The effect of Mexico's Conditional Cash Transfer Program on Migration Decisions

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Honors Thesis submitted in partial fulfillment of the requirements for Graduation with Distinction in Economics in Trinity College of Duke University.

Duke University

Durham, North Carolina

2014

Acknowledgements

I would like to thank my advisor, Professor Charles Becker, for his patience, guidance, optimism, and support throughout this challenging process. I would also like to thank Professor Kent Kimbrough and Professor Michelle Connolly for their constructive feedback and comments on my presentations and drafts. Last but not least, I am very thankful for my peers in the Honors Thesis Seminars for their input and advice.

Abstract

The Mexican conditional cash transfer program, *Oportunidades*, is commonly overlooked for long-term evaluations. One understudied effect of this poverty-reduction program is the change in migration behavior caused by the cash transfers. Using data from the Mexican Family Life Survey, this study outlines the effects of the social net program on international migration of low-income households in Mexico. The results suggest that the program causes a positive increase in likelihood for international migration for program participants. Within participating households, individuals who are responsible for grant income tend to migrate less compared to the other members of the households. This research provides valuable insight into existing literature on migration of low-income households in relation to the availability of the conditional cash transfer program.

Introduction

Many developing countries often times suffer a troubling issue known as the intergenerational poverty trap. A poverty trap is a self-enforcing cycle and occurs when households in poverty continue to remain poor due to the lack of resources or opportunities that enable its citizens to escape. Recently, some developing countries implemented a conditional cash transfer program as a possible solution to eliminate the poverty trap for low-income households. A conditional cash transfer program is very simple in structure: eligible households receive a cash reward contingent on the households sending their children to school and attending health clinic sessions. By providing monetary incentives, this social net program motivates children to gain resources to accumulate human capital through education and health interventions in hopes that these children will be able to escape poverty. For example, in 2003, the Brazilian government successfully initiated the *Bolsa Familia* conditional cash transfer program that allowed program participants to receive a monthly stipend if families enrolled their children in school and younger children received a set of vaccinations (Paes-Sousa, Santos, & Miazaki, 2011). The popularity of the conditional cash transfer program has grown, and similar programs have sprouted across many developing Latin American countries including Chile, Colombia, Honduras, and Guatemala.

The effects of the conditional cash transfer on participating households are multi-dimensional and have been a field of interest for many economic research studies. Most studies have evaluated the short-term effects of the program, such as educational attainment and health outcomes of the children soon after the program's implementation, but little literature evaluate its long-term effects. One such understudied household characteristic is the program's effects on migration. The conditional cash transfer programs have the potential to target tremendously

large populations of poverty-stricken families who may already engage in migration. The interaction between migration and this social net program is understudied. To explain, the cash transfers alter the household budgets of low-income families: additional wealth may lower the cost of migration and allow family members to migrate easier. On the other hand, participation may discourage migration by incentivizing the family members to stay to meet the program's requirements. This study will add to the literature on migration studies by evaluating migration of individuals who participate in the conditional cash transfer program using data from Mexico, a country with both well-studied migration data and one of the oldest conditional cash transfer programs, *Oportunidades.*

Oportunidades **Background**

Formerly known as *Progresa, Oportunidades* began in 1997, and is one of the pilot conditional cash transfer programs (CCT) in the world. The program was first offered to rural communities and as the program became more widely accepted, the CCT program gradually expanded to urban communities, increasing the number of program beneficiaries. By 2007, the program reported that over five million families, or roughly 18% of the country's total population were benefiting from the cash transfer program (Fiszbein, Schady, & Ferreira, 2009). The program has been noted to be very successful, improving conditions for program beneficiaries. Previous research has shown that the program decreased child labor, and increased enrollment in schools (Skoufias, Parker, Behrman, & Pessino, 2001). Studies also have discovered that the CCT increased birth weight for infants, improving health outcomes (Barber & Gertler, 2008) and decreasing infant mortality (Barham, 2011). The success of the Mexican CCT program inspired other Latin American CCT's to adopt its program design in launching their respective programs.

The program is crafted to stimulate human capital accumulation through education and improving health of children of participating households through requirements imposed on children's school attendance, family's health clinic attendance, and nutrition session attendance for mothers with young children. The program requires participation from all of the household members. First, an eligible household must send all of its children to local schools in order to meet the education attendance requirement. The World Bank reports that the benchmark attendance rate for an individual child is roughly around 80% monthly and 93% annually for all schools, and the education requirement applies until the children graduate from high school (The World Bank Group)[1]. Also, the entire family must attend a required number of medical checkups at the local clinic every year and if a household member is older than 15, the household member must attend an additional health and nutritional lecture. Finally, for pregnant mothers and young children between the ages of four months and four years, the program will give out nutritional supplements and food grants.

Oportunidades **Eligibility**

The program selection was based on the set of criteria chosen to identify families with the most severe poverty trap. First, the program isolated cities or towns by constructing a marginality index to identify those with the highest poverty rates (Skoufias, Davis, & de la Vega, 2001). The marginality index was constructed through using data from the 1990 Mexican census on population and housing (ENCASH) and 1995 population and housing count conducted by the Mexican national statistics institute (INEGI). Cities or towns that met the target poverty rates were included in the program based on size and availability of facilities and access to services.

[1] This information is as of 2007.

Next, each city or town identified poor households by comparing household income per capita against an average household's income.

In the initial analysis conducted in 1997, the program randomized 505 rural communities with 24,077 households to test the program's efficiency (Skoufias, Davis, & de la Vega, 2001). In 1998, the program assigned 320 cities as treatment and 185 cities as control (Behrman & Todd, 1999) . Each treatment group contacted all eligible, poor households and offered the program while all control groups were left alone. By randomizing at the city level, the study controlled for possible household spillover effects within the same city. After an extensive evaluation of the program, the Mexican government expanded the CCT to cover more households, including those in urban communities beginning in 2000.

If the family is determined to be eligible, the program notifies the family, and the family registers all of its members to the program (Skoufias, Davis, & de la Vega, 2001). The program is a community-wide effort in which local health clinics and schools are assigned to the family, and local officials record the appropriate attendance measures for the household. The information is verified bimonthly, and once the family meets the necessary requirements, an appropriate grant is sent to a payment center. In order to access the grant money, mothers or caretakers of the households are required to register with the payment center, and they are the only ones who can access the money. Access is granted to women to encourage empowerment of women in these households.

