sample to household heads not affiliated to the social security pension system. Notice from column (3) that the effect of the interaction of potential income from migration and the dummy for social security holders is weakly significant and negative while the effect on overall potential income is larger. Also, notice that the estimates in Column (4) are practically unchanged compared to those in Column (1). Both results lead to the conclusion that the positive effect of income from migrants on the probability of employment is only on household heads that are not affiliated to the pension system. This result supports both the insecurity hypothesis and the migration-chain hypothesis against the enabling hypothesis.

Table 6 Impact on Employment Decisions by Migration Status - Head of Households

	Non-migrant heads					Including migrants-to-be				
	Full sample			Excluding SS holders		Full sample			Excluding SS holders	
	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Destination Wages[a] * Current migrants	0.016**	0.011*	0.018**	0.016**	0.005	0.012*	0.006	0.015*	0.014*	0.003
	(0.008)	(0.006)	(0.008)	(0.008)	(0.005)	(0.007)	(0.006)	(0.008)	(0.008)	(0.005)
(Destination Wages[a] * Current migrants) * Dummy for no wealth		0.019^			0.045**		0.022^			0.051**
		(0.013)			(0.019)		(0.015)			(0.021)
(Destination Wages[a] * Current migrants) * Dummy for SS holder			-0.013^					-0.032**		
			(0.009)					(0.016)		
Dummy for no wealth (no wealth==1)	0.009	0.006	0.009	0.020	0.017	0.011	0.008	0.011	0.018	0.014
	(0.011)	(0.011)	(0.011)	(0.016)	(0.016)	(0.010)	(0.011)	(0.011)	(0.014)	(0.015)
Log of land possessions	0.015**	0.015**	0.015**	0.010	0.010	0.015**	0.015**	0.015**	0.010	0.010
	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)
Number of kids younger than 14 in the household	-0.007**	-0.007**	-0.007**	-0.005^	-0.005^	-0.006**	-0.006**	-0.006**	-0.005^	-0.005^
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Labor experience	0.054***	0.053***	0.054***	0.050***	0.049***	0.052***	0.052***	0.052***	0.049***	0.048***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)
Labor experience squared	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age	-0.056***	-0.056***	-0.056***	-0.042***	-0.041***	-0.053***	-0.053***	-0.053***	-0.040***	-0.039***
	(0.011)	(0.011)	(0.011)	(0.012)	(0.012)	(0.011)	(0.011)	(0.011)	(0.012)	(0.012)
Age squared	0.000***	0.000***	0.000***	0.000**	0.000*	0.000***	0.000***	0.000***	0.000*	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Occup. dummy[b]: CEOs, managers, gov. officials, factories and busin. owners	0.035*	0.035*	0.034*	0.072***	0.073***	0.036**	0.037**	0.034**	0.063***	0.064***
	(0.019)	(0.019)	(0.019)	(0.026)	(0.026)	(0.017)	(0.017)	(0.017)	(0.023)	(0.023)
Occup. dummy[b]: Professionals, university professors, artists, supervisors	0.018	0.019	0.018	0.176***	0.179***	-0.003	-0.002	-0.005	0.160***	0.164***
	(0.024)	(0.024)	(0.024)	(0.056)	(0.056)	(0.023)	(0.024)	(0.024)	(0.052)	(0.052)
Occup. dummy[b]: School teachers, technicians, clerical and other skilled	-0.040**	-0.040**	-0.040**	-0.032^	-0.032^	-0.045***	-0.044***	-0.045***	-0.033*	-0.031*
	(0.017)	(0.017)	(0.017)	(0.020)	(0.021)	(0.016)	(0.016)	(0.016)	(0.019)	(0.019)
Observations	9442	9442	9375	6691	6691	10340	10340	10270	7325	7325
Number of households	1152	1152	1144	815	815	1291	1291	1282	914	914
R-squared	0.03	0.03	0.03	0.04	0.04	0.03	0.03	0.03	0.04	0.03
F statistic of excluded instruments in first stage	80.547	42.802	43.349	70.754	49.288	88.315	44.323	48.804	76.072	38.680
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
F statistic of excluded instruments in first stage -interaction with dummy		50.643	8.834		43.756		22.496	11.528		39.986
p-value		0.000	0.000		0.000		0.000	0.000		0.000
Anderson-Rubin test (weak-instrument-robust inference)	4.347	2.815	2.768	3.816	3.487	2.660	1.886	2.556	3.095	3.030
p-value	0.037	0.060	0.063	0.051	0.031	0.103	0.152	0.078	0.079	0.048

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1, ^ p<0.15

All specifications include time dummies, community-time dummies and household fixed effects

a. Refers to current destination wages mapped to current migrants.   b. Occupation type excluded: agricultural workers, domestic service workers, ambulatory workers and other unskilled workers.

