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To the people of Cerro Grande.
Without their experiences
the analytical work presented here would be impossible.
Especially to Don Cruz.

Contents

Introduction

One of the most significant flows of international migration in the recent years has taken place from Mexico to the United States, totaling approximately 12 million people. This significant population movement affects both the economies of the source and the destination countries. This work consists of 3 chapters that aim to provide elements which are relevant for the analysis of the effects of this phenomenon from the perspective of the source economy.

The first chapter discusses the effect of international migration on the accumulation of human capital among Mexican youths aged 15 to 18. Evidence indicates the existence of a negative impact of sibling and parental migration on school attendance among young males, but not on a measure of cognitive ability. Migration of members of the extended family has no significant effect. Lower migration costs and differences in return to Mexican formal education between the labor markets of the United States and Mexico largely explain the negative effect within the nuclear family. There is no evidence of a robust effect among females.

The second chapter presents results showing that the probability of Mexican households receiving remittances increases as a response to temporary loss of employment by household heads. In the short term, the probability doubles with a stronger effect in the quarter of employment loss. Taking into account inter-household transfers within Mexico, the increase in the probability of private transfers is similar for households with low and high access to migratory networks in the United States. Differences in economic aid come from the larger average probability of private transfers among households with greater access to such networks. Private transfers as an insurance mechanism have reduced effectiveness in an environment of economic crisis.

Finally, the third chapter analyzes the self-selection patterns among Mexican return migrants during the period from 1990 to 2010. Using census data, the research identifies return migrants who have lived in the United States within the previous 5 years but who are currently living in Mexico. To calculate the selection patterns, the research nonparametrically estimates the counterfactual wages the return migrants would have experienced had they never migrated, by using the wage structure of nonmigrants. The evidence shows that, over time, the selection patterns tend toward negative selection. For example, in 1990, the wages the male return migrants would have experienced had they not migrated was 6 percent higher than the wages of male nonmigrants. However, by 2010, the difference had declined to -14 percent. The increasing negativity of the degree of selection is robust to the analysis of specific subgroups: rural and urban, men and women, and states with high and low migration rates. Moreover, the negative selection results for the period from 2000 to 2010 are robust to the use of different surveys that define a return migrant on the basis of different characteristics. Additionally, results imply that the wages of return migrants are higher than those the migrants would have obtained had they not migrated. This finding suggests a positive effect of migration on the skills of return migrants.

I. International Migration and Human Capital: Effects on Mexican Youth

1 Introduction

The increase in international migration in the past 50 years has led to a growing concern about the effects of these movements on the economies of origin. One of the most important flows of migration in recent times is that between Mexico and the United States. Approximately 10 percent of the population born in Mexico lives in the U.S., representing about 30 percent of immigrants in that country. The majority of these migrants eventually send remittances to families they have left behind. Because a large proportion of migrant families come from medium- and low-income sectors, international migration and the associated flow of remittances can be an important factor in poverty reduction (evidence for rural international migration of Mexicans is summarized in Yunez and Mora, 2010)

Recent literature has suggested that the impact on members of migrant families who remain in Mexico are complex and not always positive. Empirical analyses have found a negative impact of international migration on variables measuring accumulation of human capital, especially among young people aged 15 to 18 (Halpern-Manners, 2011; Lopez Cordova, 2006; Meza and Pederzini, 2009; and McKenzie and Rapoport, 2011). Various explanations have been suggested for this negative impact, but little has been done to establish their validity. The goal of this investigation is to assess the relative importance of the proposed explanations.

Using an empirical strategy, my analysis suggests that the low return to formal Mexican education from migrants to the U.S., combined with the lower migration costs

provided by access to migration networks, explains a large part of the observed negative effect of migration on young males. I take advantage of the fact that approximately two-thirds of international migrants have young siblings who remain in Mexico. Migration of these members is part of the normal process of separation of young adults and lowers the cost of migration for their younger siblings. Using data from the Mexican Family Life Survey (MxFLS), and an identification strategy using 1950s migration rates as instrumental variables, my estimates indicate that international migration of siblings produces a negative effect on school attendance among males and a null effect among females. The estimated effect of parental absence is larger, but only a third of the cases involve parental absence. The negative effect is less than twice that of sibling migration, so stress caused by parental absence accounts for less of the total negative effect. A measure of cognitive abilities shows no significant changes, suggesting that the decline in school attendance is not due to a cumulative effect on academic performance.

In the next section, I offer a review of the literature and explain the contributions of this article, with special attention to the literature on Mexico. In Section 3, a simple theoretical model is developed and the empirical implications established. In Section 4, I describe the database used and the empirical strategy. The results are presented in Section 5. Section 6 provides some conclusions.

2 Previous Literature: Results and Limitations

The general objective of the literature is to determine whether international migration and the associated flow of remittances have a positive impact on the accumulation of human capital in the country of origin, either directly on the families that have a link through migration and remittances, or through incentives generated by the possibility of migration. There is an extensive empirical literature on the subject, with mixed results depending on the country, the stage of the migration process, sex, age, and socioeconomic level.

Two interrelated phenomena occur between migrants and those left behind: i) the receipt of remittances, and ii) the absence of the migrant. The receipt of remittances represents an increase in income, so the effect expected in the accumulation of human capital among those left behind is positive, whether education as a superior good or if the income increase enables households to ease credit constraints. On the other hand, the absence of adult migrants could be detrimental to human capital accumulation. With the absence of adults, children and adolescents may lack adequate supervision and support. The absence of an adult may also require that children perform some of the tasks of the adult in the domestic economy. In the short term, migrants may need time to adapt to the labor market of the destination economy and the family must survive for a time without the migrant's income in the local economy, so an optimal decision may be to send children or young people to work. In addition, if human capital returns are lower in the destination economy and the likelihood of migrating increases for children and adolescents once a member of the family has migrated, the perceived return of an investment in human capital decreases in families with migrants.

Two recent articles illustrate the opposite effects of remittances and parental absence. Yang (2008) focuses on the effects of a shock in remittances for the formation of human capital. With a sample of households in the Philippines, he shows that a positive variation in received remittances increases the probability that households keep children in school, with the corresponding expenditures on education.[1] On the other hand, Antman (2010) focuses on the impact of the absence of the father on Mexican children aged 12 to 15 within a year of the father's migration. Results indicate that the absence of the father implies fewer hours devoted to study and an increase in hours worked outside the home by boys.

Most of the empirical literature, however, is focused on finding the net impact of migration and remittances on the human capital formation of children in families involved in migration. (Acosta, 2006; Acosta et al., 2008; Antman, 2012; Calero et al., 2009; Hanson and Woodruff, 2003; Kandel and Kao, 2001; Kandel and Massey, 2002; Macours and Vakis, 2010; McKenzie and Rapoport, 2011; and Powell, 2011). Others have tried to separate the possibly positive contribution of remittances from the presumably negative effect of the

[1] Similar results were found by Alcaraz et al. (2011) among Mexican households.

absence of any of the adults, particularly parents, in the home (Amuedo and Pozo, 2010; Bredl, 2011; and Cuecuecha, 2009).

In the case of Mexico, Hanson and Woodruff (2003) found that children aged 10 to 15 and living in households where members have migrated finished more years of school, but the effect was only significant for girls whose mothers have lower educational levels. McKenzie and Rapoport (2011) showed that living in such households decreases the likelihood of attending school for boys aged 12 to 18 and girls aged 16 to 18. The negative effect diminishes among girls living in homes with less educated mothers. Halpern-Manners (2011) obtained similar results. Focusing on Zacatecas, one of the states in Mexico with a high rate of migration, Kandel and Kao (2001) showed that for students at all grade levels, migration is positively associated with academic performance but also with diminished interest in attending a university. Using the same Zacatecas dataset, Kandel and Massey (2002) found that the existence of migration within a nuclear family increases the desire to migrate among the young. This suggests that part of the migration effect could be due to members of migrant families being more exposed to the possibility of being migrants in the future and they consider this fact in their decisions about human capital accumulation.

Powers (2011) found a negative effect of migration on the cognitive development of children aged 5 to 12, but this effect depends on the relation between the migrant and the child: if the migrant is a sibling (67 percent of the sample) there is no effect on the child's cognitive ability. Antman (2011, 2012) provides evidence suggesting that the absence of the migrant father from Mexican households tends to favor the share of educational spending on females and ultimately generates a positive effect on schooling among females without effect among males. An analysis by Cuecuecha (2009) exploits the existence of Mexican households whose adult members have migrated but who do not receive remittances. The results show that the income effect of remittances is positive, but that the absence of one of the adult members has a negative effect. The combined effect of migration and remittances is positive, but only among families with recent migrants. Meza and Pederzini (2009) find that also community international migration affects negatively human capital among rural households. Finally, Nobles (2011) shows that parents abroad have more interaction with children than parents who have left home following a divorce.

Instead of using the household as a unit of analysis, some authors have looked at the locality, municipality, or country level (Beine et al. 2008, Boucher et al., 2005, Lopez Cordova, 2006). Within this literature, Boucher et al. (2005) found that for the rural communities of Mexico the possibility of internal migration tends to have a positive effect on the level of human capital of those who stay behind, while the possibility of international migration has no significant effect. Lopez Cordova (2006) finds that in Mexican municipalities with the largest proportion of households receiving remittances, school attendance increases among children in preschool; however, there is no significant effect on school attendance among children aged 6 to 14, and there is a negative effect on adolescents between 14 and 17 years of age.

This article builds on the previous literature on Mexico, trying to overcome some of its weaknesses and limitations. Previous literature focusing on Mexicans aged 15 to 18 has not addressed the relative importance of the reasons for the negative effects (Halpern-Manners, 2011; Lopez Cordova, 2006; Meza and Pederzini, 2009; and McKenzie and Rapoport, 2011). The absence of the father and the consequent stress on the family could be one of the causes. However, as Powers (2011) has noted, most migrants are actually siblings of children between the ages of 5 and 12. In this paper, I exploit the fact that the same holds among 15- to 18-year-olds. The migration of siblings can be part of the normal process of family separation of young adults and not a shock to the family. Within this group the effect of migration could merely be associated with the fact that children and adolescents in migrant families are expecting to become migrants in the future. Families making optimal decisions have to take into account the returns to human capital in Mexico and the U.S. In Mexico, returns to education range from 7.6 to 9.7 percent, while in the U.S., Mexican migrants earn only 2.5 to 3.2 percent for each year of education in Mexico (Chiquiar and Hanson, 2005).

Authors such as Kandel and Kao (2001) and Kandel and Massey (2002) have used parental migration and migration of other household members as separated variables, but their techniques of identification do not address endogeneity between migration and human capital decisions. It is possible that migrants come from families caring less for their children's education, and that the finding of a negative effect is spurious. In addition, these authors' datasets examine only individuals enrolled in school, in a small region of the country

with a high prevalence of migration, factors that could mask the true effect. This investigation address endogeneity issues at the national level in the population aged 15 to 18.

Findings in Powers (2011) suggest a zero effect of sibling migration, concentrated in early ages (5-12) while the finding of a negative effect in previous literature is more robust in later ages (15-18), when young Mexicans typically attend high school. I show that the effect of sibling migration in the population aged 15 to 18 years is negative. An explanation that reconciles this result with the findings of Powers (2011) is that migration affects only the optimal years of school attendance, not the acquisition of skills during the years of study at an early age. My results also contrast with those of Antman (2012). However, Antman's identification strategy comes not from typical migrants but from parents whose first migration occurred after age 40. In addition, the effect described by Antman appears after excluding individuals who have not migrated before age 20, who are precisely the more adversely affected, according the theoretical implications of the model presented below.

