Rural Out-Migration and Farm Asset Accumulation: The Case of Guatemala

Felipe F. Dizon, Jr.
University of San Francisco
ffdizon@usfca.edu

Submitted to the Pacific Development Conference, March 2009

Abstract

The scale of the migration phenomenon has warranted huge effort to understand its motives and results. Grounded on the New Economics of Labor Migration theory and focusing on liquidity constraints as the central hypothesis, this paper addresses the question: will migration lead to the accumulation of farm assets in Rural Guatemala? The RETRAFECT method is applied to a back-cast panel dataset to introduce dynamic and quasi-counterfactual analysis. The study finds that the post-migration probabilities of farm investments are lower vis-à-vis the same pre-migration probabilities, but the result is mainly insignificant. Education and housing investments are more likely to be positively influenced by migration. Further, US-based migrants more likely invest in livestock which is non-farm-complementary, migrants in urban areas invest in human capital but not in farm assets, and semi-urban migrants invest in home improvements and farm-complementary agricultural capital. But in controlling for endogeniety, the migration effect on farm asset accumulation is closer to nil.

1. INTRODUCTION

This study primarily looks at the possible effects of internal and international migration on the accumulation of farm assets. The international movement of labor has proven to be an immense and unrelenting phenomenon. The potential development impact of labor out-migration, remittances not the least of them, has been a most rigorous and non-retarding field of scrutinizing and establishing theory and evidence alike. On surface, migration and remittances are an interesting feat of the development world on three points. First, remittances are generated by the poor themselves, suggesting that the peasant devises his own strategies independent of the interventions of the affluent. Second, the funds generated by migrants go directly to the pockets of their relatively deprived origin households. This frees *aid* from the distortions of bureaucracies through which external funds are channeled through. And third, the size of the migration trend and remittances has inflated to a level non-ignorable to global or minute economic actors. As of 2005, there was an estimated 191 million migrants all over the world, or 3% of the global population. As of 2007, remittance receipts were estimated at $318 billion globally, 75% of these external funds accrue directly to developing countries (Ratha and Xu, 2008)

Latin America and the Caribbean is a key region on migration and remittance dynamics, receiving $59.9 billion dollars in 2007. Guatemala is the fourth largest remittance recipient in the LAC, with a total of $4.1 billion in remittance receipts. Guatemala's remittance receipts were worth 10.3% of its GDP in 2006 (Ratha and Xu, 2008). In 2004, remittances were roughly 78% of exports, 348% of tourism, 2145% of FDI and 3052% of ODA (IADB, 2005). With a migration rate close to 11% during the past 5 years, there were 1.2 million remittance senders and 3.76 million direct beneficiaries of remittances- over a quarter of its population (IOM, 2007). These measures do not yet capture spill-over effects and other migration dimensions such as rural to urban local migration, where money transfers and development potentials are likewise realized.

Provided it is such a large resource that is tapped by the rural poor, the debate on the efficient and productive use of remittances warrants itself necessary. The receipt of remittances is not an automatic maximization of its development potential. Based on the New Economics of Labor Migration, I test a hypothesis regarding the consequent modification of the rural farm post a household migration strategy. This paper evaluates the effect of rural out-migration and its coinciding remittance receipts on the accumulation of productive farm assets. This expected accumulation of farm assets is the channel by which remittance income has been hypothesized to increase non-remittance income by more than unitary.

Section 2 provides a review of related literature. Section 3 summarizes the field method used, the data analyzed and the descriptive statistics. Section 4 discusses the estimation methodology, followed by a presentation of econometric results in the fifth section. I conclude with a summary of the key findings, caveats and recommendations.

2. LITERATURE REVIEW

The general migration debate has identified three major non-exclusive lines as to the effect of remittances. First, there is some evidence that remittances are non-productively used. Yang (2006) cites a few studies that find expanded consumption, Andersen et al (2005) and Cabegin (2006) find some evidence for labor contraction due to migration. Second, findings of Sosa and Medina (n.d.) and Andersen et al. (2005) suggest that remittances act as a safety net or insurance. Third, there has been a plethora of tests as to whether remittances lead to investment. The debate on investments include durable goods (Yang, 2006), Education (Taylor & Mora, 2006; Andersen et al., 2005; Adams, 2007; Sosa & Medina, n.d.; Adams, 2005; Yang, 2006; and Acosta, 2006), Health (Taylor & Mora; Andersen et al.; Adams, 2007 and 2005; and Sosa & Medina), Housing Improvements (Taylor and Mora, 2006; and Adams, 2005 and 2007), and Microenterprise (Adams, 2007 and Yang, 2006). There

is also evidence on investment after return migration in Egypt (Adams, 2007) and in Tunisia (Mesnard, 2004).

Labor migration has found huge discussion beginning the late 1960s, attributed to the work of Todaro (1969). He suggested that the motivation for rural-to-urban migration is the expected wage differential. This linked the migration decision to the probability of finding employment coupled with the existing difference between sector wages. However, empirical evidence has not been conclusive towards the expected wage hypothesis. Katz and Bloom (1986) questioned why migration still persists if it is observed to be an actuarially unfair endeavor. They posit that migration is in line with risk aversion, but placed in the context of an intertemporal utility function. Further, migration is imposed upon a broader decision-making entity as opposed to just an individual's deepened time horizon. Thus, the migration decision is a hybrid between a familial and purely individual decision where self-interest and altruism combine (Lucas and Stark, 1985).

Beyond the expected wage hypothesis, there has emerged the New Economics of Labor Migration (NELM) formalized by Stark and Bloom (1985). The NELM suggests two prime reasons for migration (Lucas and Stark, 1985 and Stark and Horowitz, 1982). First, migration allows a diversification of income sources leading to a mitigation of risk constraints on the household. Calero et al. (2008), McCarthy et al. (2006), Miller and Paulson (2007) and Davies (2007) find evidence for risk mitigation and/or insurance provision through migration in Ecuador, Albania, Thailand and Malawi, respectively. Amuedo-Dorantes and Pozo (2006) generate results from Mexican immigrants that suggest higher values of remittances are sent as employment and income risk increases in the host country. Second, migration yields remittances that overcome capital constraints on investment accumulation. It has been shown that capital constraints are alleviated through migration networks in Mexico (Woodruff and Zenteno, 2007), and through migrant savings in Tunisia (Mesnard, 2004). Similarly, Calero et al. (2008) find that in Ecuador remittances are used to overcome credit

constraints in human capital investments for school-aged children. More evidence on the investment role of remittances is provided for by Osili (2004) from an innovative matched US-Nigerian sample.

There are three key testable hypotheses that derive from the NELM. First, remittances lead to a more than unitary increase in farm incomes due to the productivity gains from asset accumulation. Second, remittances lead to productivity gains from asset accumulation. Third, remittances lead to the accumulation of rural farm assets. The NELM hypotheses are expected to hold primarily in rural areas due to highly volatile agricultural incomes (Rosenzweig & Wolpin, 1993), and the absence or incompleteness of credit, insurance and other critical markets (Stark & Horowitz, 1982; Rosenzweig & Wolpin, 1993; Adams, 1998; Katz & Bloom, 1986).

Taylor and Wyatt (1996) and Taylor and Lopez-Feldman (2007) find evidence for the first two hypotheses using village data from Michoacan, Mexico and the Mexican National Rural Household Survey, respectively. Mendola (2008) looked at 8 rural villages in Bangladesh. Her results suggest that internal migration yields negative effects on technology adoption, while international migration contributes to adopting technology. Rozelle, Taylor and DeBrauw (1999) found that in China, migration decreases farm productivity while remittances increase farm productivity. This was a particularly interesting study as they were able to separate the countervailing lost-labor effect and the constraint-mitigating effect involved in the migration strategy. In a study in Burkina Faso, Wouterse and Taylor (2006) find that inter-continental migration positively affects livestock production, but negatively affects non-farm and staple production since it hypothetically competes for scarce labor due to missing labor markets. They also find that assets are complementary to migration towards the engagement in risky high-return activities. They suggest that the migration effect is sensitive to labor intensity in production activities.

Evidence for the third testable hypotheses has been limited. Taylor's paper (1992) on gini decompositions looked at inequality effects of remittances in Mexico, but he also provides key

results on asset accumulation. He finds a non-significant effect of remittance income on the accumulation of education (human capital), but a positive and significant effect of remittance income on the accumulation of livestock over time. He is able to find that remittances increase non-remittance income in the long-run and rationalizes that this result is channeled from asset accumulation. Adams (1996) uses three year panel data from rural Pakistan. He finds that internal remittances leads to the accumulation of irrigated land owned and agricultural capital, while external remittances leads to the accumulation of irrigated land owned, rain-fed land owned and non-farm assets. Both types of remittances do not accumulate livestock. He also emphasizes that initial asset holdings and number of educated males have greater effects on accumulation than do remittances. Adams (1998) uses the similar rural Pakistan dataset extended to a five year panel. Almost similar from the preceding study, he finds that external remittances accumulate both irrigated and rain-fed land, but neither type of remittances leads to the accumulation of livestock and non-farm capital.

A recent study by Sanchez-Soto (2008) specifically looks at the relationship of the migration duration to the accumulation of both household assets and agricultural assets in semi-urban and rural Guatemala. The author classifies migration into broad ethnic groups and three migration destinations: rural, urban and international. She works with the expectation that US migration leads to household asset accumulation as opposed to agricultural capital and indigenous migration leads to the accumulation for productive farm assets. Further, rural-rural migration is suggested to be survival-motivated, while receipts from urban and international destinations may result into higher investment capabilities. Through basic OLS regressions, the author finds that ethnicity makes a difference, US and rural-urban migration lead to household asset accumulation, and US and rural-rural migration lead to agricultural asset accumulation. Although endogeniety and the counter-factual is not adequately discussed, the study produces interesting results as to the ethnicity and migration type differences.