The results from Columns (2) and (5) show that household heads that do not possess wealth are more likely to be employed when potentially receiving income form migrants abroad.   In fact, the estimates from Column (5) suggest that poorer households not affiliated to the pension system are the ones more likely to be employed when receiving potential income from migration.   Results from this exercise applied to the probability of business ownership (not shown here to conserve space) show a pattern similar to the one just described supporting the prediction of the enabling hypothesis that more financially constrained households should benefit more from having migrants potentially sending income from abroad.

In summary, the results from this exercise support the predictions of the insecurity and the migration-chain hypotheses while only supporting partially the predictions from the enabling hypothesis.

Migration of Household Head

In order to shed light on the migration chain hypothesis I estimate the probability of employment for an extended sample that includes household heads with migration experience during the 1990s but excludes them while being abroad, that is, it includes migrants-to-be. Similarly, I estimate the probability of business and real estate ownership for the restricted sample of household heads without migration experience, as well as for the extended sample of migrants-to-be. Results from the IV estimations are presented in Columns (6) to (10) in Table 6 for employment and in Table 7 below for investment.

Table 7 Impact on Investment Decisions by Migration Status of the Head

	Non-migrant heads		Including migrants-to-be		All households	
	Business Ownership	Real Estate Ownership	Business Ownership	Real Estate Ownership	Business Ownership	Real Estate Ownership
	IV	IV	IV	IV	IV	IV
	(1)	(2)	(3)	(4)	(5)	(6)
Destination Wages[a] * Current migrants	0.015*	-0.005	0.024**	-0.004	-0.022**	0.008^
	(0.008)	(0.003)	(0.010)	(0.003)	(0.010)	(0.005)
Dummy for occupation in agriculture or animal husbandry	-0.208***	0.004	-0.194***	0.002	-0.156***	0.012
	(0.034)	(0.024)	(0.032)	(0.022)	(0.030)	(0.021)
Log of land possessions	-0.015	-0.016***	-0.014	-0.017***	-0.011	-0.017***
	(0.011)	(0.004)	(0.011)	(0.004)	(0.011)	(0.003)
Age	0.023***	0.045***	0.024***	0.045***	0.023***	0.047***
	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)
Age squared	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of kids younger than 14 in the household	0.002	0.017***	0.002	0.017***	0.003	0.017***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Observations	9442	9442	10340	10340	10886	10886
Number of households	1152	1152	1291	1291	1334	1334
R-squared	0.02	0.03	0.02	0.03	0.00	0.03
F statistic of excluded instruments in first stage	80.225	80.225	88.157	88.157	31.942	31.942
p-value	0.000	0.000	0.000	0.000	0.000	0.000
Anderson-Rubin test (weak-instrument-robust inference)	3.336	2.044	6.502	1.929	3.967	3.163
p-value	0.068	0.153	0.011	0.165	0.046	0.075

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1, ^ p<0.15

All specifications include time dummies, community-time dummies and household fixed effects

a. Refers to current destination wages mapped to current migrants.

Estimation results from Table 6, Columns (6) to (10), show that the effect of income from migration on the probability of employment is maintained when including in the sample household heads that eventually migrate during the period of analysis. Notice that, although the point estimates of the overall effect are smaller compared to the ones reported for non-migrant heads in Cols. (1) to (5), the effect on poor households not affiliated to the pension system is larger.