The first contribution of this article will be to develop a simple model of the effects of migration on human capital decisions that incorporates the explanations proposed for the empirical findings of earlier studies. I incorporate the empirical fact that Mexican migrants in the U.S. face a lower rate of return to education than they receive in Mexico. In addition, the time spent by adults away from home is part of the technology used to produce human capital; this allows evaluation of the effect of the absence of parents on the human capital formation of children. I include the fact that migration occurs through social networks, in line with empirical evidence in Kandel and Kao (2002), Mora and Taylor (2006) and my own findings in Section 5. These networks provide information about job opportunities in the destination economy and reduce the costs of adaptation. Individuals close to migrant households are thus more likely to choose to migrate than those who have no contact with such households. These differences in access to migration networks can have effects on optimal decisions of investment in human capital, especially considering the large differences in the rate of return to education in Mexico and in the U.S.

Theoretical results indicate that migration and remittances can have positive effects only when families face liquidity constraints, because migration allows them to increase their

income. When there are no liquidity constraints, migration can have negative effects. The first explanation of this negative effect is that the return of human capital investment is lower among families belonging to a migration network. The second explanation is that the absence of a parent increases the marginal cost of education. If changes in return to human capital are small, migration will have only negative effects in families with parental absence.

The model is closely related to those of Auriol and Demonsant (2012) and McKenzie and Rapoport (2011). Like the former authors, I construct the model using a game in stages applied to migration decisions. Following the latter, I take into account the different explanations offered for the negative effect of migration on human capital accumulation in constructing the environment. The main difference between my approach and that of McKenzie and Rapoport is that I distinguish between migration of parents and migration of other family members. While parental migration may be associated with all of the explanations offered for the existence of a negative effect, migration of other members only changes the probability of migrating due to lower costs. This assumes that international migration is happening at the same time as other factors causing the separation of young adults from the family, such as marriage or internal migration.

Empirical results show that membership in migration networks has a negative impact beyond that on families in which one of the parents migrate; migration by siblings also has a negative impact on school attendance among boys aged 15 to 18. This result suggests that the main explanation for the negative effect comes from the difference in returns to education in the U.S. and Mexico. In addition, I find no robust evidence of effects on ability consistent with the non-significant effect at early ages reported in the literature. Empirical evidence also suggests that migrant networks outside the nuclear family have a smaller effect on migration and human capital decisions. These results come from different specifications using migration rates in the 1950s as instrumental variables. The finding of a negative effect applies only to school attendance and does not include effects on health, consumption, or other investments; it is thus inconclusive about the overall effect of migration and remittances on the welfare of Mexican families.

3 Model

3.1 Environment

This section proposes a simple model to explain the relationship of migration, remittances, and the formation of human capital among children. Families have only two types of members: the parent and the child. Human capital and migration decisions take place in a game with three stages. In the first stage, the parent decides whether to migrate or not. In the second stage, the parent makes a decision about the type of education the child will receive; he then consumes the rest of his income and dies. In the third stage, the child decides whether to migrate or not, receives wages according to the human capital formed in the second stage, then consumes and dies.

There are two types of families: those who have access to migration networks and those who do not. Families without access face a high migration cost because they lack information about job opportunities in the destination economy or because the monetary and psychological costs of adaptation to that economy are high. There is only one significant decision for these autarkic families: the type of human capital that the parent chooses for the child in stage 2. For families with migration networks there will be relevant decisions in the three stages of the game.

In the beginning, the parent chooses to migrate or not, maximizing the utility for his own consumption and that of the child. I consider the simplest form of utility: for the parent the sum of the child's and the parent's consumption, and for the child his own consumption. I also assume that there is no discount factor. In the second stage, the parent receives labor income and chooses the type of human capital the child will receive. The parent spends a part of his income that depends on the human capital desired for the child, and consumes the rest of his income. It is possible that the parent does not have access to credit, so the choice in the second stage will depend on the capacity to finance a minimum consumption level. The type of human capital chosen implies inputs that require remittances if the parent has migrated. In

the third stage, the child chooses whether to migrate in order to maximize consumption; he then works and consumes his entire income.

There are two types of human capital, H_h and H_l, with $H_h > H_l$. All parents have the same type of human capital H_l, and they choose whether to transfer the same type of human capital to their children or one of greater value.

In the country of origin a unit of work receives a wage of:

$$w_o = m_o + H \tag{1}$$

where m_o is the prevailing wage in the country of origin for those with the lowest human capital. Wages increase with human capital H. When migration takes place, wages in the destination country will be

$$w_d = m_d + \rho H \tag{2}$$

where m_d is the prevailing wage rate in the destination country if there is no human capital. We assume that this already incorporates the costs of migration. The factor ρ shows that returns to human capital are different between countries.[2] These parameters reflect the characteristics of Mexican migration to the U.S. if we assume $m_d > m_o$ and $\rho < 1$. This means that human capital returns are higher in the country of origin, but wages for individuals with less human capital are higher in the country of destination.

[2] These are the same functional forms found in Bratsberg and Borjas (1996) without uncertainty.

In the production of human capital of the child, the parent has two types of input combinations, one involving a share $1-t$ for the unit of time available to work, and a second in which he can produce human capital without having to sacrifice time. If the parent uses a proportion $1-t$ in the production of human capital, he can produce H_l without any additional expenditure. To produce H_h the parent must sacrifice an amount g_s of his income. When the parent produces human capital without an expenditure of time, an amount g_l is needed to produce H_l and an amount g_h to produce H_h. We assume that $g_h > g_s$ and $g_l > 0$. This reflects the fact that the expenditure to produce a certain amount of human capital is greater when inputs do not include time.

If the parent chooses to migrate, the time input is by definition zero. On the other hand, if the parent does not migrate he chooses between the two types of combinations. To establish the importance of parental presence as an input in the production of human capital, I assume that the technological combination in which a portion of available time enters into the production of human capital produces the same quantity of that capital while sacrificing less of the parents' consumption. In other words, without access to international migration networks, parents will have an incentive to live in the same household as their children. This implies, in our setting, that when the human capital produced is low,

$$m_o + H_l - g_l \leq t(m_o + H_l) \tag{3}$$

and when the human capital produced is high,

$$m_o + H_l - g_h \leq t(m_o + H_l) - g_s \tag{4}$$

Additionally, I assume that the marginal cost of producing high human capital is greater in the technological combination not involving time, that is, $g_h - g_l > g_s$, and that the income of absent parents is enough to cover the costs of low human capital. Under this assumption, (3) and (4), t satisfies the following inequality:

$$t \geq \frac{m_o + H_l - g_l}{m_o + H_l} = t_m > 0 \qquad (5)$$

An alternative is to consider the existence of additional adults to avoid the unrealistic possibility that the parent migrates and the children stay alone. A simple method that is compatible with the results below is to assume that the parent has to pay a fixed amount F to other members of the family to provide an input X for the education of the child. The technology would also assume the existence of a fixed input X. The transfers happen regardless of the migration decision or the education the child receives. Then, these changes will not affect the decisions of the parent or the child on the simple assumption of linear utility.

3.2 Autarkic Families and Liquidity Constraints

Families without access to migration networks face only the decision at stage 2. The parent will compare the sum of the child's consumption with the cost of each type of human capital and decide whether the human capital of the child will be high or low. The first happens when

$$m_o + H_h - g_s \geq m_o + H_l \qquad (6)$$

This inequality reduces to

$$H_h - H_l \geq g_s \qquad (7)$$

The parent will choose high human capital only if the increase in the child's consumption is greater than the additional cost of providing the capital. The inequality holds for the rest of the model. Thus, parents without access to migration networks will have incentives to transfer high human capital to their children. However, households do not necessarily have access to the credit needed to finance investment in human capital and the consumption of subsistence c. When $t(m_o + H_l) - g_s \geq c$ the parent will transfer high capital to the child; when $t(m_o + H_l) - g_s < c$, the capital will be low.

These results now allow us to establish the possible positive or negative effects of migration. When families face liquidity constraints, migration will have positive effects if they can increase their income to overcome those constraints. In addition, there should be no change of incentives, so that optimal human capital remains high. If households are not restricted, the possibility of migration can have a negative impact if it leads to a change in incentives from high to low human capital.

3.3 Families with Migration Networks

To find the changes in incentives experienced by households to transfer different types of human capital when they are part of a migration network, I will solve the proposed game by backward induction.

Stage 3. Migration of the Child

The child will choose to migrate if the consumption with migration is greater than without, given the human capital he receives. Thus, the child will migrate if the following inequality is true:

$$m_d + \rho H \geq m_o + H \tag{8}$$

Because $m_d > m_o$ and $\rho < 1$, this inequality can be met more easily when $H = H_l$. We will assume that only those who receive low education will migrate and those receiving high education will have an incentive to stay in the country of origin. Then, equation (8) will be satisfied with inequality when $H = H_l$, but will not hold if $H = H_h$. This result is in agreement with empirical literature showing that Mexicans with high levels of education tend to migrate less in localities with high rates of migration (McKenzie and Rapoport, 2010).

Stage 2. Human Capital

First, we consider the case in which households are not restricted by liquidity constraints. When parents decide to migrate, the payment they receive by providing high human capital to children is $m_o + H_h - g_h$. If parents choose to transfer low capital, the payment is $m_d + \rho H_l - g_l$. Parents migrating will choose high human capital only if

$$R_m = m_o + H_h - (m_d + \rho H_l) \geq g_h - g_l \tag{9}$$

The left side of the inequality is the return to human capital among families in migration networks, considering that in stage 3, individuals with low capital will migrate and individuals with high capital will stay in the country. The right side is the marginal cost of

producing high rather than low human capital. Thus, the inequality says that parents only transfer high human capital if the increase in consumption produced by higher human capital exceeds the increase in costs. The increase in consumption differs from $H_h - H_l$ because parents take into account that the child who receives low education will migrate and earn a higher wage than in the domestic economy.

Similarly, when the parent has not migrated, he chooses high human capital if:

$$R_m \geq g_s \tag{10}$$

Considering the assumptions made and comparing the previous conditions (9) and (10) with the solution of autarky, (7), the following inequality holds:

$$H_h - H_l > R_m \tag{11}$$

This inequality shows that when families are part of a migration network, the child's increase in income owing to a change in his human capital is less than in autarky. This will affect both migrant families and those who belong to the migration network but whose parents decide to stay in the country. For migrant families, there is an additional difference from autarkic and non-migrant families belonging to a network: the marginal cost to invest in high human capital, $g_h - g_l$, is higher than g_s.

When there are liquidity constraints, families without access to migration networks and families within networks but without parental migration will choose to provide low human capital to the child. Families with parental migration will face condition (9) if the increase in income associated with migration enables them to finance their minimum level of consumption c.

Stage 1. Migration of Parents.

Among families belonging to migration networks and without liquidity constraints, we can divide the solution into three cases, according to the human capital decisions in stage 2:

i) $R_m \geq g_h - g_l$. In stage 2, both types of parents, migrants and non-migrants, choose high human capital for the child.

ii) $g_h - g_l > R_m \geq g_s$. In stage 2, migrant parents choose low human capital and non-migrants choose high capital.

iii) $R_m < g_s$. In stage 2, both types of parents choose low human capital.

In case iii), migration has negative effects on human capital formation not only in migrant families. Non-migrant families who are part of a migration network can choose to invest less in human capital because they perceive a lower return, given that the child with low education will decide to migrate.