Oportunidades Grant Details

Table 1: Cash Grant Summary for *Oportunidades* in 2013 Mexican Pesos

Grade	Monetary Benefits per child[2]
Primary	$165 -330/ mo., $410/year for supplies
Secondary	$485- 620/ mo., $415/year for supplies
Middle/Higher	$810- 1055/mo., $415/year for supplies
Nutrition	$115- 345/ household
Graduation	$4,599- 5,956/ child (for all children)

Table 1 above provides a brief summary of what each household is expected to receive for the most recent year, 2013. If school attendance is met by all of the children and they successfully graduate, the household is awarded a graduation grant for each child. The compliance for the program is very high, and according to the World Bank Group, 98% of beneficiary families receive benefits from the program ("Support to Oportunidades Project," 2013).

[2] *Source: Oportunidades.gob.mx*

Figure 1: Summary of trends of different cash grants amounts per household per month, in 2010 Mexican real Pesos

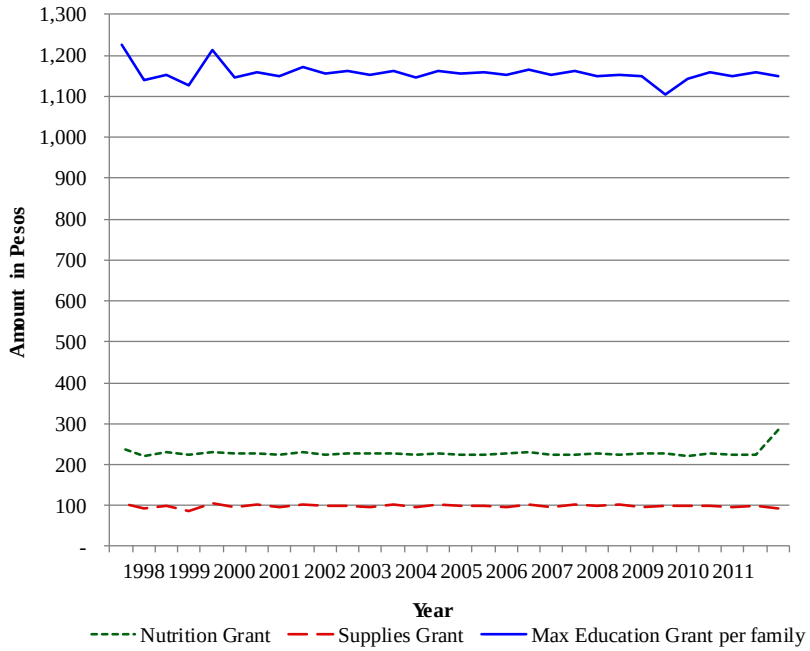


Figure 2a: Trends in Secondary Education Cash Grants per child per month, in 2010 Mexican real pesos

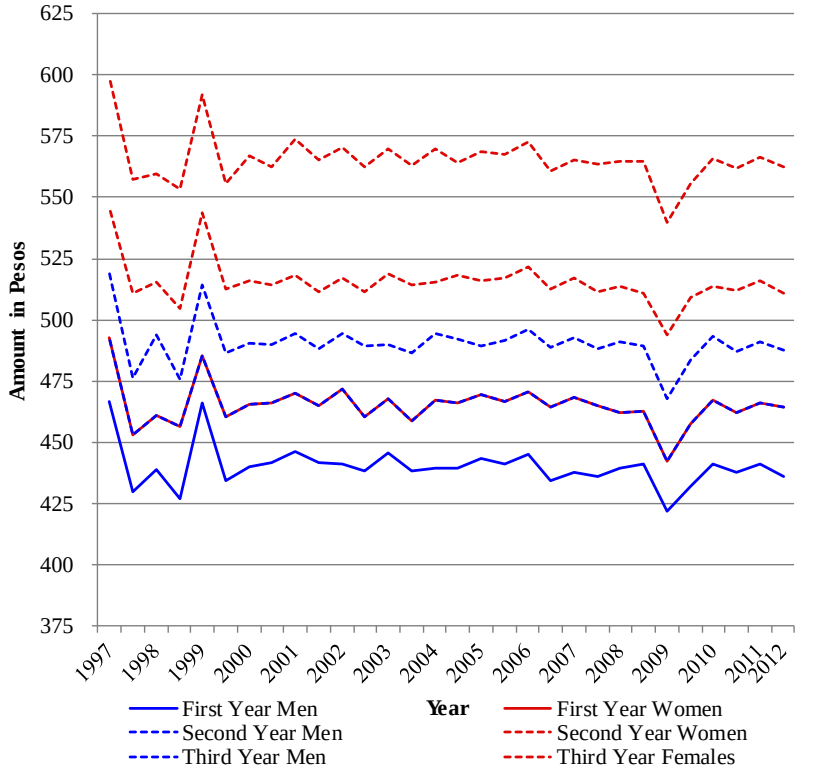
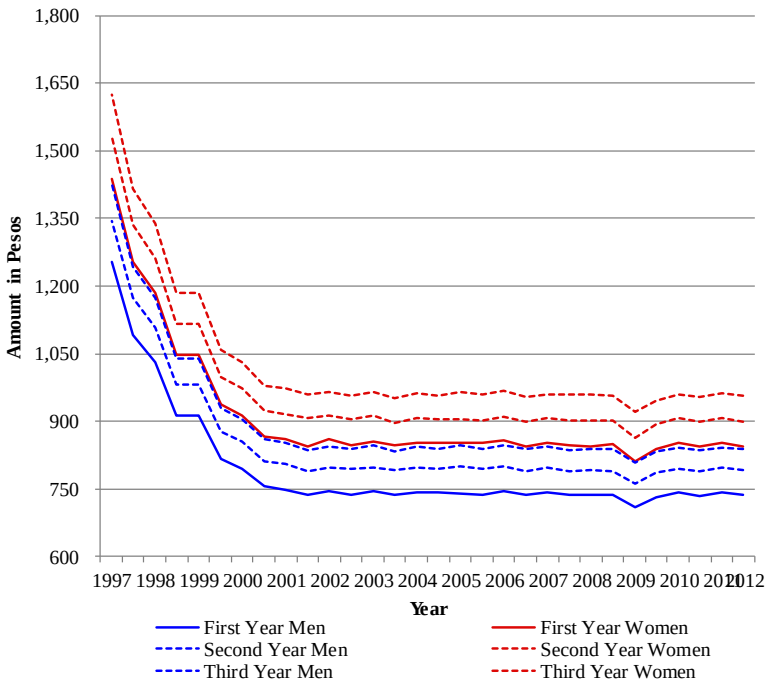


Figure 2b: Trends in Higher Education Cash Grants per child per month, in 2010 Mexican real pesos



The above three figures represent the general trends seen in the cash grants per household per month from the program. The data source is from oportunidades.gob.mx, the official government reporting of the CCT. The cash grants received from a child in primary school is not pictured above. Figure 1 illustrates the division of the monthly disbursement amount in Mexican pesos for an eligible household in the program. The nutrition support grant is for pregnant and young children who meet the eligibility for the households. The supplies grant shown in Figure 1 is a cash grant for school supplies given out annually to a child studying in secondary and higher education schools. The maximum education grant is the maximum amount that the family with a child studying in either primary or secondary school can receive in a month. Looking at the figure, the education grant is the largest source of grant income.