Turning to the results on the probability of investment in Table 7, one observes a very different pattern emerges when conditioning the sample to household heads that do not migrate. Results from the IV estimations in Table 5 are replicated in Columns (5) and (6) for comparison. They show the effect of potentially receiving remittances on business ownership to be negative when including in the sample all households regardless of the migration status of the head. In contrast, the estimations on the restricted samples in Columns (1) to (4) show a positive effect on the probability of business ownership. Thus, it seems that households potentially receiving migration income are more likely to be entrepreneurs when the household head is living in Nicaragua but not when being a migrant himself. This result is intuitive, since a household head s not living in Nicaragua cannot control the business himself and has to rely on third parties (family or hired workers).

The results from this exercise support the predictions of the migration-chain hypothesis In regard to household heads being more likely to be employed and possibly running businesses[34] before migrating but not while they are migrating. Nevertheless, these results are only suggestive, since more formal tests would require a larger sample of household heads migrating, possibly spanning a longer period.

Type of Business

The impact of migration income on business ownership will likely depend on the type of business the households are engaged in. For instance, households that are planning to migrate in the near future are more likely to engage in business activities that are more labor intensive. In the context of the enabling hypothesis, households with migrants potentially sending remittances are expected to engage in businesses that are more capital intensive. Similarly, the type of labor actually working (hired versus family) in the firm may be a proxy of the business size. For example, households that are less financially constrained are more likely to run business activities that require hired labor. Hence, in this exercise I investigate if these kinds of patterns appear in the analysis of the effect of migration income on entrepreneurial activities.

LAMP-NIC9 collects information on all business activities that require an investment from the household head or the spouse. The businesses reported by households are classified in 11 categories which I divided in three groups: capital intensive activities (factories, stores, workshops and restaurants), labor intensive activities (middleman, professional/technical, personal and other services, and street vendors), and agriculture and raising cattle. In the full sample, out of all household-years engaged in business activities 65% are labor intensive, 30% are capital intensive, and 5% are agriculture related. Regarding the type of labor employed, 25% of reported businesses employ hired workers against 75% that employ only family labor (household-years).

Before going into the estimations, it is important to raise a note of caution regarding this classification. Given the limited information I have about household businesses, I cannot completely exclude the possibility that some type of services, classified here as labor intensive, may require a significant amount of working capital. Also, in the case of capital intensive activities, in some cases the need for migration income may be

---

[34] The migration chain-hypothesis predicts that household heads should be more likely to run businesses that do not require much infrastructure, that is, that the cost of closing down is smaller. An attempt to validate this prediction is described in a subsequent exercise.

more important during the start-up process when fixed costs have to be financed and not that much when the business is already running. Since I do not have data that can inform us in these regards, interpretation of the estimated impact of migration income on business ownership should keep these issues in mind.

Table 8 presents IV estimations of the effect of migration income on business ownership by type of business. Panel A contains the estimations using the sample on non-migrant household heads, Panel B the estimations using the sample that includes heads of households that will eventually migrate during the 1990s and Panel C includes all households.

Table 8 Impact on Business Ownership by Type of Business[b]

Panel A: Non-migrant household heads

	All types	Labor Intensive		Capital Intensive		Hired labor		Family labor	
	(1)	(2)	(3)	(4)	(5)	(8)	(9)	(10)	(11)
Destination Wages[a] * Current migrants	0.015*	0.015^	0.018*	0.000	0.000	0.011	0.014^	0.004	0.004
	(0.008)	(0.009)	(0.010)	(0.001)	(0.002)	(0.008)	(0.009)	(0.003)	(0.004)
Observations	9442	9442	8475	9442	7538	9442	7382	9442	8773
Number of households	1152	1152	1065	1152	958	1152	948	1152	1091
R-squared	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02
F statistic of excluded instruments in first stage	80.225	80.225	188.054	80.225	56.303	80.225	406.567	80.225	55.825
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Anderson-Rubin test (weak-instrument-robust inference)	3.336	2.363	3.242	0.066	0.021	2.047	2.216	1.924	1.300
p-value	0.068	0.124	0.072	0.797	0.885	0.153	0.137	0.165	0.254