To determine the conditions under which there will be migration in the three previous cases, the parent compares the sum of his own consumption and the child's consumption and decides whether to migrate or not, choosing the option with higher utility. Without liquidity constraints, parents will have incentives to migrate in all cases if we allow a random realization of t, as shown in Appendix A. Moreover, parents with the lower realization of t are those who will have incentives to migrate. With liquidity constraints, parents belonging to migration networks but choosing not to migrate in the first stage will transfer low human capital in the second stage in all cases. For migrant parents, there are only two relevant cases. When $R_m \geq g_h - g_l$, parents who migrate and overcome liquidity constraints choose high human capital in the second stage. If the inequality does not hold, they choose low human capital. As shown in Appendix B, parents have incentives to migrate in all cases if t is random, including when migration does not allow them to overcome liquidity constraints.

3.4 Empirical Implications

Once families who are part of a migration network have solved the game, they divide into two groups: those with parental migration, M, and those without parental migration, NM. There are also autarkic families A. The difference in human capital transferred, according to the model described, depends on the existence of liquidity constraints and the interaction between the return to human capital perceived by families within a migration network and the marginal costs of producing human capital. Table 1 summarizes the expected decisions regarding human capital.

In the empirical analysis of the following sections, we compare the three groups of families to determine which case in Table 1 is relevant. If we find that families with migrant parents provide a higher human capital to their children than non-migrant families, we can conclude that families face liquidity constraints and that the change in returns to education produced by the possibility of migration of the child is not relevant for the human capital decision. This corresponds to row 1 of the Liquidity Constraints column in Table 1.

Another possibility is that families with migrant parents (M) transfer a lower level of human capital than non-migrant families, whether they belong to a migration network or are autarkic (NM or A). This happens when families are not restricted and the decrease in returns to education is small, as in row 2 of the No Liquidity Constraints column.

A third case of differences between the three groups of families is when families belonging to the migration network, regardless of whether they have migrant parents or not, transfer a lower level of human capital than autarkic families. This would imply that there are no liquidity constraints and that the decrease in returns to education produced by the possibility of migrating is greatest, as in row 3 of the No Liquidity Constraints column.

It is also possible to find no differences in the transfer of human capital among the three types of families. In this case, it is not possible to identify whether the families are liquidity constrained or if the differences in human capital returns between the Mexican and U.S. labor markets are changing the incentives to accumulate such capital.

Table 1: Expected Human Capital Decisions

	Liquidity Constraints	No Liquidity Constraints
1. $R_m \geq g_h - g_l$	M: H_h or H_l NM: H_l A: H_l	M: H_h NM: H_h A: H_h
2. $g_h - g_l > R_m \geq g_s$	M: H_l NM: H_l A: H_l	M: H_l NM: H_h A: H_h
3. $R_m < g_s$	M: H_l NM: H_l A: H_l	M: H_l NM: H_l A: H_h

Notes: Human capital decisions for migrant families (M), non-migrant families (NM), and autarkic families (A). H_h means high human capital. H_l represents low human capital. R_m is the return to human capital for families within a migration network. $g_h - g_l$ is the marginal cost of human capital for migrant parents and g_s is the marginal cost for non-migrant parents.

The results of previous literature (Halpern-Manners, 2011, Lopez Cordova, 2006, McKenzie and Rapoport, 2011; and Meza and Pederzini, 2009) show that school attendance among youths aged 15 to 18 decreases in families belonging to a migration network. The identification strategies used are consistent with two cases in the previous model. In the first case, only factors associated with higher costs related to the absence of either of the parents explains a reduced human capital formation. In the second, the decline in returns to education implies an additional effect among families without migrant parents but in a migration network.

The recent work of Powers (2011) finds that only the migration of parents has a negative effect on cognitive abilities among children aged 5 to 12. The migration of other household members has no effect. If empirical evidence for young people aged 15 to 18 shows a similar result, we could conclude that the negative effect found in the previous literature comes from factors associated with parental absence rather than changes in incentives caused by the low return in the labor market of the U.S. to education received in Mexico. On the other hand, if migration of other family members has a negative effect, we can conclude that the decrease in return to education caused by the possibility of migration

explains a part of the negative effect. The results of Antman (2012) are consistent with the case where liquidity constraints are binding and migration allows parents to overcome them.

4 Data and Empirical Strategy

The data come from The Mexican Family Life Survey (MxFLS) database. The baseline survey (MxFLS-1) was conducted in 2002. A second wave of fieldwork (MxFLS-2) took place in 2005-2006, with a 90 percent household re-contacting rate. The approximate sample size is 8440 households with approximately 35,000 individual interviews in 150 localities throughout Mexico. The sample design ensures representation at national and rural/urban levels. From the population, I concentrate on individuals aged 15 to 18 in 2002 or 2005, living with at least one adult aged 25 to 65. This gives 4721 cases in households surveyed in the 2002 baseline. Once we drop observations with missing values in the variables used for the estimation we have a sample of 3737.

The MxFLS asked individuals about members of their family living in the U.S. and allowed them to mention up to 8 persons, including extended family. Based on this question, the population can be divided into four groups: i) those who do not know of any member of their family in the U.S.; ii) those who know at least one member of their family in the U.S., none of whom is part of the nuclear family (typically these are cousins, aunts, or uncles); (iii) individuals with parents in Mexico but with at least one sibling in the U.S.; and iv) individuals with at least one parent in the U.S. The first group includes 63 percent of the population, the second 23 percent, the third 10 percent, and the fourth 4 percent. Powers (2011) does not use this information. Instead, she uses the data about migration in 2002-2005 to identify families with migrants; this method measures the effect of migration only after a period of 0 or 3 years, which could mask the effect of longer terms.

4.1 Descriptive Statistics.

Table 2 presents descriptive statistics as well as cases in which groups belonging to different migration networks differ from the control group (those without any type of network).[3] Youths from the four groups differ little in average age and sex composition; individuals with siblings in the U.S. average 0.3 years older. The lack of difference in sex composition suggests little relation between migration and the sex of youths who stay at home. The indigenous membership condition does not differ significantly among groups. The majority are single and tend to live with their parents. Among those who have one parent in the U.S., the father lives at home in 17 percent of the cases, while in the control group the figure is 83 percent.

The human capital variables differ significantly between the group with a migration network outside the nuclear family and the group without a network. The first group accumulates more years of education (9.53 vs. 8.90), attends school in higher proportion (0.63 vs. 0.57) and obtains a higher score on the cognitive abilities test (7.56 vs. 7.22). Description of this variable is available in section 5.2. The differences in human capital variables between the other two types of migration network and the control group are less significant, except in the case of school attendance among those who have siblings in the U.S., whose school attendance is 10 percent less. Youths with one sibling in the U.S. have a 10 percent higher labor force participation rate.

Individuals in this age group have significant involvement with the culture of migration, especially those who belong to a migrant network. Among those who have a sibling in the U.S., 16 percent have a desire to migrate; among those with a parent in the U.S., the figure is 14 percent. Among those who have a migrant network composed only of relatives outside the nuclear family, only 8 percent show an interest in migrating, but this figure is still higher than the 3 percent for those who have no migrant network. The structure of the MxFLS survey allows us to see how many of those within the age group in 2002 did in fact migrate in 2002-2005. The results are similar to the expressed desire to migrate. Young people belonging to a migration network of nuclear family members have a higher rate of migration, while those whose network is outside the nuclear family show behavior closer to

[3] Household weights provided in the ehh02wb1 table of the MxFLS were used in descriptive statistics and estimation . The data is available at http://www.ennvih-mxfls.org/

those without a network, suggesting that the network effect of migration is stronger in the nuclear family.

Table 2: Descriptive Statistics

	No Network	Extended Family	Siblings	Parents
N	2310	826	422	179
Weighted Population	63	23	10	4
Age	16.4	16.5	16.7***	16.3
Sex	0.46	0.50	0.43	0.47
Indigenous	0.08	0.05	0.09	0.08
Not married	0.95	0.96	0.91	0.95
Mother Household Member	0.93	0.93	0.93	0.89
Father Household Member	0.83	0.87	0.83	0.17***
Schooling	8.90	9.53***	8.70	8.77
School Attendance	0.57	0.63*	0.49*	0.53
Cognitive Test	7.22	7.56*	6.93	6.80
Labor Force Participation	0.26	0.29	0.36***	0.27
Wish to Migrate	0.03	0.08***	0.16***	0.14***
Migration 2002-2005	0.04	0.06	0.17***	0.17***
Children <5	0.38	0.32 *	0.42	0.38
Children 6-14	1.16	1.13	1.32	1.45**
Adolescent 15-18	1.48	1.47	1.45	1.38
Young Adult 19-24	0.55	0.50	0.64	0.30***
Adult 25-64	1.92	1.90	2.03**	1.27***
Female Adult 25-64	1.06	1.06	1.18***	1.01
Senior >65	0.11	0.09	0.11	0.21
Adult Schooling	6.12	7.07***	4.42***	5.05***
Return Migrant	0.03	0.07***	0.15***	0.13***
Rural	0.25	0.16***	0.40***	0.36***
Border	0.12	0.11	0.03***	0.04***
Mexico City	0.13	0.10**	0.05***	0.07**
Central Mexico	0.29	0.42***	0.49***	0.48***
Central Rural	0.04	0.08***	0.26***	0.24***
South	0.46	0.37***	0.42	0.41
Southern Rural	0.17	0.05***	0.11***	0.09***
Middle School	0.92	0.93	0.88***	0.88**
High School	0.63	0.75***	0.54***	0.52***
Drinking Water	0.85	0.89***	0.83	0.87
Migration 1950	1.23	1.69***	2.03***	2.17***

Notes ** p < .05 ***p < .01 of mean difference with the first column. Clustered standard errors at locality level.

The number of household members under 18 shows no major differences by age group. Only young people with a non-nuclear family migration network have fewer household members younger than 5; households of those with migration networks including parents have more children aged 6 to 14. It is interesting that in households with sibling migration, the number of members aged 15 to 25 is not smaller, suggesting that the migration process is part of the normal separation of young adults from the home. In fact, in households with sibling migration the number of adults at home is higher. In the group with migrant parents, young people's households have an average of 0.25 fewer young adults and 0.65 fewer adults.

Family socio-economic origin, approximated as the education of adults aged 25 to 64, differs according to migration network. Adolescents who belong to a non-nuclear family migration network come from more educated families, in which adults average 0.95 more years of education than the group without a migration network. Those who belong to a migration network with siblings come from less educated families; adults in these families have 1.47 fewer years of education than those in families without access to networks. In the group where parents have migrated, adults have 1.07 fewer years of school.

In some households, while the adults were present at the time of the interview, they had migrated to the U.S. in previous periods. Table 2 shows the percentage of households within each group in which adults aged 25 to 64 mentioned that they had migrated to the U.S. and returned within the last two years, or had lived there for more than a year. Unsurprisingly, groups with migrant networks exhibit a higher rate of return migration.

Mexican migration to the U.S. has generated different types of migration networks in different regions of Mexico.[4] The population living in the border region represents 12 percent of the population without migration networks, 11 percent of the population with non-nuclear family networks, and 3-4 percent of the population with nuclear family networks. Mexico City is also a region with a relative absence of migration networks: its residents account for

[4] The MxFLS sampled only 16 states, including the border states of Coahuila, Nuevo Leon, and Sonora; the southern states of Morelos, Oaxaca, Puebla, Veracruz, and Yucatan; the central states of Baja California Sur, Durango, Guanajuato, Jalisco, Michoacan, and Sinaloa; and the Mexico City metropolitan area, including the Federal District and Mexico State.