Rural farm assets are significant because they provide various uses that aid in the development of household opportunities. First, the assets expand generated farm income through increased productivity (Yang, 2006; Rosenzweig & Wolpin, 1993). Second, rural assets are also savings-mechanism, as it is stored value (Yang, 2006). And third, assets may be divested when certain shocks occur. Thus, it serves an insurance purpose in that it is consumption-smoothing in the long-run (Rosenzweig & Wolpin, 1993; Adams, 1998). The second and third asset uses are even more important in rural settings where banks are absent and formal insurance is not available.

Yet the decision on rural asset investment is not without additional complications. Each asset has a different yield, degree of risk and ease of liquidation (Adams, 1998). It goes without saying that farm land is different from a bull. They have different rates of return and different levels of liquidity which result into different development potential. Taylor and Wyatt (1996) find that remittances more substantially affect farm income if assets are illiquid. Further, the decision on rural assets is also affected by a household's time preference and the prevailing interest rate. Since the former is often larger than the latter, it is not the common case that households possess rural assets (Adams, 1998).

This current paper tests a key hypothesis of the NELM. I intend to identify if rural assets are accumulated due to migration and remittances. This is the foundation of the NELM. If remittances do not accumulate farm assets, then remittances will not lead to productivity gains, and remittances will not lead to a greater than unitary increase in farm income- at least not through the channel identified by the NELM. Understanding that there exists a gap as to providing more substantial evidence to migration and farm asset accumulation, I test the hypothesis using specific methodologies applied to data from rural Guatemala. The following section describes the data used for analysis and also provides for descriptive statistics on the sample population.

3. DATA AND DESCRIPTIVE STATISTICS

The data used for this paper was collected in the summer of 2008 from the *aldea* of Panyebar located in the Solola Department in the western highlands of Guatemala. The field methodology involved a population census of Panyebar and a few households located to its immediate western and eastern borders. The population sample is divided into five geographical categories. Of the five categories, Panyebar contains three main sections- the Centro and two *cantons*: Chiuacanac and Panacal. A sample from the Cipresales *canton* (western border) and the Pasjaquim *aldea* (eastern border) represent the two other geographical categories.

The population sample contains 411 households. Panyebar represents 351 households of the total, divided among the Centro, Chiuacanac and Panacal. Cipresales contains 31 households surveyed, and 29 other households were surveyed in Pasjaquim. The survey made use of retrospective questions on memorable events and purchases to construct a back-cast panel dataset. That is, data on several periods were collected in only one round of surveying. More regarding the back-cast methodology will be discussed in the following section. The time-series length of the quasi-panel dataset is limited to an eleven-year maximum, specifically from year 1998 to year 2008. Thus, the final dataset is an unbalanced panel dataset of 4,194 observations from 411 households.

The data contains information on general household demographics, a wealth index constructed from durable good purchases and other welfare indicators, home improvements, farm asset purchases, household shocks, credit access, migration, remittances and migrant characteristics. The point system used to construct the wealth index is shown in Table 1. The approximate costs of the assets and the exclusive possession of certain assets by the obviously rich determined the point distribution of the wealth index. Apart from such things as the wealth index, most of the variables in the study are characterized binary.

Descriptive statistics are provided for in tables 2-4. The population as of 2008 is 2,448 in 411 households. The mean HH size is 6 in 2008, higher than the 4.7 mean HH size in 1998. Households that own farm land increased from 23% to 43% from 1998 to 2008. In 2008, adult education was 2.8 years, highest education was 5.6 years, 22% of households had credit (compared to 0.89% in 1998), female literacy was 48% and electrification was 82%.

Table 3 provides characteristics on migrants. In 1998, 7% of households had migrants. This has increased to 27% of households with migrants in 2008. Of the migrant households, 16% were US-based, 45% were Guatemala-based and 21% were based in Quetzaltenango. These three destinations account for four-fifths of all migrants. Further characterizing the migrant, 64% are male (down from 77% in 1998), 58% are children of the origin household head, 5.13 years is the average education, 14 years is the average time lived in the origin household, 1.43 is the average number of children of migrants. In 2008, mean annual remittances was 6869 Quetzales (or $856) sent intermittently an average of 14.6 times a year. About a quarter of remittance recipients also receive food and gifts from the migrants, where the failure to include such data has underestimated remittance receipts in migration research.

Based on table 4, migrant households and non-migrant households are similar in terms of household size, dependency ratio, and adult education. To some extent, there is homogeneity of households mainly due to the small size of the village and its remoteness. However, migrant households are slightly wealthier, have slightly higher education attainment, possess more farm land, and have more farm asset purchases. Migrant households are also less likely to be farming households, compared to non-migrant households; although farming households have grown in proportion by ten percentage points in the migrant household sample.

The out-migration rate through time has been volatile, as shown in Figure 1. Sharp declines in out-migration occurred in 1999 and 2004. Nonetheless, a general upward trend exists. The out-

migration rate peaked in 2007 and is just under 4% of the population in 2008. From figure 2, it shows that over 20% of the population sample received remittances in 2008, up from only over 5% ten years ago. Purchase of farm assets have been increasing through time (Figure 3), although this has been primarily due to a surge in livestock asset purchase. Figure 4 shows that farm land purchase and agricultural capital purchase has been relatively low compared to livestock. Agricultural capital purchase continued on an increase in 2007, but has since slumped in 2008 along with farm land purchase.

4. ESTIMATION METHODOLOGY

The primary methodology I use to test the effects of migration on farm asset accumulation will be the Retrospective Analysis of Fundamental Events Contingent to Treatment or RETRAFECT. This method has been used by McIntosh et al. (2008) primarily to measure the impact of microfinance on home improvements. This was borrowed from finance literature on the analysis of mergers. The method makes use of a back-cast panel dataset, earlier noted in the previous section. The main dependent variable, farm asset purchase, is binary in nature. Hence, the use of a probability model suffices. The linear probability model (LPM) will be used. Compared to probit or logit models, the LPM has been shown to provide more robust estimates when flat panel datasets are used and if appropriate fixed-effects are employed. Chamberlain (1979) provides a detailed discussion of covariance and longitudinal qualitative data analysis.

The primary explanatory variable in this study is the “treatment” migration. Understandably, migration is a self-selected phenomenon marred with endogeniety. This issue will be tackled in latter estimations. Migration is measured as a binary variable 1 in the first year a migrant migrated, 0 otherwise. The RETRAFECT involves a treatment window on migration, which is similar to a symmetric lag structure and lead structure. Dummy variables are created for the years before

migration, and dummy variables are symmetrically created for the years after migration. The number of lag and lead dummies constitute the size of the treatment window. For example, a treatment window of size 9 is a treatment window of 9 explanatory variables. Four variables will be the four years before migration, one will be the year of migration, and four variables will be the four years after migration. Hence the general model is of the form:

$$I_{ijt} = S_j + T_t + \beta[X_{ijt}] + \sum_{w=-1}^{-n} M_w + \sum_{x=1}^{n} M_x + M_0 + u_{ijt} \quad (1)$$

The main dependent variable in this study is farm asset purchase *I*, a binary variable 1 if household *i* in sector *j* purchased an asset in time *t*, 0 if otherwise. *S* and *T* are sector-level fixed effects and time-level fixed-effects, respectively. The sample contains 17 sectors, 15 in Panyebar and Cipresales and Pasjaquim defined as independent sectors. The vector [*X*] is a vector of time-variant household controls which include household size, gender ratio, average adult education, number of working members, strict dependency ratio, wealth index, bank credit, cooperative credit and an aggregate household shock variable. The first summation expression denotes the sum of the variables that represent the years before migration, and the second summation denotes the sum of the variables that represent the years after migration. The value *n* is an arbitrarily chosen size of treatment window. This *n* value is simply multiplied by 2 then added 1 in order to arrive at the earlier defined treatment window size. The expression M_0 is the bivariate initial year of migration. And, *u* is a mean zero error term.

I arbitrarily choose three sizes of treatment windows: 3, 7 and 9. From equation (1), the first summation will generate pre-migration probabilities and the second summation will generate post-migration probabilities. Wald's F-tests will be conducted to test the significance of the difference of post-migration probabilities against pre-migration probabilities, if there be any. In actual specification, the farm asset purchase variable *I* will be broken down into three categories of farm

assets: farm land, agricultural capital and livestock. As earlier discussed, each asset is different in its degree of risk, rate of return and divestment capacity, among other things. Hence, a breakdown of asset type will yield a clearer story as to what assets are purchased, and why. Agricultural capital is an aggregate binary variable which includes purchase of a fumigation pump, metal cart, poultry pen, chainsaw, or water pump. Livestock is an aggregate binary variable which includes purchase of a cow, bull, horse and other animals.

Moreover, two samples will be used for estimation. The first sample is the complete population sample. The second sample which I call the restricted NELM sample comprises households that are primarily farming households and do not equally have bank credit, which I simply assume to be access to formal credit. This restricted sample more closely converges to the New Economics of Labor Migration rationale for migration- that households wish to invest in their farm but are credit constrained, hence migrant's serve as intermediaries for the financing of productive farm investments.

Apart from the RETRAFECT analysis, I include additional specifications. A first alteration is to replace the treatment window with a remittance variable that takes the value 1 for all the years a household received remittances, and 0 otherwise. A second alteration is to similarly replace the treatment window with a migrant variable that takes the value of 1 for all the years a household had a migrant, and 0 otherwise. Extending this second alteration, I segregate the migrant variable into the top three migrant-locations: the US, Guatemala City and Quetzaltenango.