Panel B: Including migrant-to-be household heads

	All types	Labor Intensive		Capital Intensive		Hired labor		Family labor	
	(1)	(2)	(3)	(4)	(5)	(8)	(9)	(10)	(11)
Destination Wages[a] * Current migrants	0.024**	0.014^	0.017*	0.010*	0.012^	0.020**	0.025**	0.004	0.004
	(0.010)	(0.009)	(0.009)	(0.006)	(0.008)	(0.009)	(0.011)	(0.003)	(0.004)
Observations	10340	10340	9263	10340	8302	10340	8124	10340	9583
Number of households	1291	1291	1191	1291	1078	1291	1066	1291	1219
R-squared	0.02	0.01	0.01	0.01	0.01	-0.00	-0.00	0.02	0.02
F statistic of excluded instruments in first stage	88.157	88.157	159.740	88.157	66.416	88.157	440.305	88.157	60.919
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Anderson-Rubin test (weak-instrument-robust inference)	6.502	2.496	3.535	2.961	2.714	4.999	5.406	1.951	1.662
p-value	0.011	0.114	0.060	0.085	0.100	0.025	0.020	0.163	0.197

Panel C: All households

	All types	Labor Intensive		Capital Intensive		Hired labor		Family labor	
	(1)	(2)	(3)	(4)	(5)	(8)	(9)	(10)	(11)
Destination Wages[a] * Current migrants	-0.022**	-0.013	-0.015	-0.009	-0.012^	0.000	-0.000	-0.022***	-0.024***
	(0.010)	(0.011)	(0.011)	(0.008)	(0.008)	(0.007)	(0.009)	(0.007)	(0.008)
Observations	10886	10886	9758	10886	8715	10886	8532	10886	10082
Number of households	1334	1334	1233	1334	1115	1334	1103	1334	1260
R-squared	0.00	0.00	0.01	-0.00	-0.01	0.01	0.01	-0.01	-0.01
F statistic of excluded instruments in first stage	31.942	31.942	28.590	31.942	30.137	31.942	29.498	31.942	24.287
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Anderson-Rubin test (weak-instrument-robust inference)	3.967	1.442	1.719	1.099	1.986	0.004	0.001	7.110	6.451
p-value	0.046	0.230	0.190	0.294	0.159	0.948	0.981	0.008	0.011

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1, ^ p<0.15

All specifications are IV and include time dummies, community-time dummies and household fixed effects. In addition, covariates reported in 1.5 for business and real estate ownership are included in the estimations but not reported to conserve space.

a. Refers to current destination wages mapped to current migrants.

b. Labor intensive: street vendor, middle man, personal services. Capital intensive: store, restaurant, workshop, factory. Hired labor: at least one hired employee. Family labor: all are family workers

From Panel A, it may be observed that the positive effect of migration income potentially received by non-migrant headed households is concentrated on labor intensive business, and there is no effect whatsoever on capital intensive business. This result contradicts the prediction of the enabling hypothesis that household heads with migrants potentially sending income from abroad would be more likely to invest more in capital intensive business. The argument behind this prediction is that engaging in this type of businesses involves riskier investments and households potentially receiving remittances from abroad are sharing the risk of the investment with the migrant. Likewise, the enabling hypothesis predicts stronger effects on the probability of owning businesses that employ hired workers than those that only employ family workers. Columns (8) to (11) show that this is the case, but the effect is not precisely estimated.

Panel B shows that the impact of migration income affects the probability of ownership of both capital as well as labor intensive when including the heads of households that will migrate later in the period. It also shows that the effect only exists on the probability of owning businesses that hire labor outside the family. The migration-chain hypothesis predicts that household heads willing to migrate will only engage in entrepreneurial activities that were easier to dissolve, such as labor-intensive activities. The findings of this exercise do not support entirely this prediction.

Finally, the results from Panel C show the effects of migration income on the probability of business ownership using the full sample. Not surprisingly, the negative effect on the probability of business ownership is concentrated on businesses that employ family labor only. Considering that the head of household is living abroad, and that in majority of cases he is the major source of labor force within the household, the family would be less likely to engage in business activities on their own.

In conclusion, this exercise does not support the predictions of the enabling hypothesis while it partially supports the predictions of the migration-chain hypothesis. The prediction of the insecurity hypothesis with regard to business ownership is that household heads living in Nicaragua with migrants abroad should be less likely to engage in risky entrepreneurial activities. The evidence shows that the the type of business for which the migration income is having a positive impact on constitutes mainly self-employment. Hence the results from this exercise do not contradict the insecurity hypothesis.