Figures 2a and 2b further decomposes the possible education grant for each eligible child sorted by year of study, school, and gender. Across both secondary and higher education levels, female students always receive more than compared to their respective male counterparts. This differential in disbursements represents the program's intention to reward families who educates girls, who are usually under-represented in the schooling system. The value of the grant increases as the level of schooling increases as well. The possible higher education grants that a child can receive seem to have decreased over the years while secondary education grants seem stable. This difference in this trend has not been noted in any of the program's analyses.

Given the program's grant composition, the grant income may differ depending on the characteristics of the children and other household members. The range of the monetary value of the cash grants vary, and can have different proportions compared to the household income. This study will hypothesize that this impact on the household's monthly budget is substantial enough to change household behavior and would like to incorporate the grant income into the analyses.

Migration Theories and Literature Review

The characteristics of the *Oportunidades* program and migration theories can be combined to infer the migration behaviors of household members who are program recipients. Not many studies have evaluated the program recipients' migration patterns, but there exist many theories and research that have studied low-income households, similar to the program's recipients. It is important to understand the underlying motivation for migration of low-income households to infer on how the program may alter the existing motivators for such individuals. This following section briefly summarizes migration findings for households that closely resemble what the *Oportunidades* targets.

The literature and theories behind migration decisions can be broadly divided into the neoclassical theory, new economics of labor migration theory, and social network theory (Lindstrom & Lauster, 2001). To begin, neoclassical scholars believe that the household and individual migration decisions occur based on the incentive to maximize individual or household utilities. Among the neoclassical migration theories, Harris and Todaro's migration theory states that an individual's migration decision is influenced by the wage differential represented in rural or urban districts or between two different locations (Harris & Todaro, 1970). If a labor opportunity in another region outside of the individual's current position is more attractive, and if the gains from migration outweigh the costs incurred, the individual is more likely to migrate. Similarly, Sajaastad's model for costs and returns on human migration articulates that an individual migrates if returns from the new work opportunity are significantly greater than the costs incurred due to relocation, then the individual is more likely to migrate (Sjaastad, 1962). More recently, however, Stiglitz has updated this approach adding that the differences in wage between rural and urban labor is explained by the premium on labor skills and turnover in the urban sector (Stiglitz, 1974). His theory suggests that the simple wage differential is not the only driving determinant for individual migration.

Next, new economics of labor migration theory shows a different perspective. In this theory, an individual's migration is heavily influenced by the household's utility optimization. In this approach, the migrant moves to work in order to send a part of the earnings in remittances back to the rest of the household (Stark & Lucas, 1988). Stark's migration model applies primarily to agricultural households with less access to credit. Such household can alleviate the credit constraint through sending one of its members to earn money. These earnings are used to help the household meet current consumption needs that include food, basic health services,

consumer goods, and housing needs (Conway & Cohen, 1998). The additional income can act as insurance and allow the household to make additional investments elsewhere such as that in agricultural production.

Another migration theory that has gained momentum is social network theory. The social network theory outlines the idea that people are more likely to migrate if they have a working kinship network at the intended location of migration (Taylor, 1986). For risk-averse households, sending a household member to migrate is a very risky decision. If the household knows someone such as a relative at the intended location of migration, the theory suggests that the household member will be more likely to migrate. By having a connection, the household can gain valuable information that may decrease risk and uncertainty. The theory also indicates that the role of networks is especially strong for international migration for households in developing countries.

The overall migration literature is extensive. Aside from the theories noted earlier, crime and violence may be strong indicators for predicting migration of individuals in Mexico. An increase in migration was seen with higher reported violent incidences of homicide and guerilla attacks (Grun, 2009). Migration and labor market participation is closely linked and high levels of violence can decrease participation in labor market for self-employed men and single women (Velásquez, 2014). Velásquez's research shows that high rates of homicide increases the possibility of victimization through extortion and theft added to the cost of participating in the labor market, motivating these individuals to migrate.

Numerous studies have explored the application of these migration theories to households in developing countries. Many literature sources suggest that low-income households decide to migrate for better wages or work opportunities or location specific characteristics (Dostie &

Léger, 2009). These migrant workers are commonly influenced by work opportunities that may allow them to sustain their families' current consumptions (Conway & Cohen, 1998). An individual migrates not only to improve the absolute household income but also the relative standing of the household's income compared to other similar households in the same community (Stark & Taylor, 1991). Low-income households are more likely to engage in international migration than compared to high-income households in the same community. Related, less educated individuals migrate internationally to the US while more educated individuals tend to stay within Mexico. Stark and Taylor conducted this study prior to the induction of the *Oportunidades* program, but can provide information that may be useful in analyzing participating households. Another study by Lindstrom and Lauster evaluates the application of all of the migration theories to a Mexican community and determines the likelihoods of internal migration and US migration(Lindstrom & Lauster, 2001). The model's outcomes follow that of predicted values and directions stated in the neoclassical, new economics, and social network theory of migration. This study would like to evaluate the validity of these migration theories with the effects due to *Oportunidades*.

One study has specifically looked into migration of *Oportunidades* grant recipients in the program's early years. Stecklov et al.'s study evaluates migration between program participants and non-program participants of similar background (Stecklov, Winters, Stampini, & Davis, 2005). Families perceived the cash grant to be an additional opportunity cost that the family would need to give up for migration. On the other hand, the grant income may decrease the actual cost to migrate. The study uses a difference-in-difference approach to measure the net effect of the treatment on two types of migration: domestic migration and international migration to the US. Stecklov et al's study concludes that the grant increased international migration for

middle-aged women and increased domestic migration for people from large families. The evaluation was conducted soon after the introduction of the program, and the possible long-term participation may not be accounted for. This study would like to articulate and identify certain members of the household and their different migration under the CCT program.

Comparing the existing literature on migration theories and the characteristics of the conditional cash transfer program, the theoretical effects from the *Oportunidades* program can be inferred. I would like to test two hypotheses about the grant's impact on migration. First, I would like to determine the net effect of program participation on migration compared to households without the grant. Second, within participating households, I would like to evaluate the likelihood of migration amongst different types of members.