A final alteration is a quasi instrumental variable methodology. Migration is replaced with a variable of shock-led migration. If the year a migrant left is the year following one of the two major hurricanes experienced in the western highlands: Mitch in 1998 and Stan in 2005, then it is considered exogenous and will be treated as migration. Other than this new exogenous migration variable, all other migration observations drop to zero in this particular specification. However, it is

understood that the exclusion restriction of the covariate storm shock 'IV' on farm investment is weak. More on endogeniety will be discussed in the final section of the paper. The following section presents the econometric findings.

5. ECONOMETRIC RESULTS

The overarching result of this paper is that rural out-migration does neither economically nor statistically significantly alter farm investment probabilities. Throughout all estimations, I find that the sum of post-migration farm investment probability effects is less than the sum of the pre-migration farm investment probability effects. This weakly suggests an abandonment of the farm. This difference ranges from as low as 0.4 percentage points to as much as 8 percentage points. However, the result is generally not significant. Migration does not materialize as a strong "treatment" to alter behavior on farm investment, as what the New Economics of Labor Migration hypothesis predicts. Table 5 shows the results with farm investment as the dependent variable, and table 6 uses the same analysis but uses the restricted sample (credit-constrained farming households). The decline in farm investment probability post migration is of even greater magnitude in credit constrained farm households, compared to the general population sample.

A couple of control variables deserve notice. As expected, the wealth index increases the probability of purchase of farm assets. This result is consistently significant throughout all specifications. Average adult education, contrastingly, is negatively correlated to purchase of farm assets. The wealth result suggests that farm assets are normal goods, while the education result suggests that the same are inferior goods. The negative result on average adult education is primarily driven by livestock purchases and does not hold for other specific assets.

As discussed in the preceding section, I breakdown farm investment into three asset types: farm land, agricultural capital and livestock. Table 7 presents the RETRAFECT results for both the

restricted and non-restricted samples for farm land purchase. For credit constrained farm households, the post-migration probability of land purchase is significantly less than the pre-migration probability using the treatment window of size 3. The Wald's F-test on difference of coefficients suggests this minimal statistical significance. Also, credit constrained farm households are accrued statistically significant declines in farm land purchase probability from the first year of migration to two years after migration. This total decline is approximately 8.5 percentage points. This negative effect switches to positive in the third and fourth year, but this result is insignificant. Looking at the non-restricted sample, migration yields an instantaneous negative effect on the probability of farm investment purchase. As well for the full sample, the negative effect disappears by the fourth year post migration.

The RETRAFECT results for agricultural capital are presented in table 9. For the full sample, the pre-migration year correlates positively to agricultural purchase probability. Migration does not however materialize an effect on the probability of purchase of agricultural capital. Livestock purchase results are provided for in table 11. Based on the Wald's F-test using the smallest window size for the full sample, the post-migration probability effect of livestock purchase is significantly lower than the pre-migration probability effect of livestock purchase by 5 percentage points. However, during the first year of migration, livestock purchase probability increases- both in the full sample and the restricted sample. This result is significant and averages at 5 percentage point increase for the full sample and 7 percentage point increase for the credit constrained farm households. This implies that livestock assets are less lumpy and are therefore easier to purchase, of course compared to farm land purchase. Also, the divestment of livestock is easier. Hence, it is less risky of an investment. Yet dynamics suggest that the probability however declines until the fourth year post-migration.

As is traditional in the RETRAFECT method, I present graphical representations of the time trend on the probability effects for the years during, before and after migration. I use the widest treatment window size 9: with four pre-migration lead dummies and four post-migration lag dummies. Figure 5 to figure 12 present these graphs for both samples and for the three asset types. The coefficients are plotted out along with the lower and upper ends of the 95% confidence interval. In the center of each graph is t=0, representing the year of migration. To the left-hand side of t=0 are the pre-migration years and to the right-hand side are the post-migration coefficients on probability effects.

An important implication of the findings is that asset types are indeed different in their results, theoretically due to degree of risk, lumpiness and rate of return. Apart from this, the paper also finds that where a migrant is based also yields key differences in the results. Tables 8, 10 and 12 (and Table 5 an 6) present additional specifications on the model for each asset type and for both samples. This is done primarily to tease out a non-dynamic analysis of migrant location differences.

A household with a US-based migrant will have a 13% higher probability of investment on farm assets, this probability increases further to 21% if the household with the US-based migrant is a credit constrained farm household. This US migrant result is highly skewed to purchase of livestock assets. For locally-based migration, I analyze the top 2 local destinations: Guatemala City and Quetzaltenango. Guatemala City is the capital and is naturally the most urban and progressive. Most Panyebar emigrants work in the industrial sector or in commercial establishments. Quetzaltenango is also commercial, with construction and farming as primary occupations for Panyebar emigrants. But Quetzaltenango, or Xela, is closer to Panyebar in both culture and wealth, than the capital.

A household with a Guatemala-based migrant (referring to the capital city), will have a lower probability of investing in farm land and agricultural capital particularly if it is a credit constrained farm household. If a household has a Quetzaltenango-based migrant, the probability of purchase of

agricultural capital increases, but credit constrained farm households with the same migrant location will find a decrease in the probability of accumulating farm land. I further test for the complementariness of livestock assets and agricultural capital to farm activity by adding a dummy variable regressor 'possess farm land' to the livestock and agricultural capital regressions. Agricultural capital is complementary to the farm, where its purchase increases as farm land is owned. But there is no evidence as to the complementary relation of land and livestock. This implies that although households with US-based migrants invest in livestock, the type of asset they invest in is less directly complementary to farm activity. On the other hand, households with Quetzaltenango-based migrants invest in agricultural capital, which is complementary to farm land activity.

The analysis is further extended to cover non-farm investments, specifically home improvements and lower education investments. Home improvement is a dummy variable 1 if the household conducted an upgrade to the home- floor, roof or walls, 0 otherwise. The lower education investment variable is a ratio of the total school-aged children to the number of school-aged children enrolled in lower education- primary and secondary education. The results for home improvement are presented in tables 13 and 14. As opposed to the farm asset results, the sum of the pre-migration probability effects is lower than the post-migration probability effects. The values range from 3.7 percentage point difference to as much as 14.5 percentage point difference. The difference for credit constrained farm households is much greater than that for the full sample. Although the Wald's F-test result is not statistically significant, the consistency of the coefficient differences throughout estimations is notable. Moreover, credit constrained farming households with Quetzaltenango-based migrants will have an 8.9 percentage point higher probability of home improvement.

The results for investment in lower education are provided for in tables 15 and 16. Again, contrary to the results for farm investment, the sum is greater post-migration than pre-migration for

probability effects on lower education investment. Throughout the window sizes and samples, the difference in sums ranges -0.4 percentage points to 30.7 percentage points. The latter result is significant- that the post-migration probability effects is greater by 30.7 percentage points than the pre-migration probability effects on lower education investments for credit constrained farming households. A treatment window graph is presented in Figure 13, this shows the increased probability effect on lower education investments post-migration (t+1 to t+4). For the full sample, households with a migrant in Guatemala City will more likely invest in lower education by 9.4 percentage points, while households with a Quetzaltenango-based migrant will less likely invest in lower education by 9.9 percentage points. The positive effect on education investments of having a Guatemala City based migrant increases to 11.8 percentage points if the household is from the restricted sample.

As earlier discussed, endogeniety is always a key concern in self-selected non-random processes such as the migration decision. I present results for the quasi instrumentation procedure which basically limits migration to only hurricane-induced migration, which is exogenous. Although the exclusion restriction is weak, the conclusion is quite clear. The quasi IV specifications are presented in the last columns of tables 5, 6, 14 and 16. I find that migration, with efforts to control for endogeniety, does not affect farm investment, home improvement or lower education investments.

6. CONCLUSIONS AND RECOMMENDATIONS

In this paper, I focus on determining the effect of migration on the accumulation of farm assets. Grounded on the New Economics of Labor Migration theory, the study sets out on the hypothesis of liquidity constraints as a rationale for migration. The RETRAFECT method was used whereby one can assess the probability effects on the years after migration against a quasi-

counterfactual which is looking at the years before migration. The analysis was extended by disaggregating farm asset type and migration type and by addressing endogeniety.

In general, there is weak evidence that migration alters farm asset accumulation behavior. Neither a positive nor negative effect materializes robustly. There is some evidence that the farm is abandoned, although the consistent negative difference in sums of post-migration coefficients on pre-migration coefficients is generally insignificant. I extend the analysis to cover non-farm investments- human capital and home improvement. As opposed to farm investment, both education and home improvement probabilities increase after migration. The result for education is economically substantial and statistically significant.

In disaggregating analysis by asset type, I find that probability of land purchase declines in the immediate year of migration; livestock purchase probability continually declines up to the fourth year after migration; and the probability of agricultural capital purchase increases in the year before migration. In disaggregating by migrant type, I find that US-based migrants more likely invest in farm investments especially if the household is involved in farming and credit-constrained, migrants based in Guatemala City will less likely invest in farm assets but will invest in lower education, and Quetzaltenango based migrants invest in agricultural capital and home improvement but do not invest in lower education. US migrants will however invest in livestock which is unlikely complementary to farm activity, while Quetzaltenango based migrants invest in agricultural capital which is complementary to farm activity. Nonetheless, in considering the endogeniety of migration, the results suggest that migration does not have an effect on farm asset accumulation, nor on education or home improvement.