13 percent of the population without networks and 5-10 percent of the population with different types of networks. Central Mexico, however, has a higher prevalence of migration networks. The population of the central states includes only 29 percent of young people with no migration networks, but 42 percent of those with non-nuclear family networks, 49 percent of those with sibling networks, and 48 percent of those with parents in the U.S. Southern states have slightly less presence in groups with migration networks than in the group without networks.

The migration networks differ in their rural or urban presence. Adolescents with non-nuclear family networks tend to be more concentrated in urban areas than those without a network; those with nuclear family networks tend to have a higher presence in rural areas. The high proportion from central states in the population with migration networks is even more important among the rural population; these states represent more than twice the rural population with nuclear family networks. Networks in the south are predominantly urban.

There are differences in the availability of educational infrastructure and the quality of public services where members of migrant networks live. Young people with non-nuclear family networks live in localities with better educational infrastructure and greater access to drinking water in the home; those with sibling and parent migrant networks live in areas with less educational infrastructure.

The identification strategy followed in this research rests on the transmission of migratory behavior through networks in previous periods. Table 2 shows that young people with access to migration networks live in states where migration had a strong presence in the 1950s. More accurately, the data corresponds to migration rates from 1955 to 1959 under the Bracero program, as described by Hanson and Woodruff (2003). This program was a series of laws and diplomatic agreements, between 1942 and 1964, for the importation of temporary contract laborers from Mexico to the U.S.. Young people without migration networks live in regions where the rate of migration in the 1950s was only 1.23 per cent, while those with non-nuclear family migration networks live in states where the migration rate in that decade was 1.69. Those with migration networks including siblings live in states where the 1950s rate of migration was 2.03, while those whose networks include a parent live in states where

the rate was 2.17. The prevalence of migration in the 1950s is the exogenous factor that explains current membership in migration networks in the identification strategy followed below.

4.2 Empirical Strategy

To analyze the effect of migration networks on human capital I estimate the following equation:

$$H_{is} = \alpha + \beta N_i + \gamma X_i + \rho L_s + \varepsilon_{is} \qquad (12)$$

H_{is} denotes a measure of human capital for individual i in locality s, which can be based on school attendance or the cognitive abilities test. In addition, labor force participation is included as outcome variable. N_i is an indicator of whether the individual has access to a migration network. The parameter of interest β measures the effect of belonging to the network. X_i includes control variables related to the individual and his family that are relevant to the formation of human capital. L_s is a set of control variables related to the locality s. Errors correlate among individuals within the same locality.

Estimation of equation (12) by OLS does not necessarily give us a causal interpretation. For example, if individuals with migrant networks also belong to families less concerned about the accumulation of human capital in their children, β would tend to be negative but would not be a causal effect of migration. To handle the identification problem an alternative is the use of instrumental variables correlated with migration networks but not with the error term. The three instrumental variables used in this paper relate to the rate of migration at the state level in the 1950s. The first is the rate of migration, the second is the interaction of the rate of migration with the rural population, and the third is the interaction

of the rate of migration with the indicator of young people from households whose adults average less than three years of schooling.

As we have seen from descriptive statistics, individuals with access to migration networks live in states where migration rates were high in the 1950s. Moreover, the rate of migration in the 1950s could be correlated more with migrant networks among the rural population because the Bracero program, which is the data source of migration rates, was designed to attract agricultural workers. The third variable is included because high migration rates tend to relax liquidity constraints on initial migration by low-income individuals. This creates a dynamic in which localities with low migration tend to send higher-educated individuals, while those with higher rates tend to send those with less education (McKenzie and Rapoport, 2010). Positive effects of the three migration network variables are expected to fulfill the relevance criterion.

In order to be a valid identification strategy, instrumental variables must explain the accumulation of human capital variables through migration networks alone. A set of control variables, which could explain the human capital decisions, is included in the estimate to lessen concern about the correlation of instrumental variables with the error term.

By example, the analysis divides the country into four regions: Mexico City, Border, Central, and South. The Mexico City and Border regions have higher socio-economic levels than the rest of the country; the Central region is closer to the national average. The poorest states are those of the South. Not including these regional variables might lead to an instrumental variables estimator that only captures differences in socioeconomic characteristics between the Central region and the rest of the country, owing to the high prevalence of migration in that region in the 1950s. The favored specification also includes variables related to household structure, household economic shocks in the previous five years, locality size, local educational infrastructure, the quality of public services, the education of adults in the household, the age of household members, and whether they are members of indigenous groups.

The analysis seeks to determine whether there is any effect of migration networks on human capital variables and if this effect extends beyond migration networks made up of

parents. Equation (12) is estimated separately for different types of networks, using the group without a network as the control, and comparing the results. The first type of migration network is defined as in previous studies: those with any member of the nuclear family living in the U.S. The second type includes individuals with siblings in the U.S., but whose parents live in Mexico. The third includes only those with a parent in the U.S. The last type consists of individuals with access to migration networks, but only outside the nuclear family.

5 Results

5.1 School Attendance

Table 3 shows the results for school attendance among young males. The first three columns compare young people living in nuclear families in which at least one member is living in the U.S. with young people who live in families without access to migration networks. In all the specifications, the control group excludes those living in households with an adult return migrant, to avoid mixing the effect of past migration with the control group; the results are not sensitive to this correction. Each of the three specifications includes a different set of controls. The first uses personal variables (age and indigenous status), two dummy variables indicating whether the localities are rural or semi-urban, the average schooling of adults in the household and its square; region year effects are also added. The second specification incorporates information about the structure of the household and economic shocks in the last five years. The third adds information about educational infrastructure and the quality of public services in the locality in 2002.

The results show that migration within the nuclear family adversely affects school attendance among young males, which is consistent with the findings of previously published studies (Halpern-Manners, 2011; Lopez Cordova, 2006; Meza and Pederzini, 2009; and McKenzie and Rapoport, 2011). The OLS negative effect is a decrease of .01-.05 in the probability of attendance, but this is not significant. IV negative effects are larger,.29-.30, and are significant at conventional levels.

Table 3: Male School Attendance, Age 15-18

	Nuclear			Siblings	Parents	Non-nuclear
	I	II	III	IV	V	VI
OLS	-0.01	-0.04	-0.04	-0.06	-0.03	0.02
	[0.04]	[0.04]	[0.04]	[0.05]	[0.05]	[0.03]
IV	-0.29**	-0.29**	-0.30**	-0.37*	-0.46**	-0.30
	[0.14]	[0.13]	[0.14]	[0.20]	[0.23]	[0.31]
N	1371	1366	1366	1257	1210	1482
Exogeneity	0.85	0.37	0.47	0.74	0.44	0.43
F- Instruments First Stage	22.98	23.92	18.21	8.25	18.40	5.43
Mig 50s	0.04**	0.04**	0.04**	0.01	0.04***	0.04***
	[0.02]	[0.02]	[0.02]	[0.01]	[0.01]	[0.02]
Mig*Rural	0.12***	0.12	0.11***	0.10***	0.09***	0.04*
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Mig*Low Education	0.03	0.03	0.03	0.02	0.01	-0.01
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]
Rural	Y	Y	Y	Y	Y	Y
Region Year Effects	Y	Y	Y	Y	Y	Y
Adult Schooling	Y	Y	Y	Y	Y	Y
Personal	Y	Y	Y	Y	Y	Y
Household Structure		Y	Y	Y	Y	Y
Economic Shocks		Y	Y	Y	Y	Y
Infrastructure			Y	Y	Y	Y
Quality of Services			Y	Y	Y	Y

Notes. Personal: age and indigenous status. Household structure: number of members <5 years, members 6-14, 15-18, 19-24, 25- 64 and >65. Economic shocks: any household member hospitalized in past 5 years; any household member lost employment or failed in business; any member of the household lost a harvest. Educational infrastructure: middle school infrastructure, high school in locality. Quality of services: drinking water coverage <80 percent, 80-99 percent, 100 percent. Rural: <2500 inhabitants, 2500-100,000 inhabitants. Adult Schooling: average schooling of adults 25-64 in household, square of the average schooling of adults. Regions: Center, Border, Mexico City and South. Instruments: State-level migration rate in the 1950s, migration rate in 1950s interacted with rural localities, migration rate in 1950s interacted with households with average adult schooling ≤3 years. Clustered standard errors at locality level are in brackets. *p < .10 ** p < .05 *** p < .01

Analyzing only young people whose siblings have migrated but whose parents live in Mexico does not change the results.[5] The OLS estimate indicates that the probability of attendance decreases by .06, without being statistically significant, and IV estimates that the decrease is .37. . Analysis of the rest of the young people with migrants in their nuclear family shows no significant effect in the OLS estimate, but the IV estimate reveals a larger and negative effect of .46 in the probability of attendance.[6] Taken together, this evidence suggests that there is a large migration effect within the nuclear family and that parental migration is not the only factor causing it, which is consistent with the non-existence of liquidity constraints and a very low return to education perceived by families within the migration network, as in case 3 of Table 2.

Column VI compares individuals with non-nuclear family networks with those with no networks.[7] OLS and IV estimates indicate no significant effect in these groups.[8] Here the question arises as to why there are no effects among these individuals if columns IV and V suggest that migration networks do have effects on human capital accumulation. Evidence discussed below suggests that these types of migration networks have lesser effects on the probability of migrating. These families are thinking about returns to human capital in a similar way as families without migration networks, and the expected result is a behavior closer to that of the control group.

In Table 3, we can also find the p value of the overidentification test and the F statistic of joint significance of the instruments in the first stage. Overall, we cannot reject the null hypothesis that the instruments were correctly excluded from the principal equation, and the F statistic is above the threshold of 10, except when we analyze the groups with sibling and non-nuclear family networks, where the F statistic is below the threshold, with the non-nuclear group exhibiting the less reliable estimates. Also, the signs of coefficients of instrumental variables in the first stage are as expected and in some cases are individually significant.

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[5] Here I exclude those with siblings living in the U.S. but with an adult return migrant at home

[6] I include individuals living with adult return migrants and with siblings in the U.S. as migrant parents.

[7] Those living with return migrants were excluded.

[8] Including individuals with networks outside the nuclear family as part of the control group provides similar results.

Table 4 shows the same information as Table 3, but for the case of young females. Estimates using OLS show a positive effect on school attendance, but this disappears with IV. Estimates without regional year fixed effects (not shown) were negative and significant, but they typically violate exogeneity. The F statistic shows that the instruments could be weak in non-nuclear networks, posing some doubts about the estimates in the second stage. Individual coefficients of instrumental variables in the first stage follow patterns similar to those of males.

Table 4: Female School Attendance, Age 15-18

		Nuclear		Siblings	Parents	Non-nuclear
	I	II	III	IV	V	VI
OLS	0.08**	0.06**	0.06**	0.08	0.04	0.04
	[0.03]	[0.03]	[0.03]	[0.03]	[0.05]	[0.04]
IV	-0.04	-0.01	-0.03	-0.02	-0.10	0.02
	[0.12]	[0.12]	[0.11]	[0.16]	[0.16]	[0.23]
N	1479	1470	1470	1344	1262	1647
Exogeneity	0.16	0.33	0.32	0.19	0.67	0.59
F- Instruments First Stage	21.71	19.64	18.09	17.06	15.00	5.05
Mig 50s	0.03	0.03	0.03	0.01	0.03*	0.01
	[0.02]	[0.02]	[0.02]	[0.02]	[0.01]	[0.02]
Mig*rural	0.12***	0.12***	0.13***	0.11***	0.09***	0.07***
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Mig*Low Education	0.02	0.02	0.02	0.02	0.01	0.03
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]

Notes. Controls are the same as in Table 4. *p < .10 ** p < .05 *** p < .01

5.2 Cognitive Test

The MxFLS applied a cognitive Raven test that asked respondents to find the missing part of a figure. The test consists of 12 questions with 8 answer options each. Table 5 presents the results using the same specifications as for school attendance, except that columns I and II are omitted. In some cases the estimated effect is negative, but it is never

significant, either with OLS or IV. Thus, we cannot reject that the true effect is zero for both males and females.