The direct grant receivers are children, mothers, or primary care givers who need to be present to participate in the program. From a cost-benefit approach, if the direct grant recipients were to migrate, the household faces a risk of losing the grant income, adding to the cost of migration for these members. This will also make it less likely for these individuals to migrate. On the other hand, the grant income from *Oportunidades* may help household members who are not direct grant receivers thinking of migrating to help decrease the costs associated with migration. Specifically, the household members such as older graduated children or other adults may move easily as explained in new economics of migration models. The program also mandates that all household adults need to attend a yearly health clinic appointment in order to meet the attendance requirement for the grant. This requirement may dissuade household members from moving far; thus, may be dissuaded to migrate far in risk of losing the grant. Overall, the theoretical predictions indicate that the grant may facilitate or deter migration in participating households depending on the type of individual.

Data

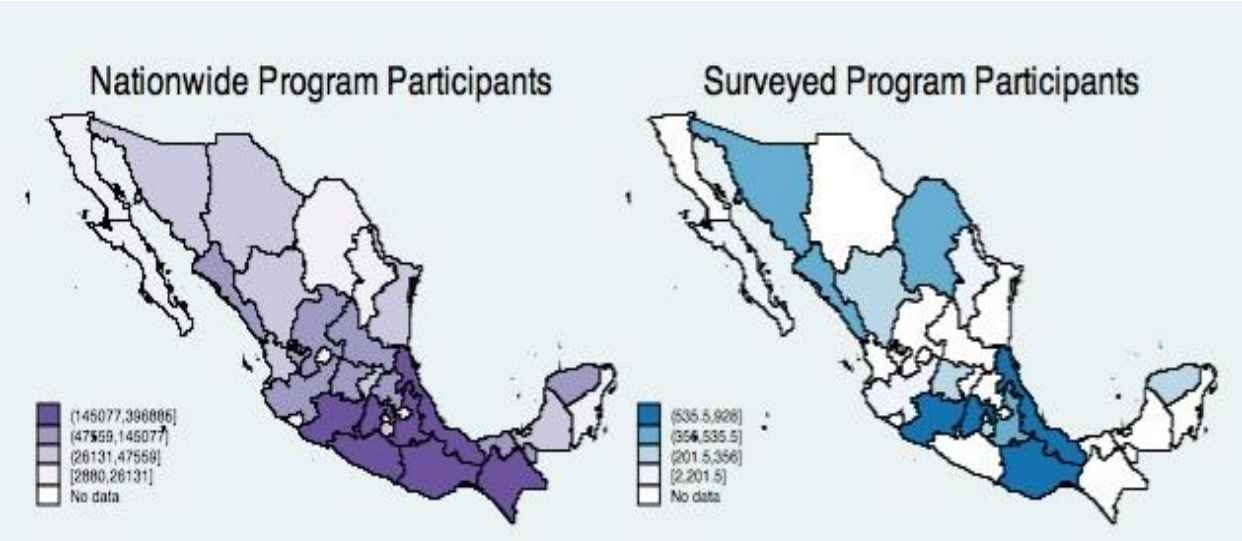
This research will use the dataset from the Mexican Family Life Survey (MxFLS) conducted by the Institute of Geography Statistics and Information (INEGI). The survey is a nationally representative, longitudinal database with approximately 8,440 households and 35,000 individuals. The MxFLS conducted the first wave in 2002 and resurveyed the same sample for the second wave in 2005. The households sampled in the survey were randomized and based on pre-selected demographic variables to create a nationally representative sample. According to the survey codebook, the sampling framework for the survey subjects follow that of the 2002 Mexican National Employment Survey (Rubalcava & Teruel, 2006).

The MxFLS dataset was chosen because the surveys were originally aimed to track households and individuals through a 10-year span through collecting data from three different levels: community or region, household, and individual. The topics covered are very broad and include socioeconomic indicators, income levels, education, migration, household assets and much more. International migration incidences from Mexico and US are reported for individuals who were present in the study at 2002 but had migrated when resurveyed in 2005. The study will use the 2002 wave of this household survey to draw information about the international migrants before their migration.

Most importantly, the dataset identifies households and individuals who are recipients of the grant from the *Oportunidades* program, and reports the average annual income received from the program. The data were collected four to five years after the start of the program, and can represent the long-term exposure to the program. In the 2002 wave, a total of 1,117 households stated they receive the grant from the program with a total of 6,235 individuals belonging to these households.

The following figure represents the geographical distribution of the grant-receiving households by states compared to the 2001 national grant disbursements released by the *Oportunidades* program. At glance, the MxFLS survey seems to contain program participants at a similar pattern of distribution as represented in the nationwide distribution. The MxFLS survey also does not collect data from every state in Mexico: the data only include information from 16 out of the 32 states in Mexico. Both the nationwide program participants' distribution and surveyed program participants' distribution show a high density of grant-receiving households in the southern states[3]. This distribution is similar to that of the national distribution of households in poverty, which suggests that the survey does reflect the trends in the program. The models will try to control for differences in regional distribution by adding state dummies.

Figure 3: Comparison of Nationwide and Surveyed Program Participants Distributions



Next, the characteristics of the individual grant-receivers were analyzed to check if the program design is effective in achieving its stated goals. The dataset contains two different types

[3] National disbursement data taken from *oportunidades..gob.mx* for September to October 2001

of responses on grant participation and income: the household head's responses on behalf of the household and responses from individual family members' responses. The data contained discrepancies across household-level responses and individual-level responses for each household. In some occasions, individuals in a household would report participation in *Oportunidades* but the household-level data denied particiaption. This could suggest that the responders for the household level data are not always aware of all of the household's income sources or individuals who responded as program participants could hide that information from the household head. For these reasons, this study will label households as participants if the household head replied indicated participation, and if household head replied no participation but an individual of that household had indicated participation. Of the 946 individuals who are program participants, 119 individuals belong to households who on the household level data indicated were not program participants.

To properly find the annual grant income, the responses of the family members were analyzed to verify whether the reported grant income was aligned with the program's intentions. Only adults over the age of 15 were allowed to report participation and grant income from the program. This group included 778 women and 168 men who reported that they earned the grant income. Men reporting the income is puzzling, since the program gave women access to program funding. The men were further evaluated, and 114 indicated that they were sons in the family, whereas among women, 175 indicated that they were daughters in the household. Since all individuals over the age of 15 reported in this survey, students who had attended school at the time of the survey and had participated in the program are indicating that they had earned the grant income. To eliminate confusion the household head's response on grant income will be used as the total annual income the household received from *Oportunidades*.

As for the dataset on migration, the MxFLS survey contains a separate set of responses for individuals who have migrated to the US between the 2002 wave and 2005 wave. These individuals were surveyed in 2002 but during the survey in 2005, had migrated to the US. Between 2002 and 2005, 854 people out of the roughly 35,000 individuals migrated internationally, roughly 2.4% of the sample (Appendix A).