Neither the weak result of general farm abandonment nor the null effect of migration on farm asset accumulation are not at par with most empirical findings that support the New Economics of Labor Migration. This suggests that the migration effect on asset accumulation is

sensitive to the characteristics of the origin community and probably the econometric methodology utilized. However, the results on migrant type are intuitively and empirically consistent. International migrants are more able overcome liquidity constraints due to larger remittance receipts. Guatemala City migrants are urban-based and are more likely to invest in activities that are connected to the urban sector, such as human capital. And Quetzaltenango-based migrants are closer to the origin community and are thus more likely to invest in farm activities or invest in home improvements.

Certain caveats are at hand. First, although the back-cast methodology introduces time dynamics, it limits data definitions. For example, although fertilizer is a key farm input it cannot be assessed as it is not a memorable purchase. Second, the exclusion restriction on the instrument for endogeniety is weak. But since migration yields a null correlation to farm asset accumulation even without instrumentation, then addressing endogeniety is less pressing a matter. Nonetheless, future extensions to the analysis will explore possibilities of more sophisticated IV procedures in spite of qualitative data limitations. Third, the surveyed area Panyebar is part of Solola which is categorized as having below national average international out-migration rates. More robust estimates of international migration effects can be achieved in samples with more extensive data on external migration. The analysis will be extended using national Guatemala data to arrive at a more comprehensive conclusion. Regardless, the current findings suggest that asset choice depends on the type of migrant, which implies that migration strategies vary by motive. But generally, migration does not lead to the accumulation of farm assets.

BIBLIOGRAPHY

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

Adams, R. (1996). Remittances, Income Distribution and Rural Asset Accumulation. *International Food Policy Research Institute, Food Consumption and Nutrition Division Discussion Paper no. 17.*

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

Adams, R. (2005). Remittances, Household Expenditure and Investment in Guatemala. *World Bank Policy Research Working Paper 3532.*

Adams, R. (2007). International Remittances and the Household: Analysis and Review of Global Evidence. *World bank Policy Research Working Paper 4116.*

Amuedo-Dorantes, C. and Pozo, S. (2006). Remittance as Insurance: Evidence from Mexican Immigrants. *Journal of Population Economics, 19:227-254.*

Andersen, L., Christensen, B.J., and Molina, O. (2005). The Impact of Aid on Recipient Behavior: A Micro-Level Dynamic Analysis of Remittances, Schooling, Work, Consumption, Investment and Social Mobility in Nicaragua. *Institute for Advanced Development Studies, Development Research Working Paper Series no. 02/2005.*

Cabegin, E. (2006). Effect of Filipino Overseas Migration on the Non-Migrant Spouse's Market Participation and Labor Supply. *IZA Discussion Paper no. 2240.*

Calero, C., Bedi, A. and Sparrow, R. (2008). Remittances, Liquidity Constraints and Human Capital Investments in Ecuador. *IZA Discussion Paper no. 3358.*

Chamberlain, G. (1979). Analysis of Covariance with Qualitative Data. *National Bureau of Economic Research, Working Paper no. 325.*

Davies, S. (2007). Remittances as Insurance for Covariate and Idiosyncratic Shocks in Malawi: The importance of distance and relationship. *JEL Classification Codes: D190, D310, O180.*

IADB (2005). Remittances 2005: Transforming Labor Markets and Promoting Financial Democracy, Statistical Comparisons. *Inter-American Development Bank and Multilateral Investment Fund.*

IOM (2007). Survey on Remittances 2007, Gender Perspective. *International Organization for Migration, Workbook on Migration no. 24.*

Katz, E. and Bloom, D. (1986). Labor Migration and Risk Aversion in Less Developed Countries. *Journal of Labor Economics 4, 1; 134-149.*

Lucas, R. and Stark, O. (1985). Motivations to Remit: Evidence from Botswana. *The Journal of Political Economy 93, 5; 901-918.*

McCarthy, N., Carletto, G., Davis, B., and Maltsoglou I. (2006). Assessing the Impact of Massive Out-Migration on Agriculture. *ESA Working Paper No. 06-14.*

McIntosh, C., Villaran, G., and Wydick, B. (2008). Microfinance and Home Improvement: Using Retrospective Panel Data to Measure Program Effects on Fundamental Events. *JEL Classifications: O12, O16, C21.*

Mendola, M. (2008). Migration and Technological Change in Rural Households: Complements or Substitutes. *Journal of Development Economics 85 (2008), 150-175.*

Mesnard, A. (2004). Temporary Migration and Capital Market Imperfections. *Oxford Economic Papers 56; 242-262.*

Miller, D. and Paulson, A (2007). Risk Taking and the Quality of Informal Insurance: Gambling and Remittances in Thailand. *FRB of Chicago, WP no. 2007-01.*

Osili, U.O. (2004). Migrants and Housing Investments: Theory and Evidence from Nigeria. *Economic Development and Cultural Change, 52, 4.*

Ratha, D. and Xu, Z. (2008). Migration and Remittances Factbook 2008. *Migration and Remittances Team, Development Prospects Group, the World Bank*.

Rosenzweig, M. and Wolpin, K. (1993). Credit Market Constraints, Consumption Smoothing, and the Accumulation of Durable Production Assets in Low-Income Countries: Investments in Bullocks in India. *Journal of Political Economy 101, 2; 223-244.*

Rozelle, S., Taylor, J.E., and DeBrauw, A. (1999). Migration, Remittances and Agricultural Productivity in China. *The American Economic Review 89 (2), 287-291.*

Sanchez-Soto, G. (2008). The Effects of Cumulative Migration on Households' Asset and Capital Accumulation in Rural Guatemala. *Annual Meeting of the Population Association of America.*

Sosa, L.C., Medina, C. (n.d.). Migration as a Safety Net and Effects of Remittances on Household Consumption: The Case of Colombia. *Banco de la Republica de Colombia.*

Stark, O. and Bloom, D. (1985). The New Economics of Labor Migration. *The American Economic Review 75, 2; 173-178.*

Stark, O. and Horowitz, D. (1982). Research on Rural-to-urban Migration in LDCs: The Confusion Frontier and Why We Should Pause to Rethink Afresh. *World Development 10, 1; 63-70.*

Taylor, J.E. (1992). Remittances and Inequality Reconsidered: Direct, Indirect and Intertemporal Effects. *Journal of Policy Modeling 14(2): 187-208.*

Taylor, J.E. and Lopez-Feldman, A. (2007). Does Migration Make Rural Households More Productive? Evidence from Mexico. Food and Agriculture Organization, *ESA Working Paper No. 07-10.*

Taylor, J.E. and Mora, J. (2006). Does Migration Reshape Expenditures in Rural Households? Evidence from Mexico. *World Bank Policy Research Working Paper 3842.*

Taylor, J.E. and Wyatt T.J. (1996). The Shadow Value of Migrant Remittances, Income and Inequality in a Household Farm Economy. *The Journal of Development Studies 32, 6; 899-912.*

Todaro, M. (1969). A Model of Labor Migration and Urban Unemployment in Less Developed Countries. *The American Economic Review 59, 1; 138-148.*

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

Wouterse, F. and Taylor, J.E. (2006). Migration and Income Diversification: Evidence from Burkina Faso. *ARE Working Papers, 06,003.*

Yang, D. (2006). International Migration Remittances and Household Investment: Evidence from Philippine Migrants' Exchange Rate Shocks. *NBER Working Paper Series, WP 12325.*

TABLES AND FIGURES

Table 1. Construction of Wealth Index

Table 1	
Wealth Index Construction	
Indicator	*Points*
Vehicle	4
Sewing Machine	2
Cellphone	2
Television	2
Sewing Machine	2
Telephone (landline)	2
Water Connection	1
Electiricty Connection	1
Possession of Lavadero	1
Radio	0.5
Floor Type	
None (Soil)	0
Cement	1
Ceramic	2
Wall Type	
Cane	0
Tin, Wood, Adobe	1
Partly Block	2
All Block	3
Maximum Points	23

Table 2. Population Sample Household Characteristics

Table 2. Household Characteristics			
	1998	**2003**	**2008**
Population	1569	2089	2448
Mean HH Size	4.66	5.40	5.96
Primarily Farming Households	73.59%	70.28%	69.34%
Female Head Literacy Rate	43.88%	46.49%	48.17%
Dependency Ratio	0.49	0.53	0.53
Mean of Average Adult Education	2.2	2.5	2.8
Highest Educational Attainment	3.9	4.5	5.6
Percent of Electrified HHs	57%	66%	82%
HHs Own Farm Land	23%	30%	43%
HHs with Bank Credit	0.89%	2.07%	21.89%

Table 3. Migrant Characteristics and Remittances

Table 3. Migrants and Remittances			
	1998	**2003**	**2008**
Migrant Households	7.42%	15.25%	27%
Stock of Migrants	31	71	158
Average Migrant Age	27.62	27.52	27.29
Proportion of Male Migrants	77%	74%	64%
Migrant is Spouse of HH Head	25%	37%	28%
Migrant is Child of HH Head	54%	51%	58%
Migrant's Years in Origin	17	15	14
Average Migrant Education Years	5.15	4.51	5.13
Average Children of Migrant	1.65	1.77	1.43
US-Based Migrants	19%	11%	16%
Guatemala City based Migrants	50%	54%	45%
Quetzaltenango Based Migrants	12%	16%	21%
Average Annual Remittance	--	--	6869.23
Remittances Frequency Per Year	--	--	14.59
Migrants who sent food	--	--	21.37%
Migrants who sent gifts	--	--	25.86%

note: last four items are time invariant

Table 4. Comparison of Migrant and Non-Migrant Household Demographics

	Migrant Households		Non-Migrant Households	
	1998	**2008**	**1998**	**2008**
Primarily Farming Households	43%	53%	76%	75%
Mean HH Size	4.9	5.9	4.6	6.0
Dependency Ratio	0.50	0.53	0.49	0.53
Mean of Average Adult Education	2.4	2.8	2.2	2.8
Highest Educational Attainment	4.7	6.4	3.8	5.4
Possess Farm Land	26%	50%	23%	41%
Farm Investment	9%	31%	9%	21%
Wealth Index Value	4.85	9.06	3.70	7.34