The results of the cognitive test, together with those related to school attendance, suggest that migration does not have a cumulative effect on cognitive skills, forcing individuals to drop out. Rather, it seems that the decision to leave school is linked to household optimal decisions. The model outlined in previous sections suggests that a lower return to observable human capital for individuals becoming migrants is the main explanation for this fact.

Table 5: Cognitive Test, Age 15-18

	Nuclear	Siblings	Parents	Non-nuclear
Males				
OLS	-0.18	-0.20	-0.11	0.08
	[0.43]	[0.51]	[0.38]	[0.22]
IV	-0.13	-0.20	0.66	0.87
	[0.88]	[1.22]	[1.07]	[1.44]
N	1366	1257	1210	1482
Exogeneity	0.43	0.40	0.67	0.60
F-First Stage	18.21	8.25	18.4	5.43
Females				
OLS	0.07	0.02	0.17	0.06
	[0.21]	[0.23]	[0.30]	[0.21]
IV	-0.22	-0.32	-0.51	-1.32
	[0.69]	[0.84]	[1.11]	[1.47]
N	1470	1344	1262	1521
Exogeneity	0.93	0.97	0.74	0.90
F-First Stage	18.09	17.06	15.00	5.05

Notes. Controls: Personal characteristics, household structure, economic shocks, educational infrastructure, quality of services, rural, schooling of adults, and region year fixed effects. Clustered standard errors at locality level in brackets. *p < .10 ** p < .05 *** p < .01

These results for parental and sibling migration contrast with the finding in Powers (2011) that sibling migration had no effect and parental migration had a negative effect on cognitive ability, but the results are not necessarily contradictory. The estimations here focus on individuals in a different age group. In addition, the measure of migration used here

allows for migration within the nuclear family over a longer period, not just in the short period of three years before the effects are measured. If the effect of family stress is short-termed, or remittances grow in the long run, we can expect more negative effects of parental migration in the short term. On the other hand, if sibling migration only affects the optimal investment in years of schooling but not the effort of individuals in school at earlier ages, we can expect greater negative effects of sibling migration at later ages.

5.3. Labor Force Participation

Lower school attendance observed among males might involve higher participation in the domestic labor market. Effects on the probability of belonging to the labor force were thus examined. The MxFLS asked individuals whether they had worked, carried out activities to help with household expenditures, or sought work in the previous week. Those who responded "Yes" were classified in the estimate as part of the labor force.

Table 6: Labor Force Participation, Age 15-18

	Nuclear	Siblings	Parents	Non-nuclear
Males				
OLS	0.06	0.09	0.03	0.03
	[0.05]	[0.06]	[0.07]	[0.03]
IV	0.28**	0.41**	0.39**	0.34
	[0.13]	[0.20]	[0.18]	[0.26]
N	1366	1257	1210	1482
Exogeneity	0.54	0.90	0.43	0.23
F-First Stage	18.21	8.25	18.4	5.43
Females				
OLS	0.01	0.01	0.01	0.01
	[0.03]	[0.04]	[0.05]	[0.03]
IV	0.11	0.18	0.22	0.42*
	[0.13]	[0.17]	[0.20]	[0.26]
N	1470	1344	1262	1521
Exogeneity	0.78	0.77	0.83	0.65
F-First Stage	18.09	17.06	15.00	5.05

Notes. Controls: Personal characteristics, household structure, economic shocks, educational infrastructure, quality of services, rural, schooling of adults, and region year fixed effects. Clustered standard errors at locality level in brackets. *p < .10 ** p < .05 *** p< .01

Table 6 shows the results for labor force participation. The same specifications are used as for school attendance, omitting columns I and II. The effect on labor force participation is positive for males belonging to nuclear family migration networks in IV estimates, both for sibling and parental networks. The effect of non-nuclear family networks is not significant, as in the case of school attendance of young females. These results suggest that early participation in the labor market among males substitute the lower school attendance.

5.4. Robustness and Checks

The results described thus far raise some questions. One is why migration with no nuclear family networks seems to have a null effect on human capital decisions. Another refers to the theoretical model developed in section 3. In that model, only parental absence could cause a family stress that increased costs, while the absence of siblings would have no effect on the cost of producing human capital. I will provide evidence suggesting that the absence of siblings in the household relates to the normal process of young adults' separation from the home, which diminishes the worry about negative effects associated with sibling migration, other than the effect on the probability of migration. A third issue is whether the results still hold under other specifications.

Effects on the probability of migration

The fact that only nuclear family migration networks member have effects on human capital decisions may be due to their greater effect on the probability of migration. Fortunately the MxFLS allows for the evaluation of this possibility, as it includes individuals who migrated in 2002-2005 and recovers the characteristics observed in 2002. To establish whether this hypothesis may be valid, I estimate the following equation:

$$M_{is} = \alpha + \beta R_i + \gamma B_i + \lambda P_i + \rho X_i + \varepsilon_{is}. \qquad (13)$$

M_{is} is the indicator of whether the individual i in locality s migrates or not. R_i indicates whether the individual has some type of migration network, B_i indicates whether the individual has a nuclear family network, P_i indicates whether the individual has a parental migration network, and X_i are additional controls. Errors may be correlated at the level of each locality s. To know the level at which the migration network increases the likelihood of migration, it is necessary to observe the parameters β, γ, and λ. The effect of non-nuclear family networks is measured by β, the effect of nuclear family networks is the sum of $\beta + \gamma$, and the effect of parental networks is the sum of all three parameters.

Table 7: Migration Network

	Males		Females	
	I	II	I	II
N	1644	1644	1322	1060
Any Member	0.04*	0.06**	0.02	0.02*
	[0.02]	[0.03]	[0.01]	[0.01]
Nuclear Family	0.14***	0.08*	0.05***	0.03*
	[0.04]	[0.05]	[0.02]	[0.02]
Parents	-0.01	-0.02	0.04	0.04
	[0.08]	[0.09]	[0.05]	[0.05]
Constant	0.06***		0.02*	
	[0.02]		[0.01]	

Notes. Column I includes variables listed. Column II includes age, indigenous membership, schooling of adults, household members aged <5, 6-14, 15-18, 15-24, >64, economic shocks, local educational infrastructure, rural, and regional dummies. Clustered standard errors at locality level in brackets. *p < .10 ** p < .05 *** p < .01

Table 7 shows the results of a linear probability model for migration from 2002 to 2005 for males and females aged 15 to 24, with two specifications. In the first, there is no additional control. In the second, X includes variables related to family structure, economic shocks in the home in the previous five years, the existence of educational infrastructure, rural or urban status of localities, and regional dummies. The results show that non-nuclear family networks have a positive effect on migration, both for males and females, once we consider controls. Networks within the nuclear family increase migration significantly,

compared with the non-nuclear network: from 8 to 14 percent for males and 5 to 7 percent for females. Finally, the fact that the migration network includes one of the parents does not significantly change the probability of migration for young people in a nearby horizon, beyond the effect of the nuclear family.

Thus, the lower effect on migration of non-family migration networks could explain the apparent lack of effect on human capital accumulation. The results also show that the effect of migration networks on the probability of migration in the nearby horizon is lower in females than in males, a factor possibly explaining the apparent lack of effect among females.

Family Size

To determine whether the absence of siblings is part of the normal process of separation of young adults from the home, we can make the same estimates as in columns I, II, and III of Table 3, but with the number of young people at home as the dependent variable. In the first three columns, the number of young people aged 15 to 18 is the dependent variable; in the last three, it is the number aged 19 to 24.

Table 8: Number of Siblings

Age	15-18			19-24		
	I	II	III	I	II	III
OLS	-0.09	-0.05	-0.05	0.01	-0.06	-0.06
	[0.07]	[0.07]	[0.07]	[0.08]	[0.07]	[0.07]
IV	-0.01	0.00	0.05	0.11	0.02	0.08
	[0.24]	[0.23]	[0.22]	[0.29]	[0.29]	[0.29]

Notes. I, II, and III are the same specifications as in Table 4, except for dependent variable. Clustered standard errors at locality level in brackets. *p < .10 ** p < .05 *** p < .01 .

The results appear in Table 8. OLS and instrumental variables show that the difference is not significant. Taken together, these estimates suggest that the absence of siblings occurs at a point close to where they would have left the home by internal migration or marriage.

We can thus expect fewer negative effects of family stress or effects on household production than in the case of parental absence.

Fixed Effects at the State Level

Preliminary estimates without the use of regional variables showed greater effects on school attendance. It is possible that including regions of smaller size lessens the estimated effects. Table 9 shows evidence that this is not the case. This table presents the estimated effect with instrumental variables, making two changes to the specification of column III in Table 3. The first is that fixed effects are used at the state rather than regional level. The second is that only two instrumental variables are used: the interaction of the 1950s rate of migration with the rural sector and with low-education households. The effects of these changes appear in the columns Nuclear Family, Siblings, Parents, and Non-Nuclear.

The results show effects even greater than in the previous analyses: migration by members of the nuclear family, both siblings and parents, significantly diminishes school attendance among males, though it has a non-significant effect among females. There is no evidence of an impact on the cognitive abilities test. Dropping out of school is also associated with a higher supply of male labor. The effects of parental migration on school attendance and labor force participation are larger than the effects of sibling migration. The significance of instruments in the first stage is low in the case of non-nuclear migration.

6 Remarks and Conclusions

This article shows that migration from Mexico to the United States produces a negative effect on the accumulation of human capital, as measured by school attendance among males aged 15 to 18. Considering that migration of siblings is part of the normal process of separation of young Mexicans from their families, the negative effect of sibling migration is explained by two factors: i) the low returns to education received in Mexico once migrants are in the U.S. labor market; and ii) the increased probability of migration among young

people left behind due to lower migration costs. Parental migration also exhibits a larger, negative effect, which suggests that other channels through which migration affects families are also playing a role. Factors associated with incentives rather than the stress caused by parental absence could explain most of the negative effect found in prior literature. This is because parental absence represents a smaller proportion of cases and because the estimated effect is less than twice the effect of sibling migration.