Empirical Specification

This study's main interest is to evaluate the possible effects that the *Oportunidades* program may have on the migration decisions of household participants. In migration literature, the model that most adequately captures this outcome is the logit model. The decision on whether or not to migrate is binary, and this model captures the effect of certain characteristics on the migration likelihood for the individual. This study will adopt a similar model approach in order to measure the program's effect on an individual's migration.

This model's outcome will be whether or not the individual migrated to the US sometime between 2002 and 2005, given the characteristics reported about the individual in 2002. The independent variables are from 2002 to avoid possible reverse causality. The following model represents the migration outcome against the characteristics:

$$(1) \quad Logit(M_{ij}) = \alpha + \sum_{k=1}^{n} \beta_{ijk} X_{ijk} + \sum_{k=1}^{m} \gamma_{jk}\, \theta_{jk} + hhGrant_j + \sum_{k=1}^{16} \varphi_k\, S_k + \varepsilon_{ij}$$

The outcome of this model is binary indicator with value of 1 for migration to the US for individual *i* from household *j*. Individual-level characteristics (*X*) are include age, age-squared, gender and last completed education level. The dataset does not report the number of years in school and will instead use education levels, sorted into three binary variables of the following categories: no education, secondary and high school completion. Primary schooling is omitted to

prevent multicollinearity. The household characteristics (θ) in this model include whether or not the household knows a relative in the US (*relatives*), whether or not the household is agricultural (*hhAgr),* number of adults in the household (*hhAdults*), crime, and indigenous origin. Crime is measured through two binary variables, *Gangs* and *Drugs.* These variables indicate whether or not the household had known of gang or drug violence in its neighborhood. *Indigenous* is a binary indicator for whether or not the individual belongs to an indigenous group. The treatment variable, household grant participation (*hhGrant*) is a binary variable indicating whether or not the individual belonged to a household that received the *Oportunidades* grant at the time of survey. In order to control for distance and regional characteristics, the model includes state dummies (*S*) for all 16 states in the sample. ε_{ij} is the error reported in the model. In addition, the model will cluster standard errors by municipality in order to correct for correlation of standard errors within each municipality.

The predictions of the coefficients on the variables reflect that of previous theories and literature. For example, *Age* and Age^2 will determine the relationship between age of individuals to be linear or quadratic. Individuals with less education may be more inclined to migrate to the US for work than those with higher education who have a tendency to seek work within Mexico (Stark & Taylor, 1991). Relatives in the US is a proxy for US migration networks as explained in social network migration theory, and the coefficient for this indicator is likely to be positive, suggesting that individuals that have this connection will be more likely to migrate (Taylor, 1986). Rural and agricultural households see more migration incidences; thus, *hhAgr* is likely to be positive (Stark & Lucas, 1988). Number of adults is included to test if more adults in the household may make it easier for others to leave. Crime measures, *Gangs* and *Drugs*, will

measure the relationship between these two types of violence against migration. *Indigenous* is included to observe if ethnical background will alter migration.

The prediction on household participant binary indicator, *hhGrant*, may be ambiguous. This variable compares the difference in likelihood of migrating between individuals from grant receiving households against the rest of the population. Each grant-receiving household is composed of two types of individuals: direct grant receivers, individuals required to stay to receive the grant, and non-direct grant receivers, all other household members. The coefficient on *hhGrant* signifies the net effect of the grant for participating households on migration compared to the rest of the population. Thus, the effect of the grant may differ depending on the composition of these types of individuals within grant-receiving households.

The above model accounted for all of the individuals in the 2002 MxFLS dataset. To further analyze individuals who have migrated to the US, a second model experiments with another treatment variable. This model tests the hypothesis that there is a difference in migration amongst members of participating households. The second logit model tries to capture this effect by adding a binary variable, *indvGrant*. The *indvGrant* variable is a binary variable coded as 1 for being a direct grant receiver and 0 for a non-grant receiver. Some modifications were made in assigning values for this variable, based on the survey results. First, if the individual had indicated in the individual survey that he or she had earned grant income, the binary indicator was labeled as 1. These individuals included older children and mothers who were part of the participating household. Also, to correct for misreporting, all mothers and female spouses of the household head were labeled as grant recipients. In addition, all children who were part of a participating household in school were coded as 1. All other individuals in participating

households were coded as 0. The following model below compares migration between direct grant receivers and non-direct receivers in participating households.

$$(2) \quad Logit(M_{ij}) = \alpha + \sum_{k=1}^{n} \beta_{ijk} X_{ijk} + \sum_{k=1}^{m} \gamma_{jk}\, \theta_{jk} + indvGrant_j + \sum_{k=1}^{16} \varphi_k\, S_k + \varepsilon_{ij}$$

The estimated coefficients for all of the variables except for the treatment variable should be the same as predicted in the previous model. For the *indvGrant* variable, the coefficient on this variable should be negative, based on the hypothesis that the opportunity cost of the grant-receiving individuals would be high and deter these individuals from migrating to the US.

Results

Table 2 presents the results of the analyses of program participation and Mexico to US Migration. Model 1, Model 2, and Model 3 are analyses with all individuals in the dataset, and Model 4 is an analysis with only adults between the ages of 15 to 29. All models have adjusted standard errors by clustering at the municipality level to control for within municipality correlation of standard errors. In addition, each model includes state level dummy variables to control primarily for distance to the US and also for other state specific characteristics.

Table 2: Logit Models with *hhGrant* on US Migration

	Outcome: Migration to US	Models			
	Independent variables	(1)	(2)	(3)	(4)
					15 to 29 year olds
Individual	Age	-0.0675***	-0.0661**	-0.0674**	0.377*
		(0.0224)	(0.0280)	(0.0281)	(0.203)
	Age^2	9.66e-05	0.000140	0.000162	-0.0101**
		(0.000334)	(0.000414)	(0.000412)	(0.00486)
	Gender (male=1)	0.677***	0.647***	0.631***	0.773***
		(0.105)	(0.126)	(0.126)	(0.143)
	No Education	-0.164	-0.173	-0.257	-0.0307
		(0.346)	(0.373)	(0.360)	(0.543)
	Secondary Education	0.0700	0.157	0.152	0.138
		(0.114)	(0.123)	(0.125)	(0.156)
	High School Education	-0.159	-0.233	-0.233	-0.241
		(0.165)	(0.177)	(0.177)	(0.213)
Household	Relatives	1.063***	1.142***	1.153***	1.165***
		(0.143)	(0.148)	(0.147)	(0.166)
	hhAgr	0.404**	0.410**	0.403**	0.451**
		(0.159)	(0.171)	(0.172)	(0.178)
	hhAdults	0.0119	0.0390	0.0369	0.0141
		(0.0369)	(0.0421)	(0.0424)	(0.0436)
	Gangs	-0.0156	-0.0165	-0.0138	-0.106
		(0.0656)	(0.0693)	(0.0688)	(0.0716)
	Drugs	0.0255	0.0467	0.0487	0.121*
		(0.0614)	(0.0656)	(0.0639)	(0.0644)
	Indigenous	0.0926	0.121	0.101	0.248
		(0.224)	(0.221)	(0.236)	(0.248)
Treatment	log(hhIncome)	-	-0.322**	-0.309**	-0.147
		-	(0.141)	(0.143)	(0.127)
	$(log(hhIncome))^2$	-	0.0131***	0.0127***	0.00540
		-	(0.00441)	(0.00451)	(0.00414)
	hhGrant	0.340**	0.354*	-	-
		(0.155)	(0.194)	-	-
	hhGrantIncome	-	-	0.000300**	0.000286**
		-	-	(0.000144)	(0.000140)
	$hhGrantIncome^2$	-	-	-3.62e-08*	-3.37e-08*
		-	-	(2.02e-08)	(1.98e-08)
	Constant	-5.52	-16.00***	-16.06***	-21.98***
		(0.659)	(1.178)	(1.186)	(2.431)
	State Dummies	Yes	Yes	Yes	Yes
	No. Obs.	19,307	15,754	15,628	5,950
	Chi-squared	1048	-	-	-
	Pseudo-R^2	0.169	0.175	0.176	0.142