Figure 1. Out-Migration Rate

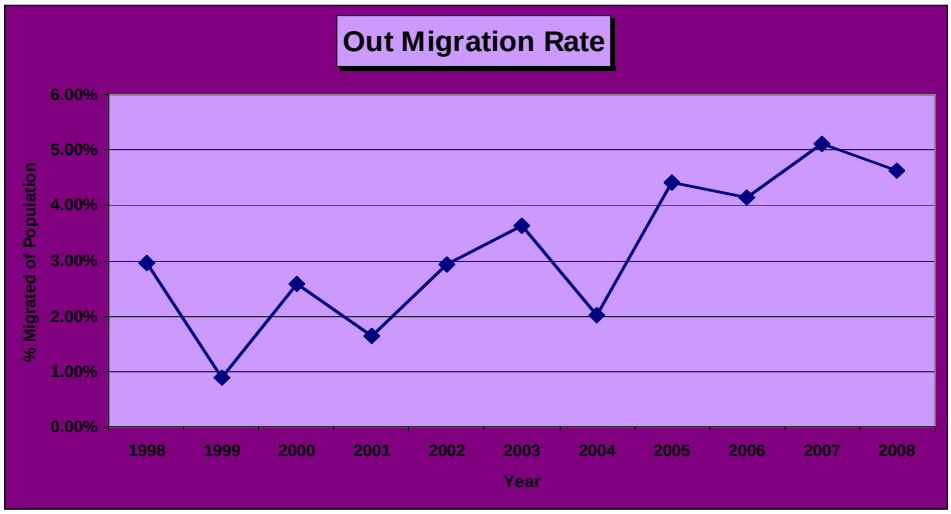

Figure 2. Percent of Households that Receive Remittances

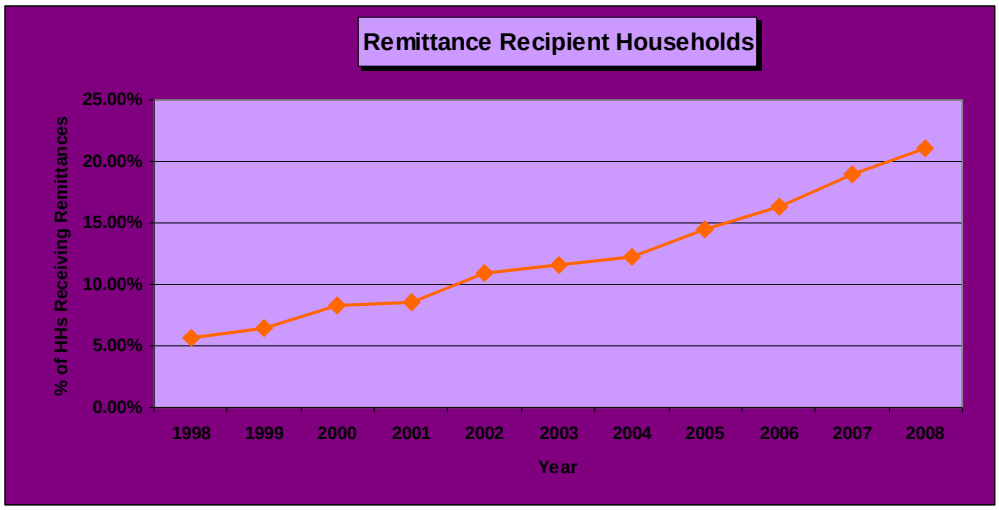

Figure 3. Percent of Households that Purchased a Farm Asset

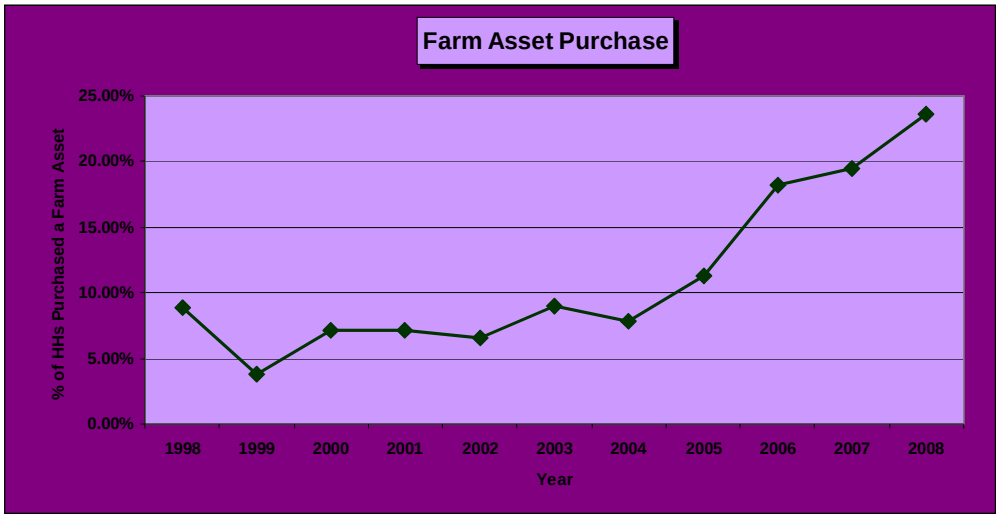

Figure 4. Farm Asset Purchase by Type of Asset

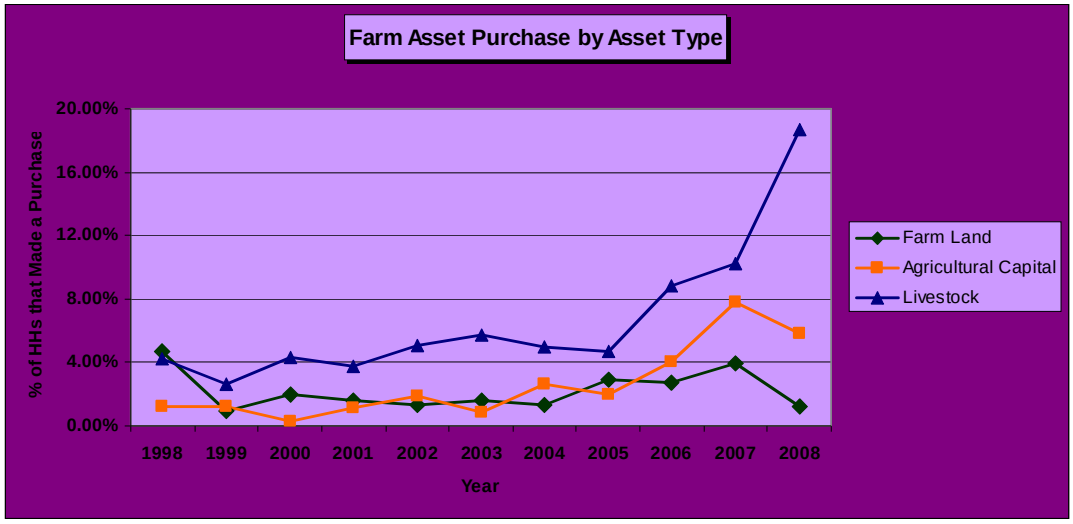

Table 5. LPM Regression on Farm Investments (Full Sample)

Farm Investment LPM Regression on Full Sample							
Explanatory Variable	Retrafect			Remittances	Had Migrant		Quasi IV
4 Years Before			-0.004				
3 Years Before		0.005	0.005				
2 Years Before		-0.016	-0.016				
1 Year Before	0.040	0.039	0.040				
Migration	0.038	0.038	0.038				
1 Year After	0.009	0.010	0.009				
2 Years After		0.011	0.011				
3 Years After		-0.001	-0.003				
4 Years After			-0.010				
Remittances				0.015			
Migrant					0.020		
US Migrant						0.131**	
Guate Migrant						0.004	
Xela Migrant						0.038	
Migrant (Tormenta)							0.087
HH Size	-0.000	-0.000	0.000	0.000	0.000	0.000	0.000
Gender Ratio	0.006	0.007	0.007	0.007	0.007	0.006	0.007
Education	-0.007*	-0.007*	-0.007*	-0.007*	-0.006*	-0.007**	-0.006*
Working Members	0.039***	0.039***	0.039***	0.040***	0.040***	0.040***	0.040***
Dependency Ratio	0.018	0.017	0.017	0.016	0.016	0.017	0.016
Wealth	0.014***	0.014***	0.014***	0.014***	0.014***	0.014***	0.014***
HH Shock	0.021	0.021	0.021	0.021	0.021	0.020	0.022
Bank Credit	0.006	0.006	0.006	0.006	0.006	0.008	0.006
Coop Credit	0.017	0.016	0.016	0.017	0.015	0.018	0.012
Constant	0.252***	0.250***	0.251***	0.248***	0.244***	0.244***	0.250***
Observations	4171	4171	4171	4171	4171	4171	4171
Households	410	410	410	410	410	410	410
R-Squared	0.1079	0.1080	0.1081	0.1075	0.1077	0.1141	0.1089
Difference of Lags to Leads	-0.031	-0.008	-0.018				
Wald's Test (p-value)	0.4906	0.9141	0.8753				

All estimates use robust standard errors

Asterisks denote significance (*10%, **5%, ***1%)

Sector and Year level fixed effects are used in all estimations

Table 6. LPM Regression on Farm Investments (Restricted NELM Sample)