Destination: Costa Rica versus the United States

Nicaraguan migrants have historically migrated to Costa Rica and to the United States. The reasons and the patterns of migrations to each of these destinations have not only been different but have changed over time. Understanding such differences is a very important area of research that can illuminate policy design. In the present paper, I do not intend to explain such differences but will attempt to exploit them to shed light on my findings. For example, migration to the United States entails higher costs. Given the comparative distance, the trip itself is more expensive and if the migrants do not have the proper documentation it is also riskier. Also, maintaining contact with family members from the United States is not only more expensive but it may be less frequent and in some cases just not feasible. On the other hand, the monetary benefits of migrating to the United States are larger since wages are higher than in Costa Rica.

In this context, one would expect the effect to be different depending on whether the households are receiving migration income from the United States or from Costa Rica. Accordingly, the three hypotheses proposed in this section imply the effect to be larger for households potentially receiving income from migrants in the United States.

In terms of the enabling hypothesis, the effect of migration income on the probability of employment and investment is expected to be stronger for households with migrants in the United States than for those with migrants in Costa Rica, given that wages in the United States are higher than in Costa Rica for the same occupations.

The insecurity hypothesis predicts that household heads are more likely to be working when the probability they assign on their family members returning home is lower. Since migration to the United States implies higher migration costs than to Costa Rica and it also makes more difficult and expensive for families to maintain contact, the effect of migration income on the probability of employment should be stronger when having migrants in the United States compared to having migrants in Costa Rica

Finally, under the migration-chain hypothesis the effect should be stronger for households with migrants in the United States. On one hand, the benefits from migrating to the United States are higher, considering they will encounter higher wages and possibly be reunited with their family members. On the other hand, the amount of resources needed for migration is also higher; hence they will work harder to get it.

In order to tests these predictions I estimate the effect of migration income disaggregated by destination. The results are presented in Table 9. I do not find any significant statistical difference between the effects of potentially receiving migration income from Costa Rica or from the United States. Most of the point estimates are significantly different from zero only in the case of income from the United States. But a statistical test on the equality of the two estimates is not rejected in any of the samples and specifications. So it seems that the effect of income potentially sent by migrants living in Costa Rica is imprecisely estimated. One possible explanation for this result is that the variance of income from migrants in Costa Rica is much smaller (little more than one third) than the variance of income from migrants from the United States. I undertook several exercises in which I transformed the income variables in logs, assuming different constants for rescaling. The point estimates in these exercises were of course closer in magnitude, but the Costa Rican coefficient remained insignificant.

Table 9 Probability of Employment, Business, Real Estate Ownership by Destination

	Panel A: Sample of household heads without migration experience during 1990s		
	Employment	**Business Ownership**	**Real Estate Ownership**
	IV	IV	IV
	(1)	(2)	(3)
Wages in Costa Rica[a] * Current migrants in Costa Rica	0.048	0.016	0.005
	(0.049)	(0.014)	(0.006)
Wages in US[a] * Current migrants in the US	0.015**	0.016*	-0.005
	(0.007)	(0.009)	(0.003)
Observations	9442	9442	9442
Number of households	1152	1152	1152
R-squared	0.02	0.02	0.02
F statistic of excluded instruments in first stage - CR	64.846	65.970	65.970
p-value	0.000	0.000	0.000
F statistic of excluded instruments in first stage - US	36.082	35.534	35.534
p-value	0.000	0.000	0.000
Anderson-Rubin test (weak-instrument-robust inference)	2.306	2.100	1.450
p-value	0.100	0.122	0.235
Test: Costa Rica and US coefficients are equal	0.456	0.000	2.145
p-value	0.499	0.982	0.143
Test: Costa Rica and US coefficients are equal and equal to zero	4.714	4.185	2.843
p-value	0.095	0.123	0.241