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

To begin, the covariates in the first three models are consistent in direction and magnitude. As the age increases, an individual is less likely to migrate, and men are significantly more likely to migrate than compared to women. Although the education variables do not have statistical significance, the models indicate the general trend that less educated individuals migrate to the US. Dissecting further, the analyses indicate that an individual is more likely to migrate with at least secondary education completed than with no education at all. People with higher education, as indicated by high school completion, are deterred from moving to the US.

Interaction terms between age and gender as well as gender and education were included for further evaluation (Appendix B). This model suggests that older men are less likely to migrate compared to other the rest of the population. Concerning gender and education, individuals with no education are statistically less likely to migrate than with some education, but men with no education are more likely to migrate than the rest of the population. On the other hand, men with high school completion are also less likely to migrate. Household participation in the program sees a greater effect for men as well. To capture the variation of the effect of the household grant participation on different regions, a separate model was created with interaction variables between the treatment and each region (Appendix C). The regions with significantly higher likelihood of migration with grant participation are Durango, Guanajuato, Michoacan and Morelos. Durango shows a strong positive prediction with *hhGrant* perhaps due to being close to the border. Also, these states have the highest poverty rates in the nation that may explain partially the difference in grant impact.

Table 2 evaluates the effect of household participation with adding household-level characteristics for further interpretation of the data. First, having a relative in the US is highly

significant and the strongest predictor for migration, supporting the social network theory. Having a relative in the US may be capturing unobserved exchange of information between the individual and relative that may reduce risk, easing migration. This could be verified if the location of the relative's residence and the individual's migration destination were evident; however, the dataset does not provide this information in detail. Next, the models suggest that individuals from agricultural households or rural surroundings are significantly more likely to migrate, following the findings closely from Stark's studies evaluating credit constrained agricultural households. Individuals from an indigenous group also are more likely to migrate, but lacks statistical significance. Finally, individuals from households who report violence through presence of gangs and drugs have mixed results. The presence of gangs seems to decrease migration while drugs seem to increase the likelihood of migration, contradicting previous literature conclusions that violence induces migration. This conclusion should be taken with disclaimer since both indicators lack statistical significance.

The results on program participation are consistent between Model 1 and Model 2. An individual from a participating household is significantly more likely to migrate than compared to an individual from a non-participating household. Model 2 includes self-reported household income as an additional control. This variable was constructed through adding all individual self-reported annual income for each family, with top and bottom 1% trimmed to remove outliers and adjust for self-reporting errors. Model 2 uses the log transformation of household income and its squared value to test for a quadratic relationship between household income and migration. The Wald test for fit reveals a chi-squared value of 29.75 and has a p-value of close to 0, supporting that the household income variables are statistically significant additions to

Model 1 (Appendix D) . Due to the log transformation, households who reported no annual household income were dropped from the model.

Model 2 reveals that the relationship between migration and household income is indeed quadratic and parabolic: as household income increases, the likelihood of migration decreases with income until after passing a certain income level, the likelihood of migration increases. After controlling for household income, belonging to a participating household still increases the likelihood of migration.

Model 3 analyzes the effects on migration with differing values of household grant income. The household grant income is the total annual grant income that the household heads of participating households reported to have received from *Oportunidades.* Individuals not participating in the grant were coded as receiving no grant income. Similar to household income, this variable was trimmed to remove outliers of the top and bottom 1% to adjust for self-reporting errors. Both the grant income and its squared value are significant, suggesting that as household grant increases, the migration likelihood increases until hitting a local maximum. After a certain level of grant income, the migration likelihood decreases with increasing grant income. Using the coefficients from the model, the inflection point is determined to be at 8,287 Mexican pesos. Compared to the average grant income for participating households, this value is above one standard deviation of the mean (Appendix E). This suggests that as the household receives more grant income, the individual is likely to migrate until 8,287 Mexican pesos, where an additional peso will have diminishing effects and will deter the individual from migrating.

To test migration for adults only, Model 4 isolated the sample to individuals between ages 15 to 29. This population was isolated to remove younger children or older adults who are less likely to migrate from the analysis. Most covariates display a similar trend to that of the

entire population with exception to age and indicator for presence of drugs in the neighborhood. For this group, age holds a quadratic relationship with migration, while the presence of drugs in the neighborhood is significant and increases migration. Household grant income and its squared term are still significant, and can be assumed to have a similar relationship to that explained in Model 3. Model 4 and its effects show a similar trend to that of the previous models, implying that household program participation is significant in increasing migration for young adults.

Model 3 had dropped observations for individuals who have reported household income of zero due to the income log transformation. These households could be extremely poor and the grant income may have different effects. The specifications from Model 4 were applied and verified (Appendix F). Household grant income shows a positive impact on migration and suggests a linear relationship in which an increase in household income increases the likelihood of migration.

Table 3 displays the results of the analysis that evaluates that difference in migration within individuals of grant receiving households. The covariates from the models in Table 2 thatwere included in the models in Table 3 exhibit similar general trends as in the models in Table 2.