Farm Investment LPM Regression on Restricted Sample							
Explanatory Variable	Retrafect			Remittances	Had Migrant		Quasi IV
4 Years Before			-0.030				
3 Years Before		-0.018	-0.023				
2 Years Before		-0.001	-0.005				
1 Year Before	0.030	0.028	0.025				
Migration	0.066	0.066	0.062				
1 Year After	-0.022	-0.021	-0.025				
2 Years After		0.026	0.021				
3 Years After		-0.002	-0.009				
4 Years After			-0.036				
Remittances				0.005			
Migrant					0.006		
US Migrant						0.212**	
Guate Migrant						-0.029	
Xela Migrant						0.030	
Migrant (Tormenta)							-0.018
HH Size	-0.002	-0.002	-0.001	-0.002	-0.002	-0.002	-0.002
Gender Ratio	0.016*	0.016*	0.016*	0.015	0.015	0.016*	0.015
Education	-0.003	-0.003	-0.003	-0.003	-0.002	-0.004	-0.003
Working Members	0.031**	0.031**	0.021**	0.031**	0.031**	0.030**	0.031**
Dependency Ratio	0.014	0.014	0.012	0.012	0.012	0.011	0.011
Wealth	0.018***	0.017***	0.018***	0.017***	0.017***	0.017***	0.018***
HH Shock	0.036	0.037	0.036	0.036	0.036	0.035	0.036
Constant	0.245***	0.243***	0.244***	0.247***	0.246***	0.243***	0.248***
Observations	2795	2795	2795	2795	2795	2795	2795
Households	294	294	294	294	294	294	294
R-Squared	0.1195	0.1197	0.1207	0.119	0.119	0.1328	0.119
Difference of Lags to Leads	-0.052	-0.006	-0.016				
Wald's Test (p-value)	0.3549	0.9501	0.9072				

All estimates use robust standard errors

Asterisks denote significance (*10%, **5%, ***1%)

Sector and Year level fixed effects are used in all estimations

Table 7. LPM RETRAFECT Regression on Farm Land Purchase

Land Purchase RETRAFECT LPM Regression						
Explanatory Variable	Full Sample			Restricted Sample		
4 Years Before			-0.009			-0.021***
3 Years Before		0.009	0.009		-0.003	-0.004
2 Years Before		0.003	0.004		0.007	0.007
1 Year Before	0.016	0.017	0.017	0.018	0.019	0.019
Migration	-0.028***	-0.027***	-0.030***	-0.028***	-0.028***	-0.028***
1 Year After	0.012	0.012	0.011	-0.025***	-0.026***	-0.027***
2 Years After		-0.004	-0.005		-0.029***	-0.030***
3 Years After		-0.011	-0.010		0.008	0.008
4 Years After			0.025			0.019
Constant	-0.016	-0.015	-0.016	-0.021	-0.020	-0.021
Observations	4171	4171	4171	2795	2795	2795
Households	410	410	410	294	294	294
R-Squared	0.0169	0.0171	0.0176	0.0252	0.0259	0.1081
Difference of Lags to Leads	-0.004	-0.032	-0.016	-0.043	-0.070	-0.017
Wald's Test (p-value)	0.8652	0.4695	0.9926	0.0809	0.1734	0.8753

All estimates use robust standard errors

Asterisks denote significance (*10%, **5%, ***1%)

Sector and Year level fixed effects are used in all estimations

The regressions include control variables which have been omitted from the table

Table 8. LPM Additional Specifications Regressions on Farm Land Purchase

Land Purchase LPM Regression						
Explanatory Variable	Full Sample			Restricted Sample		
Remittances	0.003			-0.002		
Migrant		-0.002			-0.009	
US Migrant			0.011			0.028
Guate Migrant			-0.007			-0.015*
Xela Migrant			0.002			-0.029***
Constant	-0.018	-0.017	-0.016	-0.024	-0.022	-0.020
Observations	4171	4171	4171	2795	2795	2795
Households	410	410	410	294	294	294
R-Squared	0.0153	0.0153	0.0156	0.0233	0.0237	0.0253

All estimates use robust standard errors

Asterisks denote significance (*10%, **5%, ***1%)

The regressions include control variables which have been omitted from the table

Sector and Year level fixed effects are used in all estimations

Table 9. LPM RETRAFECT Regression on Purchase of Agricultural Capital

Agricultural Capital Purchase RETRAFECT LPM Regression						
Explanatory Variable	Full Sample			Restricted Sample		
4 Years Before			0.000			-0.013
3 Years Before		0.004	0.004		0.001	-0.000
2 Years Before		0.001	0.001		0.007	0.006
1 Year Before	0.051**	0.052**	0.051**	0.027	0.026	0.025
Migration	0.025	0.025	0.025	0.041	0.043	0.042
1 Year After	0.019	0.019	0.019	0.023	0.024	0.023
2 Years After		0.000	0.000		0.026	0.024
3 Years After		-0.003	-0.003		-0.024	-0.025
4 Years After			-0.004			-0.005
Possess Land	0.020**	0.020**	0.020**	0.020**	0.020*	0.020**
Constant	0.004	0.004	0.004	0.006	0.007	0.006
Observations	4171	4171	4171	2795	2795	2795
Households	410	410	410	294	294	294
R-Squared	0.0475	0.0475	0.0475	0.0524	0.0530	0.0531
Difference of Lags to Leads	-0.032	-0.041	-0.044	-0.004	-0.008	-0.001
Wald's Test (p-value)	0.3543	0.4696	0.4955	0.9346	0.9134	0.9937

All estimates use robust standard errors

Asterisks denote significance (*10%, **5%, ***1%)

Sector and Year level fixed effects are used in all estimations

The regressions include control variables which have been omitted from the table

Table 10. LPM Additional Specifications Regressions on Purchase of Agricultural Capital

Agricultural Capital Purchase LPM Regression						
Explanatory Variable	Full Sample			Restricted Sample		
Remittances	0.010			-0.004		
Migrant		0.013			-0.002	
US Migrant			-0.007			0.003
Guate Migrant			-0.007			-0.035**
Xela Migrant			0.060*			0.048
Possess Land	0.020**	0.020**	0.020**	0.020**	0.020**	0.019*
Constant	0.001	-0.001	0.001	0.010	0.010	0.011
Observations	4171	4171	4171	2795	2795	2795
Households	410	410	410	294	294	294
R-Squared	0.0444	0.0445	0.0467	0.0505	0.0505	0.0535

All estimates use robust standard errors

Asterisks denote significance (*10%, **5%, ***1%)

The regressions include control variables which have been omitted from the table

Sector and Year level fixed effects are used in all estimations

Table 11. LPM RETRAFECT Regression on Livestock and Animal Purchase

Livestock Purchase RETRAFECT LPM Regression						
Explanatory Variable	Full Sample			Restricted Sample		
4 Years Before			0.013			-0.011
3 Years Before		-0.002	-0.001		-0.010	-0.015
2 Years Before		-0.015	-0.015		-0.025	-0.030
1 Year Before	0.019	0.017	0.017	0.035	0.031	0.027
Migration	0.049**	0.049**	0.050**	0.072*	0.070*	0.066*
1 Year After	-0.031	-0.030	-0.029	-0.032	-0.033	-0.036
2 Years After		0.015	0.016		0.009	0.005
3 Years After		0.008	0.007		-0.002	-0.011
4 Years After			-0.014			-0.069**
Possess Land	-0.000	0.000	0.000	0.022	0.022	0.022
Constant	0.286***	0.283***	0.284***	0.277***	0.274***	0.278***
Observations	4171	4171	4171	2795	2795	2795
Households	410	410	410	294	294	294
R-Squared	0.1126	0.1128	0.1129	0.1127	0.1136	0.1148
Difference of Lags to Leads	-0.050	-0.007	-0.034	-0.067	-0.022	-0.082
Wald's Test (p-value)	0.0922	0.901	0.6034	0.1122	0.8060	0.3696

All estimates use robust standard errors

Asterisks denote significance (*10%, **5%, ***1%)

Sector and Year level fixed effects are used in all estimations

The regressions include control variables which have been omitted from the table

Table 12. LPM Additional Specifications Regressions on Livestock and Animal Purchase

Livestock Purchase LPM Regression						
Explanatory Variable	Full Sample			Restricted Sample		
Remittances	0.007			0.015		
Migrant		0.006			0.011	
US Migrant			0.136**			0.155*
Guate Migrant			0.016			0.011
Xela Migrant			-0.011			0.004
Possess Land	-0.000	-0.000	-0.002	0.023	0.023	0.017
Constant	0.284***	0.284***	0.278	0.275***	0.275***	0.271***
Observations	4171	4171	4171	2795	2795	2795
Households	410	410	410	294	294	294
R-Squared	0.1112	0.1114	0.1196	0.1115	0.1121	0.1219

All estimates use robust standard errors

Asterisks denote significance (*10%, **5%, ***1%)

The regressions include control variables which have been omitted from the table

Sector and Year level fixed effects are used in all estimations

Figure 5. Migration Treatment Window on Farm Investment (Full Sample)