	Panel B: Sample of all households	
	Business Ownership	**Real Estate Ownership**
	IV	IV
	(4)	(5)
Wages in Costa Rica[a] * Current migrants in Costa Rica	0.020	0.023^
	(0.032)	(0.014)
Wages in US[a] * Current migrants in the US	-0.026**	0.007
	(0.010)	(0.005)
Observations	10886	10886
Number of households	1334	1334
R-squared	-0.01	-0.01
F statistic of excluded instruments in first stage - CR	79.658	79.658
p-value	0.000	0.000
F statistic of excluded instruments in first stage - US	17.036	17.036
p-value	0.000	0.000
Anderson-Rubin test (weak-instrument-robust inference)	3.016	2.211
p-value	0.049	0.110
Test: Costa Rica and US coefficients are equal	1.946	1.203
p-value	0.163	0.273
Test: Costa Rica and US coefficients are equal and equal to zero	7.169	3.993
p-value	0.0278	0.136

Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$, ^ $p<0.15$

All specifications include time dummies, community-time dummies and household fixed effects. In addition, covariates reported in tables 1.4 for employment and 1.5 for business and real estate ownership are included in the estimations but not reported to conserve space.

a. Refers to current destination wages mapped to current migrants.

Discussion

In this subsection I have undertaken different exercises in an attempt of discriminating between the hypotheses proposed to explain the empirical results. First, I estimated the effect of migration income on the probability of employment for poorer households and for households not affiliated to the social security pension system. I found the effect to be stronger for poorer households and for household heads not counting on a formal pension in the future. This result, however, support the predictions of both the insecurity and the migration-chain hypotheses while it partially supports the enabling hypothesis.

Second, I estimated the effect of migration income on employment including household heads that eventually migrate during the sample of analysis and find that the effect is maintained. Likewise, I estimate the effect of migration income on business and real estate ownership including these households as well as migrant-headed households. I found that migration income has a positive effect on the probability of business ownership in the case of non-migrant household heads but a negative effect in the case of migrant-headed households. These findings are consistent with predictions of the migration-chain hypothesis but also with predictions from the enabling hypothesis.

Third, I estimated the effect of migration income for different types of businesses. I found the positive effect of business ownership was concentrated on labor intensive business and not particularly different for businesses that hire labor. These results do not support the predictions of the enabling hypothesis of households investing more in capital intensive activities given that, under this hypothesis, migration income is relaxing financial constraints. When including migrant-headed households in the sample, I find that the effect of migration income on business ownership is concentrated in businesses that only employ family labor. This result supports the predictions of the migration-chain hypothesis since household heads are in general the main source of labor within the households and if migrating they cannot be in charge of entrepreneurial activities in Nicaragua.

Finally, I estimated the disaggregated effect of having migrants in Costa Rica and the United States. One would expect that, given that the migration patterns and the destinations differ in many important ways, the effect from having migrants in the United States would be greater than the effect of having migrants in Costa Rica. Surprisingly, I did not find evidence supporting these predictions. In addition, I also estimated the interaction effects of migration income and variables representing irregular migration and duration of migration. These estimations, not shown in this paper, measure a negative effect of income potentially earned by irregular migrants on the probability of employment. One explanation, under the insecurity hypothesis, may be that irregular migration increases the probability of migrants returning home and therefore household heads feel less insecure about their future compared to other households with regular migrants. Nonetheless, the empirical literature on irregular migration has found that irregular migrants are more likely to return but also undertake longer trips than regular migrants. Hence, the interpretation of the effect on the probability of employment becomes ambiguous since longer migration may also imply lower probability of return and therefore households would feel more insecure about their future.

In summary, I find results that shed light on the possible mechanisms behind the effect of migration income on household behavior. These are in fact interesting in their own right. However, I cannot effectively validate or reject the predictions and therefore cannot distinguish between the three proposed hypotheses.

5. Conclusions

This paper looks at the effect income potentially earned by Nicaraguan migrants living in the United States and Costa Rica on employment and investment decisions made by of households in the sending communities during the 1990s. Using a 9-year panel dataset, I estimate an instrumental variable model with fixed effects in an attempt to overcome endogeneity issues. Specifically, I use variation in wages at the destination using the information of occupations, locations and gender of Nicaraguan migrants in the 1980s at the household level in addition to fixed effects.

I find that income from migration increases the probability of employment of household heads. This result indicates the value of the identification strategy it contrasts sharply with those found in earlier literature which did not effectively control for endogeneity of international remittances. The IV model with fixed effects unveils substantial downward bias in OLS estimates. Regarding investment decisions, I find that migration income increases the probability of business ownership when household heads are not migrants. In contrast, I find that migrant headed households are less likely to own businesses but more likely to invest in housing.