Table 3: Logit Models with *indvGrant* and US Migration

	Outcome: Migration to US	Models			
	Independent Variables	(5)	(6)	(7)	(8)
					15 to 29 year olds
Individual	Age	-0.154***	-0.131***	-0.109**	-0.248
		(0.0411)	(0.0436)	(0.0503)	(0.493)
	Age^2	0.00110**	0.000869*	0.000429	0.00338
		(0.000455)	(0.000484)	(0.000577)	(0.0119)
	Gender (male=1)	0.893***	1.093***	1.117***	1.073***
		(0.264)	(0.264)	(0.315)	(0.315)
	No Education	-0.304	-0.601	-0.441	-1.285
		(0.456)	(0.517)	(0.562)	(1.360)
	Secondary Education	-0.444**	-0.234	0.175	-0.245
		(0.211)	(0.221)	(0.233)	(0.224)
	High School Education	-0.323	0.128	0.329	0.111
		(0.358)	(0.326)	(0.504)	(0.308)
Household	Relatives	1.561***	1.214***	1.233***	1.100***
		(0.289)	(0.280)	(0.355)	(0.341)
	hhAgr	0.513*	0.314	0.329	0.437
		(0.263)	(0.207)	(0.279)	(0.275)
	hhAdults	-0.0809	-0.0304	0.0232	-0.0378
		(0.0532)	(0.0462)	(0.0782)	(0.0704)
	Gangs	-0.0745	-0.155	-0.126	-0.263
		(0.112)	(0.125)	(0.156)	(0.177)
	Drugs	-0.0885	-0.0953	-0.168	-0.0273
		(0.109)	(0.120)	(0.127)	(0.162)
	Indigenous	0.243	0.174	0.229	0.170
		(0.293)	(0.292)	(0.283)	(0.297)
	log(hhIncome)	-	-	-0.688**	-
		-	-	(0.291)	-
	$(log(hhIncome))^2$	-	-	0.0301***	-
		-	-	(0.0100)	-
	indvGrant	-0.383*	-0.360	-0.442	-0.418
			(1.011)	(1.237)	(1.021)
	Constant	-0.397	-15.43***	-13.15***	-12.57**
		(1.048)	(1.371)	(2.177)	(5.123)
	State Dummies	No	Yes	Yes	Yes
	No. Obs.	3,291	3,010	2,186	1,104
	Chi-squared	195.9	-	-	607.6
	Pseudo-R^2	0.183	0.257	0.313	0.212

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

The interpretation of the difference in migration for individuals in grant receiving households differs slightly across the model specifications. Consistently, all models show that individuals that are direct grant receivers and must be present in Mexico for the household to

receive the grant are less likely to migrate than other individuals in the family. This result is only statistically significant for Model 5 without state dummies. Adding household income controls and state dummies takes away statistical significance: however, the models still suggest that the direct grant receivers are less likely to migrate compared to other individuals in the family. This supports the hypothesis that the households would assign higher migration costs to direct grant receivers due to the added risk of losing the stream of grant income. Model 8 shows the results from the analysis on individuals between ages 15 to 29 from grant-receiving households to remove young children and elderly people from the analysis. Direct grant-receivers are less likely to move, and the effect is greater than in Model 7. Compared to the results from Table 2, this analysis provides evidence that even though belonging to a grant-receiving household motivates migration, the direct grant-receivers are deterred from migrating.

Addressing Selection Bias

The households selected into the program follow the eligibility criteria that may bias the household participants from the general sample. The assignment into the CCT is non-random by its nature and would affect the interpretation of the variables in the previous models since the presumed effect of the program could be a result of confounding household characteristics from the selection process rather than from the grant itself. To account for this possible selection bias, a propensity score matching model was conducted to validate the effects of *hhGrant* and *indvGrant* variables. The theoretical background behind this approach is that the treatment, in this case participation into *Oportunidades*, is based on a set of characteristics. The model will try to estimate the probability of belonging to the treatment group through using existing covariates in the data and artificially design a more comparable treatment and control group. The

overall effect is measured through comparing these artificial groups through using the generated "score" or similarity to the treatment or control group.

To begin, a probit model analysis was conducted to generate the probability of belonging to a participating household (Appendices G1 and G2). Selection into the program was based on the relative poverty status of the household compared to the community: thus, the covariates included in the probit model captured household poverty through income, assets, as well as including environmental factors such as violence incidences to mimic what the program may have used to identify eligible participants. The probit model also controlled for age and gender for individual level characteristics.

Table 4: Propensity Score Matching Models		
Outcome: Migration to US		
Independent Variables	**ATT**	**T-stats**
hhGrant	0.012	2.2
	(0.005)	
indvGrant	-0.012	-0.54
	(0.022)	

Results are shown in Table 4 for both treatment variables. Adjusting for selection, an individual from a participating household is significantly more likely to move to the US than an individual from a non-participating household. The magnitude of this effect is smaller than that seen through the logit models in Table 2. The difference in the effect could be attributed to the possibility of omitted variable bias included in the logit models in Table 2. The models' covariates are likely to not have summarized all of the household or individual unobservable characteristics that may have contributed in the inflation of the program's effects. The results from Table 4 correct for this possible bias and its results still support the conclusions from Table 2 that state that belonging to a participating household increases the likelihood of migrating.

Evaluating the migration differences within grant-receiving households, the *indvGrant* variable shows an average treatment effect that is negative. The average treatment effect is small and not statistically significant but suggests direct grant-receivers are less likely to migrate compared to non-grant receivers with similar individual and household demographics. This result is smaller in magnitude than concluded in models from Table 3. Note that this is inherent because direct grant receivers are predominately composed of children and mothers due to the program's nature. The logit models from Table 3 may have captured their likelihood of migration along with grant categorization, making the predicted migration estimates larger in magnitude than in the propensity-score matching model.

Conclusion

This study attempts to connect the relationship between the national *Oportunidades* program to the migration decisions of Mexican families. The low-income population affected by the conditional transfer program is substantial and studying the impacts of the program is essential in understanding international migration. Using the data from MxFLS, this study defines the effects of the social net program through logit models and propensity score-matching models, taking advantage of the specific data on household participants and grant details to further outline the commonly overlooked long-term analysis on this type of intervention. The models presented follow closely to that of trends presented by Taylor (1986) for the social network theory and provide evidence for Stark's household migration models (1988).

The models presented heterogeneous effects of the social net program depending on the individuals' characteristics. While controlling for variables presented in previous studies and theories, this paper provides evidence that individuals who belong to participating households have a net positive likelihood to migrate to the US. The effect is greater for men than in women

of participating households. Also, the effect of the grant is positive and significantly greater in specific states that include Durango, Guanajuato, Michoacán, and Morelos. Furthermore, the models identify a threshold of grant income, in which participating households experience an increase in migration until 8,287 Mexican pesos and decreasing migration likelihood above that threshold. For zero income earners, the effect of the grant income is positively correlated, and observes a linear relationship with migration. The migration patterns for young adults between 15 to 29 years old with and without the program were compared to reveal that the grant increased migration for participating members. Amongst participating households, grant receivers (children and mothers) are less likely to migrate than other members of their households, providing evidence that the grant program is a perceived opportunity cost for households, preventing migration for such individuals. This effect was also seen for the younger population between 15 to 29 years of age with less statistical significance.