Table 9: Robustness

	Nuclear Family	Siblings	Parents	Non-nuclear
Males				
Attendance	-0.51**	-0.58**	-0.77**	-2.17
	[0.21]	[0.26]	[0.36]	[2.14]
Exogeneity	0.24	0.43	0.23	0.74
F First Stage	13.50	7.43	11.00	0.59
Cognitive Test	-0.70	-0.61	-0.11	2.30
	[1.06]	[1.44]	[1.35]	[5.24]
Exogeneity	0.33	0.27	0.69	0.63
Labor Force Participation	0.50*	0.60*	0.79**	3.02
	[0.26]	[0.34]	[0.40]	[2.59]
Exogeneity	0.51	0.93	0.35	0.99
Females				
Attendance	-0.03	-0.01	-0.15	0.13
	[0.14]	[0.18]	[0.23]	[0.40]
Exogeneity	0.14	0.09	0.46	0.49
F First Stage	18.61	23.13	10.07	3.28
Cognitive Test	0.58	0.56	1.27	-0.46
	[0.76]	[0.85]	[1.29]	[2.06]
Exogeneity	0.62	0.69	0.97	0.70
Labor Force Participation	0.09	0.19	0.26	0.77
	[0.16]	[0.18]	[0.28]	[0.48]
Exogeneity	0.48	0.53	0.70	0.92

Notes. Controls: Personal characteristics, household structure, economic shocks, local educational infrastructure, quality of services, rural, schooling of adults, and region year fixed effects. Clustered standard errors at locality level in brackets. *p < .10 ** p < .05 *** p < .01

The results of this study differ in some aspects from previous literature on the same age group. I find that the effect among females is not significantly distinct from zero, in contrast

to the negative effect found by McKenzie and Rapoport (2011). Two possible explanations could support the zero effect among females. First, females tend to migrate less than males do. Second, when they do migrate, their participation in the U.S. labor market is less. The difference could also be because of the different periods covered by the respective datasets. My findings of no effect of networks outside nuclear family contrast with Meza and Pederzini (2009) where migration within locality negatively affects human capital decisions. Instrumental variables estimation shows a poor performance in the case of non nuclear family migrant networks. Then I cannot rule out that migration beyond nuclear family has also a negative impact.

I also find that lesser school attendance substitutes for greater labor force participation, in contrast to the results reported by Halpern-Manners (2011). With respect to Powers (2011), my findings suggest that sibling migration exerts a negative effect on human capital accumulation at later ages, typically when young Mexicans decide to drop out of high school. Also, neither parental migration nor sibling migration produces negative effects on cognitive ability, suggesting that dropout decisions are not part of cumulative effects at an early age.

Interpretation of the causes of the adverse effect of sibling migration rests on the assumption that migration of siblings produces no significant effects in the home beyond the reduction in migration cost. Evidence shows that the structure of households in which young people with migrant siblings live is similar to other households, suggesting that international migration is happening at the same time as other phenomena that would have caused the abandonment of the home by young adults. The unique difference is that they are international migrants instead of internal migrants or young adults forming a new household. This allays the concern that absence of siblings could have a potentially negative effect other than lowering migration costs.

The negative effect had an impact on almost 15 percent of the male population of Mexico in 2002-2005. During the recent crisis, migration from Mexico to the U.S. has dropped, posing some doubts about the importance of the negative effect. This question remains uncertain. It is also important to note that the policy concern of these phenomena includes both countries, given the fact that a large part of the affected population is living in

the United States today. Also, in the case of the sending country, results indicate that negative impacts of international migration, as the results on human capital of this paper, coexist with the positive impact of remittances. Then, a better understanding of the joint effect of migration and public policies is needed to improve the welfare in sending regions.

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Appendix A

To determine whether parents will migrate in the first stage, we compare the utility without migration and utility with migration in three cases.

Case 1 . $R_m \geq g_h - g_l$. Utility without migration is $t(m_o + H_l) - g_s + m_o + H_h$ and utility with migration is $m_d + \rho H_l - g_h + m_o + H_h$. Comparing utilities, the parent will migrate if

$$t \leq \frac{m_d + \rho H_l + (g_s - g_h)}{m_o + H_l} = t_1 \qquad (14)$$

Case 2 . $g_h - g_l > R_m \geq g_s$. Utility without migration is $t(m_o + H_l) - g_s + m_o + H_h$ and utility with migration is $2(m_d + \rho H_l) - g_l$. The parent will migrate if:

$$t \leq \frac{2(m_d + \rho H_l) - (m_o + H_h) + (g_s - g_l)}{m_o + H_l} = t_2 \qquad (15)$$

Case 3 . $R_m < g_s$. Utility without migration is $t(m_o + H_l) + m_d + \rho H_l$ and utility with migration is $m_d + \rho H_l - g_l + m_d + \rho H_l$. The parent will migrate if:

$$t \leq \frac{m_d + \rho H_l - g_l}{m_o + H_l} = t_3 \qquad (16)$$

Inequalities (14), (15), and (16) imply that the lower the value of t, the greater the incentive to migrate. This means that if other inputs and the desired type of human capital are fixed and there is a random distribution of t, the parent who has to spend more time in the production of human capital is the one with incentives to migrate. In other words, migration selects parents from households with lower productivity in human capital formation.

A question that remains unresolved is whether inequalities (14), (15), and (16) contradict inequality (5), meaning, in fact, that there are some individuals having incentives to migrate depending on their value of t. Consider the following *Lemma 1: Under assumptions of the model*, $t_3 > t_m$. *With the additional assumption* $m_d + \rho H_l - (m_o + H_l) > (g_h - g_l) - g_s$, $t_1 > t_m$ *and* $t_2 > t_m$. Then, there are feasible realizations of t causing migration in all cases.

Proof Lemma 1. For $t_3 > t_m$ it is necessary that $m_d + \rho H_l > m_o + H_l$. This is true under the assumption made in stage 3 of the game. Under our assumption that $m_d + \rho H_l - (m_o + H_l) > (g_h - g_l) - g_s$, $t_1 > t_m$. Also, $t_2 > t_m$ if $m_d + \rho H_l - (m_o + H_l) > m_o + H_h - (m_d + \rho H_l) - g_s$. This holds if we take into account the assumption made and $R_m \leq (g_h - g_l)$. This last is true because we are in the case where $g_h - g_l > R_m$.

Appendix B

When $R_m \geq g_h - g_l$, two conditions are necessary to ensure migration and transfer of high human capital. The first requires that the utility with migration $(m_d + \rho H_b - g_h + m_o + H_h)$ is higher than the utility without migration $(t(m_o + H_l) + m_d + \rho H_l)$. This holds if:

$$t \leq \frac{m_o + H_h - g_h}{m_o + H_l} = t_4 \tag{17}$$

Also, income after migration must allow the individual to overcome liquidity constraints in order to transfer high human capital. That is, $m_d + \rho H_l - g_h \geq c > t_c(m_o + H_l) - g_s$ must also be satisfied. This happens only if:

$$t < \frac{m_d + \rho H_l - (g_h - g_s)}{m_o + H_l} = t_c \tag{18}$$

Inequality (18) is a necessary condition to overcome liquidity constraints. If the inequality is not met, parents cannot finance high education even with migration. From the above conditions, it is not clear whether parents who migrate always overcome liquidity constraints. For that we have *Lemma 2: When* $R_m \geq g_h - g_l$ *and assuming that* $m_d + \rho H_l - (m_o + H_l) > (g_h - g_l) - g_s$, $t_4 > t_c > t_m$.

Proof Lemma 2. For $t_4 \geq t_c$ it is only necessary that $R_m > g_s$. This is true since we are in the case where $R_m \geq g_h - g_l$, and we know by assumption that $g_h - g_l > g_s$. For $t_c > t_m$ we only need the assumption of the Lemma.

Lemma 2 shows that there are some values of t where parents can migrate, but cannot overcome liquidity constraints, when $t_4 > t > t_c$. Then, $R_m \geq g_a - g_b$ does not ensure a positive migration effect in all cases.

The question that remains is whether migration is still desirable under these circumstances. When parents who migrate and parents who do not migrate transfer low education, payments will be the same as in Case 3 of the solution without liquidity constraints. The next Lemma ensures that some parents will migrate, even when they cannot overcome liquidity constraints, if we are in the case where $R_m \geq g_h - g_l$. *Lemma 3: Under the assumptions made,* $t_4 \geq t_3 > t_c$. This lemma ensures that some parents will still migrate.

Proof Lemma 3. For $t_4 \geq t_3$ we need $R_m \geq g_h - g_l$, which is satisfied since we are in that case. For $t_3 > t_c$ it is only necessary that $g_h - g_l > g_s$. This is true from the assumptions of the model.

When $R_m < g_h - g_l$, parents migrate if inequality (16) holds. Migrant and non-migrant parents do not differ in their choice of human capital.

II. Remittances as an Insurance Mechanism in the Labor Market

1 Introduction

Lack of access to credit and insurance markets characterizes many regions in underdeveloped countries. Households must establish alternative strategies to smooth their consumption against temporary fluctuations in income. If the fluctuations are drastic, it is possible that households may have to reduce spending on food and other items necessary for their long-term welfare, such as investments in human capital.

International remittances are an important source of income for Mexico. In 2005, the country was the third largest recipient of remittances in the world, amounting to 2.8 billion U.S. dollars, representing 2.8 percent of the Mexican GDP (Fajnzylber and Lopez, 2008). Mexican migration is almost exclusively to the United States, and is characterized by a large share of low- and middle-income individuals from households with limited access to formal credit markets. The analysis of international remittances as an insurance mechanism is thus of crucial importance.

Previous literature has shown that Mexican migrants facing greater income uncertainty in the U.S. tend to send more remittances (Amuedo-Dorantes and Pozo, 2006). Evidence also indicates that international remittances increase in response to an aggregate shock, such as the Mexican crisis of 1995 (McKenzie, 2003), and that they reduce income volatility (Amuedo-Dorantes and Pozo, 2011). Households receiving remittances reduce their probability of being in poverty, but the effect is only significant with respect to food-

and capabilities-based poverty, without a significant effect on asset-based poverty (Esquivel and Huerta-Pineda, 2006).

This study contributes to the analysis by showing that remittances can reduce the volatility of income against shocks in the labor market. However, the main difference between households with greater connections to migrants in the U.S. and those with lesser connections is the average economic aid received. Thus, the alleviation of poverty through remittances comes from motives not associated with insurance.

A weakness of previous literature is its focus on the analysis of international remittances as insurance mechanism in Mexico without considering that many of these cash flows could exist between households if migrants were Mexican residents. Receipt of transfers from other households in Mexico is higher than the receipt of remittances. In 2006, 15.8 percent of Mexican households received a transfer from other households in Mexico, representing 5.1 per cent of total income, compared with only 6.1 per cent of Mexican households receiving remittances and 3.9 percent of the total income due to remittances.[9]

This paper divides the analysis of remittances into two related questions: 1) Are Mexican households that face a transitory idiosyncratic shock in the labor market more likely to receive international remittances? and 2) Do households with greater access to international migration networks cope with these shocks to a greater extent through private transfers? The first question seeks to determine whether international remittances serve as a mechanism by Mexican households to deal with negative events affecting only the household, without attempting to discriminate whether this happens as part of a coinsurance contract or through altruism. This is in line with previous research. However, our results only cover shocks specific to household (idyosincratic) and are not directly comparable to results measuring shocks at locality or other level of aggregation. The second question arises from concerns about the effect on welfare. Households not receiving remittances

[9] 2006 National Survey on Household Incomes and Expenses (ENIGH).

could also benefit from economic aid from other households in Mexico, transfers that would exist without international migration. Thus, in order to assess welfare differences between households related to migrants in the U.S. and other households, we need to know whether they receive more economic aid independent of whether they receive remittances. If households with a greater connection with migratory networks in the U.S. have a higher level of insurance, public policy intervention designed to smooth consumption is more urgent in regions with fewer connections to such networks.

Loss of labor income by household heads is the measure of transitory idiosyncratic shocks. Apart from its underdeveloped financial system, Mexico has no public unemployment insurance mechanism; this shock therefore represents a drastic loss of income. Variables such as the labor participation of the household head spouse , their hours worked, and the hours worked by other household members are also analyzed to see whether households with greater connections to international migration differ from households with less connection.