In order to shed light on the mechanisms behind these results I propose three hypotheses: enabling, insecurity and migration-chain hypothesis. Also, I undertake several exercises in an attempt to assess their predictions. I find interesting results and support for some of the predictions, but unfortunately, with the current dataset, I cannot effectively distinguish between the three hypotheses.

Finally, the findings presented in this paper may be seen as a step forward in the study of the effects of migration in the sending communities. The empirical results may be seen as more reliable compared to other results existing in the literature that fail to control for some sources of endogeneity bias. Also, I attempt to shed light at the mechanisms behind the complex relationship between migration, remittances and household behavior. And, even though I am not able to distinguish between the proposed mechanisms, the ideas presented here may be useful in guiding future research. In particular, these results could guide the design of more in-depth and broader surveys that could help fill the knowledge gap in this area. Finally, the findings of positive effects of migration income on employment and entrepreneurial activities are of value for informing policymakers. Unfortunately, in most cases, the physical and financial infrastructure needed for entrepreneurial activities to be successful are not yet developed or not openly accessible in the sending communities. Also, households lack the knowledge to start and maintain successful enterprises. There may be a great potential for development and growth if policies are directed towards strengthening and multiplying these household-level efforts.

BIBLIOGRAPHY

Acosta P. (2006), "Labor Supply, School Attendance, and Remittances from International Migration: the Case of El Salvador", Policy Research Working Paper N. 3903, The World Bank.

Adams R. (1998), "Remittances, Investment, and Rural Asset Accumulation in Pakistan", Economic Development and Cultural Change, October 1998; 47, 1; pp. 155-173.

Amuedo-Dorantes C. and S. Pozo (2006a), "Migration, Remittances, and Male and Female Employment Patterns", American Economic Association, Papers and Proceedings, May 2006, Vol. 96 No. 2, pp. 222-226.

Amuedo-Dorantes C. and S. Pozo (2006b), "Remittance Receipt and Business Ownership in the Dominican Republic", The World Economy, pp. 939-956

Amuedo-Dorantes, C., T. Sainz and S. Pozo (2007), "Remittances and Healthcare Expenditure Patters of Populations in Orin Communities: Evidence from Mexico", INTAL-ITD, Working Paper 25. Buenos Aires, IDB-INTAL.

Azam, J-P. and F. Gubert (2004), "Those in Kayes. The Impact of Remittances on their Recipients in Africa", Working paper, University of Toulouse (ARQADE and IDEI), and DIAL, IRD, Paris.

Azam, J-P. and F. Gubert (2006), "Migrants' Remittances and the Household in Africa: A Review Evidence", *Journal of African Economies,* Volume 15, AERC Supplement 2, pp. 426-462.

Bernheim, B. D., A. Shleifer, and L. H. Summers. (1985) "The Strategic Bequest Motive." *Journal of Political Economy* 93, pp.1045-76.

Colussi, A. (2003) "Migrants' Networks: An Estimable Model of Illegal Mexican Migration", Mimeo, University of Pennsylvania.

Carrion-Flores, C. (2006) "What Makes You Go Back Home? Determinants of the Duration of Migrants of Mexican Immigrants in the United States." Mimeo, The University of Arizona.

Cox, D. and O. Stark (1995) "An Exchange Implication of Transfers: the Demonstration Effect" In *Altruism and Beyond*, ed. Oded Stark, 49-87. Cambridge University Press.

Funkhouser, E. (1992), "Migration from Nicaragua: Some Recent Evidence", World Development, Vol. 20 No. 8, pp. 1209-1218.

Hanson, G. and C. Woodruff (2003), "Emigration and Educational Attainment in Mexico", Mimeo, University California at San Diego.

Hanson, G. (2007), "Emigration, Remittances and Labor Force Participation in Mexico", INTAL-ITD, Working Paper 28. Buenos Aires, IDB-INTAL.

Hildebrandt, N. and D. Mckenzie (2005) "The Effects of Migration on Child Health in Mexico" *Economia*, Fall 2005, 257-289.