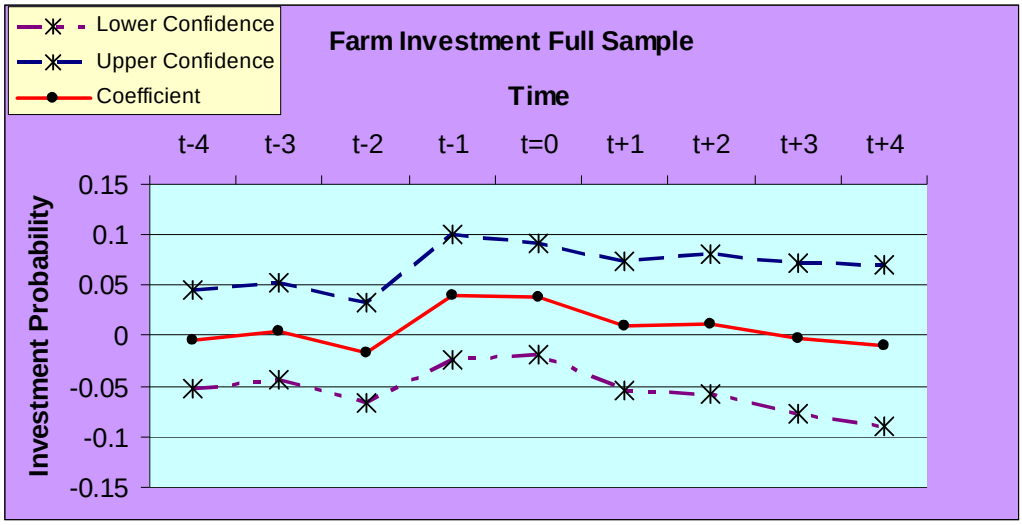

Figure 6. Migration Treatment Window on Farm Investment (Restricted Sample)

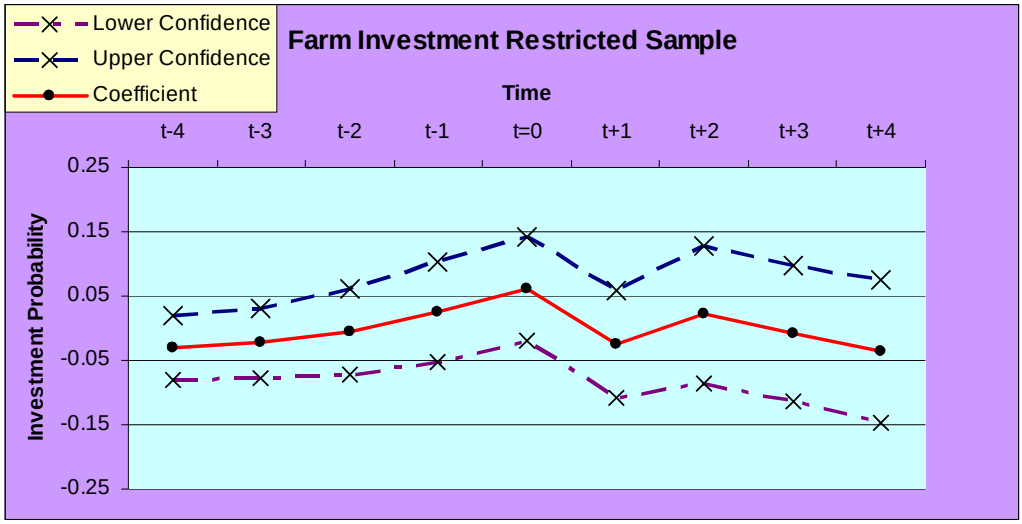

Figure 7. Migration Treatment Window on Farm Land Purchase (Full Sample)

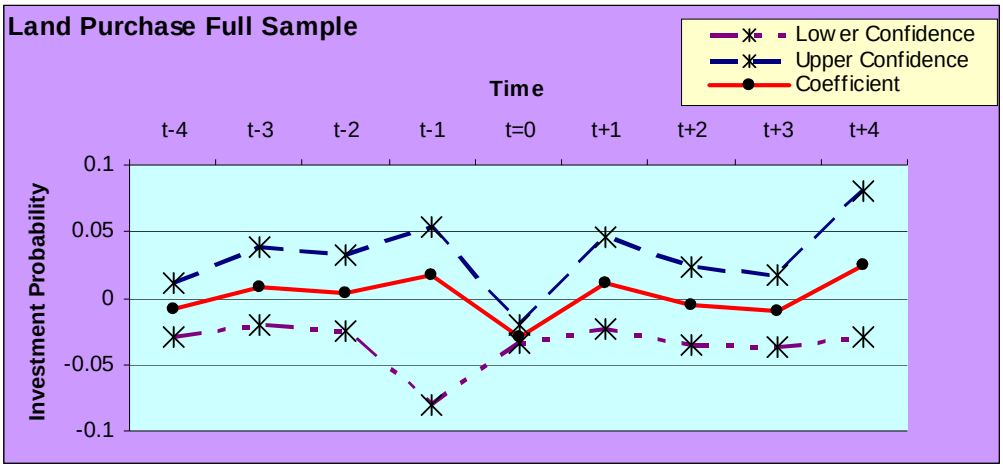

Figure 8. Migration Treatment Window on Farm Land Purchase (Restricted Sample)

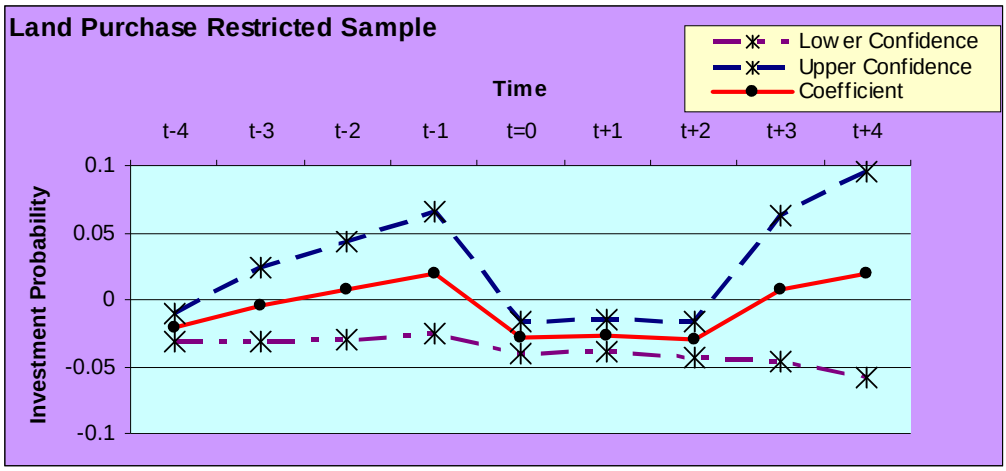

Figure 9. Migration Treatment Window on Purchase of Agricultural Capital (Full Sample)

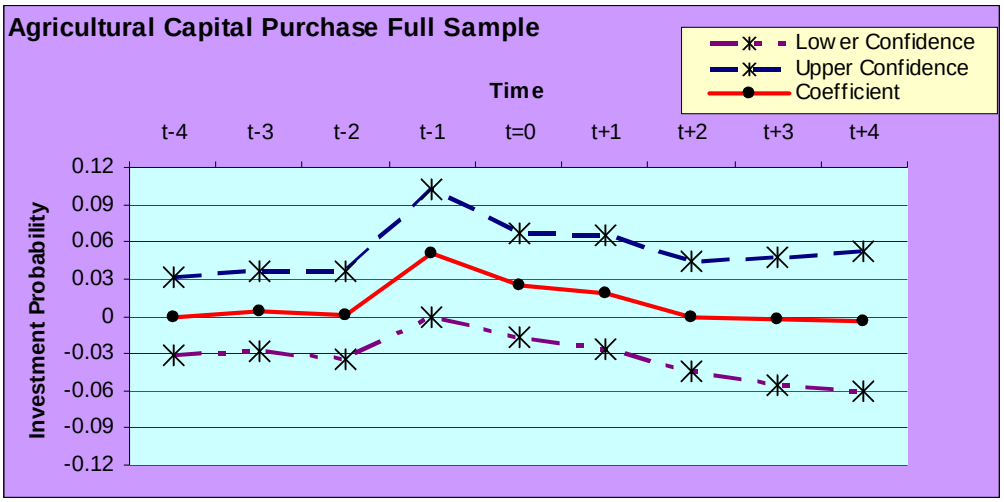

Figure 10. Migration Treatment Window on Purchase of Agricultural Capital (Restricted Sample)

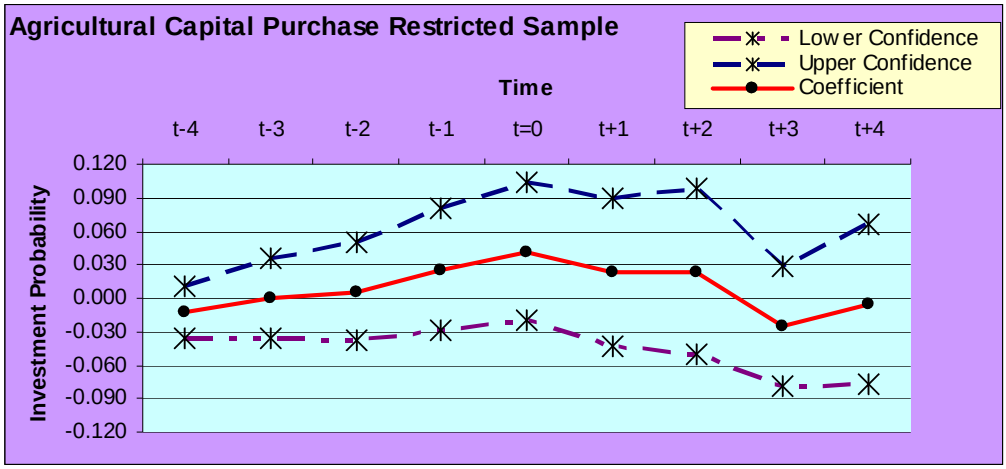

Figure 11. Migration Treatment Window on Livestock and Animal Purchase (Full Sample)