To answer these questions, this study exploits The National Survey of Employment and Occupation (ENOE) database, taking advantage of the longitudinal structure of the data to deal with the endogeneity between shocks and remittances. We show in the paper that the probability of receiving remittances doubles among households whose heads lose employment, especially if we focus on the quarter of the loss. The same applies to the probability of receiving inter-household transfers within Mexico. Overall, the increased probability of receiving aid among households that have greater access to U.S. migration networks is no different among other households. However, although the probability increase is the same, households with greater access to migratory networks on average receive more economic aid, which could help them to cope with shocks more easily. Private transfers are a mechanism of insurance used extensively among low-income households. However, the availability of this mechanism decreases in the presence of aggregate shocks. Other adjustment variables related to the labor supply of the household

head spouse, or other household members do not change in the short term, either among households with greater access to migratory networks or those with less.

The following section provides a review of relevant literature. Section 3 presents some theoretical considerations. The data and empirical strategy are described in Section 4. Results are presented in Section 5, and conclusions in Section 6.

2 Previous Literature

This research involves two bodies of economic literature. The first focuses on explaining the motivation behind remittances; the second analyzes household behavior in response to economic shocks and their effects on consumption, labor supply, human capital investment, and other variables of interest. These bodies of literature overlap because remittances can be one of the mechanisms enabling families to smooth their consumption, given an absence of or imperfections in formal credit and insurance markets.

The literature on remittances has pointed out that one of the motivations for such transfers is a coinsurance contract between the migrant and other members of the locality of origin (Lucas and Stark, 1985; Docquier and Rapoport, 2006). However, this type of contract faces moral hazard and asymmetric information problems (Gubert, 2000; Docquier and Rapoport, 2006). Once the migrant insures a minimum consumption to his family or others in his place of origin, the insured may have incentives to reduce their own effort. Also, migrants may not perfectly monitor this effort or the outcome variables. This could be especially true in international migration, where absence is typically long-term, making the migrant more dependent on information provided by the recipient of remittances.

At the empirical level, it is difficult to establish whether remittance flows are due to coinsurance contracts or to other reasons that may also involve an increase in remittances

as a response to a transitory decrease in income (Clarke and Wallsten, 2003). For example, altruistic feelings of migrants towards members of their family or community can also involve an increase in remittances (Docquier and Rapoport, 2006).

Given the difficulty of establishing whether the flow of remittances is part of a coinsurance contract or is simply due to altruism, the empirical literature is mostly committed to establishing whether a decrease in income, either specific to the home or with some level of aggregation, causes an increase in remittances. Clarke and Wallsten (2003) find that remittances have increased in Jamaica because of the damage caused in 1988 by Hurricane Gilbert, acting as an insurance mechanism among the families that suffered greater damages. Yang and Choi (2007) use rain shocks as an instrumental variable of changes in income in the Philippines. They find that remittances increase when there is a decrease in household income and that remittances replace the full change in income. Morten (2010), with a sample of 10 Indian villages, also finds that remittances from outside a village respond positively to shocks in households. In addition, remittances not only increase in response to an idiosyncratic shock in the household; they also respond positively to aggregate shocks at the caste or sub-caste level.

From the migrant's perspective, Amuedo-Dorantes and Pozo (2006) show that migrants facing greater income uncertainty tend to send more remittances, possibly as a payment for insurance in case of failure and a return to Mexico. Receipt of remittances also implies a lower income variance among Mexican households (Amuedo-Dorantes and Pozo, 2011). Households receiving remittances reduce their probability of being in poverty, but the effect is only significant on food- and capabilities-based poverty, without a significant effect on asset-based poverty (Esquivel and Huerta-Pineda, 2006).[10]

National and international remittances are only one of the mechanisms that households can use to cope with income shocks to smooth their consumption. Households can reduce their assets and savings or increase the labor supply of some of their members.

10 The results are similar taking into account only rural households. See Taylor et al. (2005).

Even family structure changes to protect households against risk (Rosenzweig, 1988). With respect to labor supply, Cameron and Worswick (2003) show that households in Indonesia coping with crop loss react by finding additional jobs, whose additional income is an important resource for smoothing consumption. Similar evidence comes from India for households with agricultural activities (Kochar, 1999). The evidence of adjustments in labor supply also exists among urban households in Mexico. Parker and Skoufias (2004) show that women's labor force participation among urban households increases in response to husbands' unemployment, noting a significant effect during the 1995 crisis. The effect of husbands' wages on women's labor supply has received significant attention in the literature on labor supply, with some studies of advanced economies finding substitution between the labor supply of different family members (Blundell and Macurdy, 1999).

Ultimately, despite a lack of access to credit or insurance markets, household consumption may have high levels of insurance (Townsend, 1994). However, in the Mexican case, insurance of non-durable goods consumption is not complete, and the evidence suggests that investments in human capital decrease in the presence of idiosyncratic shocks (Attanasio and Szekely, 2001). The effectiveness of household strategies may depend on whether the shocks are idiosyncratic or aggregate. For example, with the aggregate shock of the 1995 crisis, Mexican households reduced transfers to other households and were unable to increase their labor supply, evidencing problems in two common mechanisms used to cope with idiosyncratic shocks. However, they received larger remittances from abroad (McKenzie, 2003).

This study is the first to examine whether remittances serve as an insurance mechanism against idiosyncratic risks in the labor market, from the standpoint of households left behind in Mexico. While international remittances can serve as an insurance mechanism, internal transfers between households can also have the same function. Even if international migration allows access to higher and stable levels of income information problems associated with distance could inhibit the existence of remittances with insurance motivation between migrants and households remaining in Mexico. Taking

advantage of the fact that international migration is a phenomenon highly concentrated in certain geographical regions, the study investigates whether households living in these regions use private transfers as an insurance mechanism to a greater extent. This determination allows us to assess whether considerations of consumption smoothing are the most important in reducing poverty by means of remittances.

Unfortunately, the measure in the dataset of international remittances and private transfers from other Mexican households only tells us whether a household receives economic aid or not; estimations thus cover only the extensive margin. Effects on the labor supply of other household members will help to establish whether insurance mechanisms differ between households with high and low access to migration networks in the U.S.

3 Theoretical Considerations

In this section, I propose a simple model aimed at capturing the relationship between access to insurance through private transfers and the use of other household members' labor supply as a mechanism of adjustment to idiosyncratic shocks in the labor market. I posit the existence of a single period, on the assumption that households do not anticipate shocks. We can thus see a response in the current period.

A family with two working age members $i = 1, \quad 2$ faces decisions of labor supply in a period. Wages are known and equal to w_1 and w_2. However, the first member can receive a shock consisting of the impossibility of offering his labor in the market. The second member can freely offer his labor in both scenarios. The utility depends on total household consumption "c" and the hours worked by both members "h", and is given by $u(c, h_1, h_2, x)$. Utility increases with consumption and decreases with hours worked. x is a set of observable and unobservable variables that can shift utility in the household.

Household income has two components: labor income and transfers from other households. The budget constraint becomes $c = h_1 w_1 + h_2 w_2 + T$. Transfers depend on shocks, due to insurance contracts or altruistic sentiments of other households. Without a shock, $S = 0$, a household receives a transfer normalized to $T(S = 0) = 0$. When a household faces a shock, $S = 1$, transfers are positive: $T(S = 1) = T_s$.

Under the first scenario, households solve the following problem:

$$\text{Max}_{h_1\ h_2} \quad u(c, h_1, h_2, x)$$

$$\text{s.t.} \quad c = w_1 h_1 + w_2 h_2 + T, \quad T = 0$$

Assuming an interior solution, first order conditions are:

$$U_1 w_1 + U_2 = 0 \tag{1}$$

$$U_1 w_2 + U_3 = 0 \tag{2}$$

Labor supply rules come from these conditions:

$$h_1(S = 0) = h_1(w_1, w_2, T = 0, x) \tag{3}$$

$$h_2(S = 0) = h_2(w_1, w_2, T = 0, x) \tag{4}$$

In the second scenario, when agent 1 receives a shock, the optimization problem becomes:

$$\text{Max}_{h_2} \quad u(c, h_1 = 0, h_2, x)$$

$$\text{s.t.} \quad c = w_2 h_2 + T, \quad T = T_s$$

The first order condition is:

$$U_1 w_2 + U_3 = 0 \tag{5}$$

and optimal supply

$$h_1(S = 1) = 0 \tag{6}$$

$$h_2(S = 1) = h_2(w_2, T = T_s, x) \tag{7}$$

To know the effect of shocks to the first household member on the labor supply of the second household member, it is necessary to obtain the difference $h_2(S = 1) - h_2(S = 0) = h_2(w_2, T = T_s, x) - h_2(w_1, w_2, T = 0, x)$ The effect comes from two channels. The first arises because labor supply does not depend on the wage of the first individual in the case of shock, and the second because of the increase in non-labor income

of households through an increase of transfers among those with transfers as an insurance mechanism.

If the utility function is separable in h_1, h_2 , and c , and assuming that wages are not correlated with the shock of the first agent, the two effects can be reduced to simple modifications of non-labor income in the optimal supply rule of the second agent. This would be the case if instead of assuming h_1 as an endogenous variable, we take it as a parameter, $h_1 = 0$ where there is a shock and $h_1 = h*$ without a shock, $h* = h_1(S = 0)$ being the optimal supply without a shock. Considering $I = T + h_1 w_1$ the sum of non-labor income in this modified problem, the relevant difference becomes $h_2(S = 1) - h_2(S = 0) = h_2(w_2, I = T_s, x) - h_2(w_2, I = h * w_1, x)$. The shock decreases the non-labor income by the wage of the first agent, but increases non-labor income due to the insurance mechanisms provided by private transfers. If labor supply depends negatively on non-labor income, households receiving transfers from other households as an insurance mechanism will experience a lesser increase in the labor supply of the second member. This would be the case if households living in regions with high migration were more likely to offset the loss of income from the first agent with transfers from other households. To estimate the difference, it will be necessary to take into account that the vector x may differ between individuals with and without a shock in a given period.

4 Data and Empirical Strategy

The data comes from the National Survey of Occupation and Employment (ENOE), a quarterly survey designed to capture the behavior of labor market in Mexico since 2005. Each family is interviewed in 5 consecutive quarters. Interviewers contact one-fifth of the sample for the first time each quarter. An expanded questionnaire included questions about economic aid received by any household member from the first quarter of

2005 to the second quarter of 2006. Subsequently, this question was included only once each year. To capture information about economic aid in all quarters, the sample for this study is restricted to households with the first interview in the first or second quarter of 2005.

Households established in response to the questionnaire whether the origin of aid was the U.S. or Mexico. Unfortunately, the question on aid does not include the monetary amount or whether the aid was monetary. Economic aid received from the U.S. will be referred to hereafter as remittances, aid from other residents of Mexico as Mexican transfers; the term "private transfer" includes both categories.

To establish the importance of remittances, Table 1 shows some of the characteristics dividing households between those who received remittances in at least one of the five quarters and those not receiving remittances. In addition, the table divides households depending on the sex of the household head, because patterns differ significantly according to this variable. Among male-headed households, receipt of remittances only reaches 10 percent while for female-headed households the figure is 23 percent. These proportions are close to double the rate as reported by ENIGH. A possible explanation for the difference is that households receive remittances on an irregular basis, and while ENOE captures information about five quarters, ENIGH only asks about two. Male household heads are older in households receiving remittances; female household heads tend to be younger. Among male-headed households, the differences in marital status and spouse living at home between households receiving and not receiving remittances are small and not significant. Among female-headed households, 40 percent of those receiving remittances have a married household head, versus 15 per cent of those not receiving remittances, but only 3 percent of spouses live at home in the former, compared with 7 percent in the latter. This suggests that a significant portion of remittances among female-headed households come from husbands in the U.S. In both male- and female-headed households, remittances tend to go to rural households with low levels of education and slightly more members than those not receiving remittances.