Kossoudji, S. A. (1992) "Playing Cat and Mouse at the U.S.-Mexican Border" *Demography* 29(2): pp. 159–180.

Lindstrom, D. P. (1996), "Economic opportunity in Mexico and return migration from the U.S." *Demography* 33(3): pp. 357–374

Lopez-Cordova, E. (2005) "Globalization, Migration and Development: The Role of Mexican Migrant Remittances." INTAL-ITD, Working Paper 20. Buenos Aires, IDB-INTAL.

Lucas, R. E. B. (1987), "Emigration to South Africa's Mines", The American Economic Review, Vol. 77, No. 3 (June 1987), pp. 313-330.

Lucas, R. E. B. and O. Stark (1985), "Motivations to remit: evidence from Botswana". *Journal of Political Economy* 93 (5), pp. 901–918.

Massey, D. (1988), "Economic Development and International Migration in Comparative Perspective", Population and Development Review, Vol. 14, No. 3, pp. 383-413.

McKenzie, D. and H. Rapoport (2005), "Network Effects and the Dynamics of Migration and Inequality: Theory and evidence from Mexico", *Journal of Development Economics*, 84 (2007) pp. 1–24

McKenzie, D. (2006), "Beyond Remittances: The Effects of Migration on Mexican Households", in International Migration, Remittances and the Brain Drain, ed. C. Özden and M. Schiff, Washington DC., The World Bank.

McKenzie, D, J. Gibson and S. Stillman (2006), "How Important is Selection? Experimental vs Non-Experimental Measures of the Income Gains from Migration", World Bank policy Research Working Paper 3906, May 2006.

Mendola, M. (2008), "Migration and technological change in rural households: Complements or substitutes?" *Journal of Development Economics*, 85, pp. 150–175

Munshi, K. (2003),"Networks in the Modern Economy: Mexican Migrants in the U.S., *The Quarterly Journal of Economics,* 118 (2), pp. 549-597.

Naufal, G. (2007) "Who Remits? The Case of Nicaragua" IZA Discussion Paper No. 3081, September 2007.

Reichert, J. and D. Massey (1987) "Patterns of U.S. Migration from a Mexican Sending Community: A Comparison of Legal and Illegal Migrants." *International Migration Review*, Vol. 13, No. 4, pp. 599-623

Rozelle, S., J. E. Taylor and A. deBrauw (1999), "Migration, Remittances, and Agricultural Productivity in China" The American Economic Review, Vol. 89, No. 2, Papers and Proceedings of the One Hundred Eleventh Annual Meeting of the American Economic Association, (May 1999), pp. 287-291.

Schnabl, P (2007) "Migration and Devlopment in Mexican Communities: Evidence from US Labor Demand Shocks." Mimeo, Massachusetts Institute of Technology.

Stark, O. (1988), *The Migration of Labor.* Oxford, United Kingdom, Blackwell Publishers.

Stark, O. (1995), *Altruism and Beyond*, Cambridge, Massachusetts, Cambridge University Press.

Stark, O. and Lucas R. E. B. (1988), "Migration, remittances and the family". Economic Development and Cultural Change 36, pp. 465–482.

Woodruff, C. (2007) "Mexican Microenterprise Investment and Employment: The Role of Remittances" INTAL-ITD, Working Paper 26. Buenos Aires, IDB-INTAL

Woodruff, C. and R. Zenteno (2001), "Remittances and Microenterprises in Mexico", Working paper, University of California, San Diego (UCSD) and ITESM-Guadalajara.

Woodruff, C. and R. Zenteno (2007), "Migration Networks and Microenterprises in Mexico" *Journal of Development Economics*, Vol. 82, pp. 509-528.

Wooldridge, J. (2001) *Econometric Analysis of Cross Section and Panel Data.* Cambridge, Massachusetts. The MIT Press.

Yang, D. (2006), "Why Do Migrants Return to Poor Countries? Evidence from Philippine Migrants' Responses to Exchange Rate Shocks", *The Review of Economics and Statistics,* November 2006, 88(4), pp. 715-735.

Yang D. (2008), "International Migration, Remittances and Household Investment: Evidence from Philippine Migrants' Exchange rate Shocks", *The Economic Journal,* 118 (April), pp. 591-630.