The analyses conducted in this research may be applicable in a wider spectrum of analyzing the complex issues behind Mexico to US migration. The evidence presented provides insight that the grant may have unintentional effects of increasing international migration for participating individuals. From a policy perspective, the conditional cash transfer program's net effect encourages international migration to the US for a majority of the low-income households in Mexico. The government is successful in keeping mothers from migrating and children in school within Mexico, as seen through the difference in migration motivations amongst grant receiving households. Further research can be directed towards tracking participating children down, especially the younger children, after their graduation to measure their decisions in international migration. With the findings presented, this research hopes to add more insight into the existing literature and to build a stronger understanding behind migration decisions.

Appendix

Appendix A: US Migrants Summary Statistics	
	% of population
Gender	
Men	0.61
Women	0.39
Average age	21.34
Education	
None	0.04
Primary	0.43
Secondary	0.33
High School	0.11
Higher Education	0.03

	Appendix B: Logit Model with more individual characteristics		
	Outcome: Migration to US		
	Independent variables	(1)	(2)
Individual	Age	-0.0546**	-0.0558***
		(0.0221)	(0.0193)
	Age^2	9.27e-05	9.26e-05
		(0.000331)	(0.000253)
	Age*Gender	-0.0205**	-0.0189**
		(0.00814)	(0.00922)
	Gender (male=1)	1.307***	1.140***
		(0.326)	(0.326)
	No Education	-1.031*	-0.972*
		(0.590)	(0.527)
	Secondary Education	0.121	0.0955
		(0.166)	(0.173)
	High School Education	0.209	0.164
		(0.225)	(0.215)
	Gender * No Education	1.350**	1.250**
		(0.686)	(0.613)
	Gender * Secondary Education	-0.0830	-0.0496
		(0.234)	(0.226)
	Gender * High School Education	-0.624**	-0.559*
		(0.288)	(0.289)
Household	Relatives	1.062***	1.065***
		(0.143)	(0.103)
	hhAgr	0.402**	0.406***
		(0.161)	(0.110)
	hhAdults	0.0106	0.0104
		(0.0370)	(0.0309)
	Gangs	-0.0151	-0.0173
		(0.0668)	(0.0513)
	Drugs	0.0260	0.0270
		(0.0623)	(0.0465)
	Indigenous	0.108	0.105
		(0.224)	(0.151)
	hhgrant	0.342**	0.0761
		(0.155)	(0.186)
	hhgrant *gender		0.451*
			(0.232)
	State Dummies	Yes	Yes
	No. Obs.	19,307	19,307
	Chi-squared	1362	796.7
	Pseudo-R^2	0.172	0.173

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix C: Region Analysis on *hhGrant*	
Outcome: Migration to US	
Independent Variables	(1)
hhgrant	-1.029
	(0.705)
Durango*hhGrant	2.641***
	(0.991)
Guanajuato*hhGrant	2.175***
	(0.801)
EstadoMex*hhGrant	0.662
	(0.914)
Michoacan*hhGrant	1.669**
	(0.788)
Morelos*hhGrant	1.433**
	(0.722)
Oaxaca*hhGrant	1.197
	(0.830)
Puebla*hhGrant	1.401
	(0.938)
Sinaloa*hhGrant	-0.296
	(0.933)
Sonora*hhGrant	-0.613
	(1.188)
Veracruz*hhGrant	-0.232
	(0.944)
Constant	-1.644
	(1.066)
No. Obs	15,544
Chi-squared	727.0
Pseudo-R^2	0.169

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Covariates: age, age-squared, gender, education levels, hhAgr, hhAdults, crime, community population levels, indigenous, income, income-squared

Appendix D: Goodness of fit Tests for Table 2		
Goodness of fit Tests for Table 2	(1) and (2)	(2) and (3)
Chi-squared value	29.75	4.77
Prob > chi-squared	<0.001	0.0092

Appendix E: Household Grant Income for participants	
***Oportunidades* Grant Summary**	
Mean	3267.57
Std Deviation	3270.87

	Appendix F: Logit Models for zero-income earners	
	Outcome: Migration to US	
	Independent Variables	(1)
Individual	Age	-0.0951**
		(0.0390)
	Age^2	0.000314
		(0.000505)
	Gender (male=1)	0.683***
		(0.186)
	No Education	-0.296
		(0.589)
	Secondary Education	-0.127
		(0.256)
	High School Education	-0.0914
		(0.350)
Household	Relatives	0.668**
		(0.326)
	hhAgr	0.620*
		(0.371)
	hhAdults	0.101
		(0.0732)
	Gangs	0.0235
		(0.150)
	Drugs	-0.0361
		(0.125)
	Indigenous	0.238
		(0.419)
Treatment	hhGrantIncome	0.000300**
		(0.000137)
	$hhGrantIncome^2$	-1.49e-08
		(1.21e-08)
	Constant	-3.260***
		(0.790)
	State Dummies	Yes
	No. Obs.	2,786
	Chi-squared	424.0
	Pseudo-R^2	0.236

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

	Appendix G1: Probit Model for estimating Propensity Score for *hhGrant*	
	Outcome: hhGrant	
	Independent Variables	(1)
Individual	Age	-0.00336***
		(0.000711)
	Gender (male=1)	-0.0756***
		(0.0247)
Household	Owns house	0.210***
		(0.0342)
	Telephone	-0.662***
		(0.0328)
	Toilet	-0.865***
		(0.0258)
	Indigenous	0.553***
		(0.0316)
	Drugs	-0.0822***
		(0.0119)
	Gangs	0.139***
		(0.0126)
	hhIncome	-1.71e-10***
		(0)
	Constant	-0.584***
		(0.0551)
	No. Obs.	19,301
	Chi-squared	3738
	Pseudo-R^2	0.220

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

	Appendix G2: Probit Model for estimating Propensity Score for *indGrant*	
	Outcome: indvGrant	
	Independent Variables	(1)
Individual	Age	0.00551***
		(0.00149)
	Gender (male=1)	-1.814***
		(0.0534)
Household	Owns house	-0.198**
		(0.0805)
	Telephone	-0.0843
		(0.0876)
	Toilet	0.103*
		(0.0583)
	Indigenous	0.0752
		(0.0581)
	Drugs	-0.0294
		(0.0254)
	Gangs	-0.00570
		(0.0286)
	hhIncome	8.93e-11
		(5.59e-11)
	Constant	0.794***
		(0.125)
	No. Obs.	3,123
	Chi-squared	1339
	Pseudo-R^2	0.310

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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