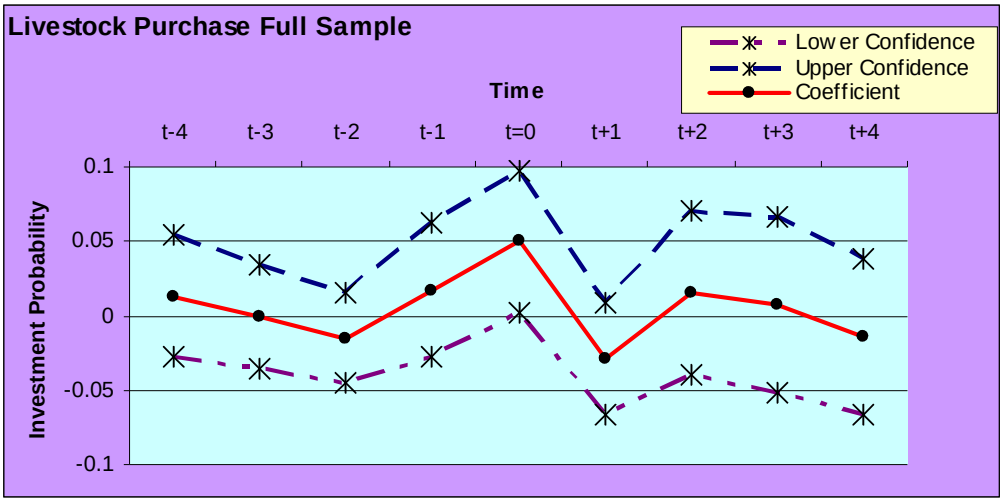

Figure 12. Migration Treatment Window on Livestock and Animal Purchase (Restricted Sample)

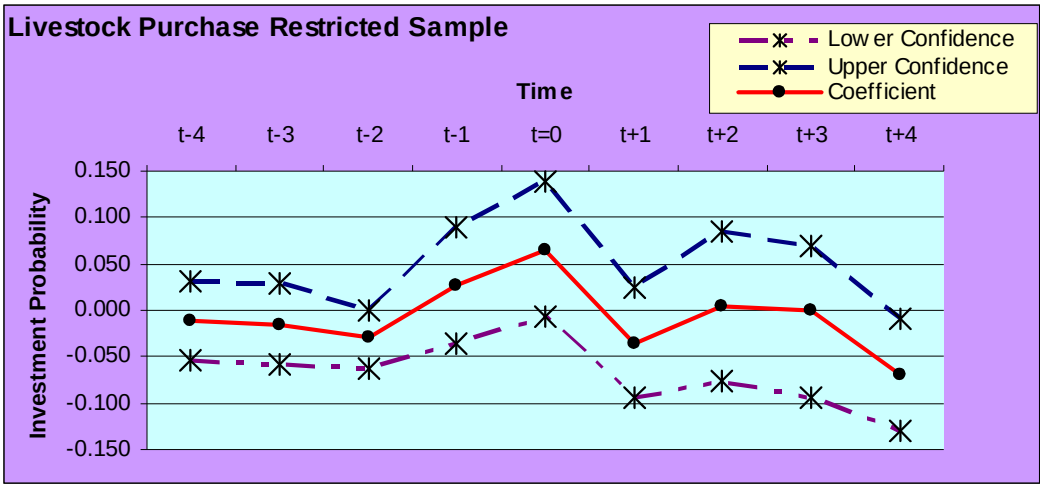

Figure 13. Migration Treatment Window on Lower Education Investment (Restricted Sample)

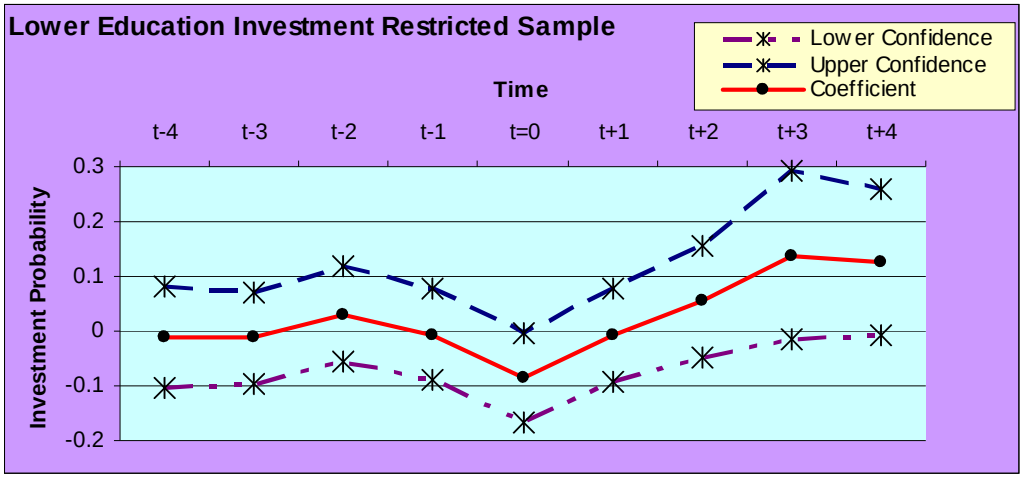

Table 13. LPM RETRAFECT Regression on Home Improvement

Home Improvement RETRAFECT LPM Regression						
Explanatory Variable	Full Sample			Restricted Sample		
4 Years Before			0.013			0.010
3 Years Before		0.003	0.004		0.022	0.022
2 Years Before		0.021	0.020		0.013	0.012
1 Year Before	-0.014	-0.014	-0.015	-0.008	-0.008	-0.009
Migration	0.030	0.029	0.029	0.042	0.037	0.037
1 Year After	0.041	0.040	0.041	0.057	0.056	0.057
2 Years After		0.016	0.016		0.026	0.027
3 Years After		0.008	0.008		0.090	0.090
4 Years After			-0.006			-0.030
Constant	0.098***	0.097***	0.100***	0.105***	0.099***	0.100***
Observations	4171	4171	4171	2795	2795	2795
Households	410	410	410	294	294	294
R-Squared	0.0191	0.0195	0.0195	0.0217	0.0242	0.0243
Difference of Lags to Leads	0.055	0.054	0.037	0.065	0.145	0.109
Wald's Test (p-value)	0.1168	0.3865	0.6185	0.1923	0.1405	0.3182

All estimates use robust standard errors

Asterisks denote significance (*10%, **5%, ***1%)

Sector and Year level fixed effects are used in all estimations

The regressions include control variables which have been omitted from the table

Table 14. LPM Additional Specifications Regressions on Home Improvement

Home Improvement LPM Regression								
Explanatory Variable	Full Sample				Restricted Sample			
Remittances	0.025*				0.023			
Migrant		0.020*				0.020		
US Migrant			0.038				0.026	
Guate Migrant			0.020				0.007	
Xela Migrant			0.041				0.089*	
*Tormenta*Migrant*				0.041				0.041
Constant	0.095***	0.096***	0.093***	0.102***	0.107***	0.107***	0.103***	0.110***
Observations	4171	4171	4171	4171	2795	2795	2795	2795
Households	410	410	410	410	294	294	294	294
R-Squared	0.0188	0.0187	0.0194	0.0182	0.0203	0.0205	0.0465	0.0335

All estimates use robust standard errors

Asterisks denote significance (*10%, **5%, ***1%)

The regressions include control variables which have been omitted from the table

Sector and Year level fixed effects are used in all estimations

Table 15. LPM RETRAFECT Regression on Lower Education Investments

Education Investment RETRAFECT LPM Regression						
Explanatory Variable	Full Sample			Restricted Sample		
4 Years Before			0.001			-0.010
3 Years Before		0.007	0.010		-0.016	-0.011
2 Years Before		0.067**	0.070**		0.027	0.031
1 Year Before	0.003	0.013	0.018	-0.016	-0.010	-0.006
Migration	-0.033	-0.026	-0.023	-0.092**	-0.088**	-0.084**
1 Year After	-0.001	0.007	0.010	-0.018	-0.010	-0.009
2 Years After		0.045	0.048		0.051	0.055
3 Years After		0.079*	0.088*		0.126*	0.138*
4 Years After			0.081*			0.127*
Constant	0.998***	0.990***	0.986***	0.997***	0.982***	0.975
Observations	4171	4171	4171	2795	2795	2795
Households	410	410	410	294	294	294
R-Squared	0.1649	0.1661	0.1664	0.1637	0.1650	0.1655
Difference of Lags to Leads	-0.004	0.107	0.128	-0.002	0.166	0.307
Wald's Test (p-value)	0.9225	0.6113	0.2077	0.9733	0.1911	0.0397

All estimates use robust standard errors

Asterisks denote significance (*10%, **5%, ***1%)

Sector and Year level fixed effects are used in all estimations

The regressions include control variables which have been omitted from the table

Table 16. LPM Additional Specifications Regressions on Lower Education Investments

Education Investment LPM Regression								
Explanatory Variable	Full Sample				Restricted Sample			
Remittances	0.028				0.019			
Migrant		0.058***				0.068**		
US Migrant			0.017				0.069	
Guate Migrant			0.094***				0.118***	
Xela Migrant			-0.099**				-0.054	
*Tormenta*Migrant*				-0.045				-0.083
Constant	0.982***	0.965***	0.973***	0.998***	0.984***	0.969***	0.969***	0.991***
Observations	4171	4171	4171	4171	2795	2795	2795	2795
Households	410	410	410	410	294	294	294	294
R-Squared	0.1648	0.1659	0.1667	0.1649	0.1632	0.165	0.1634	0.163

All estimates use robust standard errors

Asterisks denote significance (*10%, **5%, ***1%)

The regressions include control variables which have been omitted from the table

Sector and Year level fixed effects are used in all estimations