Table 1: Remittances

	Males		Females	
	Remittances	No Remittances	Remittances	No Remittances
N	2,403	24,512	1,708	6,422
Weighted Households	0.10	0.90	0.23	0.77
Age	54.8	45.8	49.6	53.6
Older	0.40	0.18	0.31	0.36
Schooling	4.89	7.86	5.13	6.23
Size	4.44	4.30	3.63	3.32
Married	0.91	0.92	0.40	0.15
Spouse in Household	0.87	0.88	0.03	0.07
Rural	0.37	0.22	0.32	0.14
Remittances				
1 Quarter	0.61		0.42	
2 Quarters	0.19		0.19	
3 Quarters	0.11		0.15	
4 Quarters	0.07		0.13	
5 Quarters	0.02		0.11	
Transfers from Mexico				
1 Quarter	0.22	0.13	0.25	0.22
2 Quarters	0.10	0.04	0.13	0.12
3 Quarters	0.04	0.02	0.08	0.08
4 Quarters	0.03	0.01	0.06	0.05
5 Quarters	0.01	0.01	0.03	0.04

Notes. Older: Household head >60. Schooling: years of education completed. Size: number of household members. Spouse in household: Household head's spouse lives in the household. Rural: localities with fewer than 2500 inhabitants. 1 Quarter: Household received transfers in one of the five quarters; likewise for other numbers of quarters. In the sociodemographic variables only Married and Spouse in Household are not significantly different in the men case at conventional level.

An important characteristic is that households receive remittances on an irregular basis, especially in the case of households headed by men. Sixty-one percent of households receiving remittances received them in only one of the quarters, and only 2 percent of male-headed households received them in all five quarters. The irregularity in female-headed households was somewhat less, but still considerable: 42 percent of recipient households received remittances in only one quarter, and only 11 percent received them in all five

quarters. This irregularity suggests that motivation behind remittances might be temporary, as insurance against a temporary idiosyncratic shock to household income. Households also tend to receive economic aid from within Mexico. These transfers also arrive irregularly over time; the majority of male-headed households with Mexican transfers received them in only one of the five quarters. Mexican transfers in female-headed households show greater regularity, but even so an important proportion arrives irregularly.

In order to determine whether remittances or Mexican transfers respond to transitory idiosyncratic shocks in the labor market, this study focuses on household heads with more stable labor force participation. The sample is therefore restricted to household heads aged 25 to 55 with a job in the first three quarters of observation. The shock measure is the loss of employment during the fourth quarter. Limiting households to be employed three quarters allows a sample with more stable labor force participation. However, results do not depend on this restriction as shown in section 5. This leaves us with 612 households with a shock and 19,193 households without a shock. Table 2 shows descriptive statistics of both groups in the first quarter.

Household heads who received a shock tend to be female with less schooling, but similar in age and living in households of the same size. Household heads with a shock are more likely to be unmarried. With regard to the receipt of economic aid, households facing a shock in the fourth quarter were more likely to receive remittances and Mexican transfers in the first quarter, but only in the case of remittances is the difference statistically significant. There was some type of private transfer in 12 per cent of households with a shock, but in only 8 percent of those without a shock. Job loss by household heads does not seem to relate to areas of greater receipt of remittances. Viewed at the municipal level, the proportion of households receiving remittances in the year 2000 does not differ between households with and without a shock.[11]

[11] The proportion of households receiving remittances in 2000 comes from the Mexican Census.

Migration and the receipt of remittances are highly concentrated in some municipalities and persistent over time. In making an estimation, this study uses the percentage of households receiving remittances in 2000 as a variable that allows us to identify households with greater links to migrant networks in the U.S.

Table 2: First Quarter Descriptive Statistics

	Shock	No Shock
N	612	19,193
Sex	0.74***	0.88
Age	40.8	40.4
Schooling	7.14***	8.73
Married	0.77***	0.86
Size	4.35	4.44
U.S. Remittances	0.06*	0.03
Mexican Transfers	0.07	0.05
Private Transfers	0.12**	0.08
Remittances 2000	0.04	0.04
Rural	0.23	0.20
Self-employed	0.43***	0.26
Entrepreneur	0.04***	0.08
Long-term Contract	0.13***	0.34
Hours	40.1***	46.1
Labor Force Spouse	0.31	0.30
Hours Spouse	11.0	10.8
Hours Others	32.2	29.8
Hourly Wage	24.4**	29.6
Weekly Household Labor Income	1487***	1883

Notes. U.S. Remittances: Household member received economic aid from someone living or working in the U.S. Mexican Transfers: Household member received economic aid from someone living or working in Mexico. Private Transfers: U.S. Remittances or Mexican Transfers. Remittances 2000: Average receipt of remittances in 2000 at municipality level according to Mexican 2000 Census. Long-term Contract: Employed with a contract with indefinite term. Hours: Hours worked last week. Labor Force Spouse: Spouse worked last week. Hours Spouse: Average hours worked by the spouse, including zero values. Hours Others: Hours worked by all members in household except household head. Hourly Wage: Pesos per hour worked at March 2010 prices. Weekly Household Labor Income: Sum of labor income of all household members. Statistical significance with errors clustered at municipality level: *** $p < .01$, ** $p < .05$, * $p < .10$.

Households with a shock tend to be concentrated in rural areas; however, the difference is small and not statistically significant. Previous studies have emphasized the tendency of rural households to replace the labor supply from agricultural activity on their own farms to other activities off the farm (Cameron and Worswick, 2003; and Kochar, 1999). The measure of shocks in the present study could be capturing little of what happens in rural households facing a crop loss if those households shift to non-farm work, because they will report an employment in ENOE.

The type of activity and the long-term security of employment tend to differ between household heads with and without a shock. Household heads with a shock were self-employed in 43 percent of the cases, as compared with only 26 percent of those in households without. Among those with a shock, entrepreneurial activity is less frequent: only 4 percent were employers, as compared with 8 percent of those without a shock. Only 13 percent of those with a shock had employment contracts for an indefinite term, in contrast to 34 percent of those without.

Household heads with a shock worked fewer hours and earned a lower hourly wage in the first quarter. On average, household heads with a shock worked 6 hours less per week than those without a shock, and had an hourly wage of only 24.4 pesos per hour, as compared with 29.6 pesos among household heads without a shock.

ENOE also captures the labor market behavior of other members of the household. Labor participation and hours worked by the spouse do not differ between households with and without a shock. If we consider hours worked by all household members other than the head, the difference is not statistically significant. Table 2 also indicates that the labor income of households with a shock is statistically less.

4.1 Empirical Strategy

ENOE allows us to observe households before the shock, during the quarter of the shock, and one quarter later. This permits the use of differences-in-differences techniques to estimate the effect. I estimate the following equation:

$$Tr_{it} = \alpha + \beta t_t + \gamma T_i + \delta T_i * t_t + \varepsilon_{it} \quad (8)$$

Tr is any of the outcome variables: remittances, Mexican transfers, or private transfers. t is a dummy variable with value 1 in the quarter of the shock and one quarter later, and T is a dummy variable with value 1 for households that received a shock. δ measures the effect of the treatment (T) on the outcome variable (Tr) and is known as the differences-in-differences estimator. This strategy allows control for fixed differences in the receipt of remittances between households with and without a shock. The main risk in this identification strategy is that households with a shock differ in the temporal trend of receiving remittances, or $Cov(T_i * t_t, \varepsilon_{it}) = 0$ not holding. For example, if households anticipate that they will receive some type of financial support, either from U.S. or from Mexico, they could reduce their labor supply in response to that expectation. In that case, causality goes from remittances to shock. I discuss this possibility in section 5.4. Results are similar using a fixed effects specification that controls for fixed differences at the household level. However, some differences-in-differences estimation parameters are of particular interest. We not only want to know whether remittances are increased as a result of the shock, but also whether households with greater access to international migration networks make greater use of transfers from other households as an insurance mechanism. Households in regions with a high concentration of international remittances in the year 2000 will be identified with the dummy variable Hm. A modification of the previous equation allows analysis of whether the effect of the shock differs between individuals with high and low access to migration networks in the U.S.:

$$Tr_{it} = \alpha + \beta t_t + \gamma T_i + \eta Hm_i + \delta T_i * t_t + \theta Hm_i * t_t + \lambda Hm_i * T_i + \rho Hm_i * t_t * T_i + \varepsilon_{it} \quad (9)$$

Here the parameter of interest is ρ. This estimator measures the difference in the effect of the shock between households with high and low access to international migration networks, discounting trends due to factors others than the shock. Estimation of ρ is known as the triple differences estimator. We can add additional controls or quarter effects to both equations.

5 Results

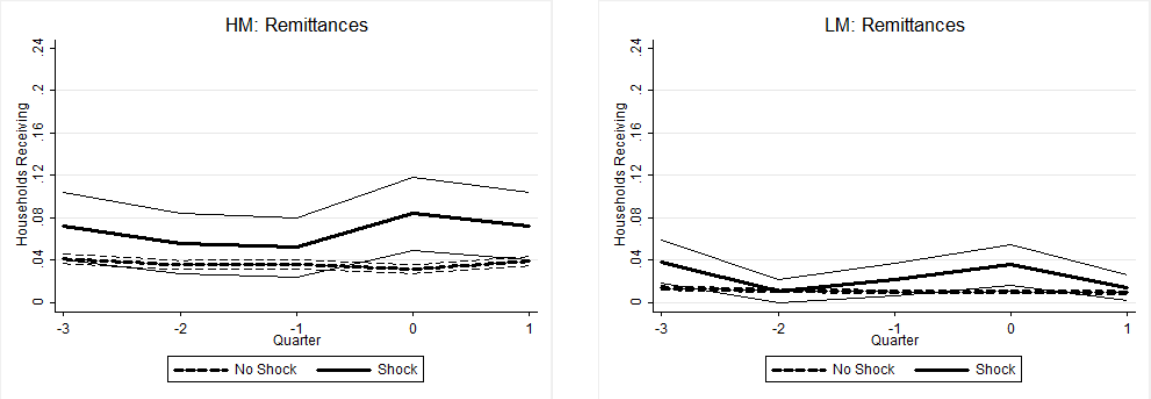
5.1 Economic Aid

Before presenting the results, it is instructive to observe the behavior of variables graphically. The effect of employment loss on receipt of economic aid from other households appears in Figures 1-3. I divide households between those in municipalities where the number receiving remittances in 2000 is greater than or equal to 4 percent (HM), according to the census, and those where the number is less than 4 percent (LM). This leads to 29.43 percent of households living in municipalities with high access to migration networks. The horizontal axis shows the five quarters of observation, with the quarter in which the household head lost employment labeled Quarter 0.

Figure 1 shows that households with a shock have a higher probability of receiving remittances, both in areas with high and low access to migration networks. The probability of receiving remittances among those who received a shock is higher in the quarter of the shock, while households without a shock show stable behavior across quarters. Figure 2 shows that the probability of Mexican transfers is higher among households with a shock, in areas with both high and low migration. The probability of Mexican transfers increases substantially in the quarter of the shock. This increase of internal transfers holds in the quarter after the shock. Remittances, on the other hand, tend to concentrate in the quarter of the shock.

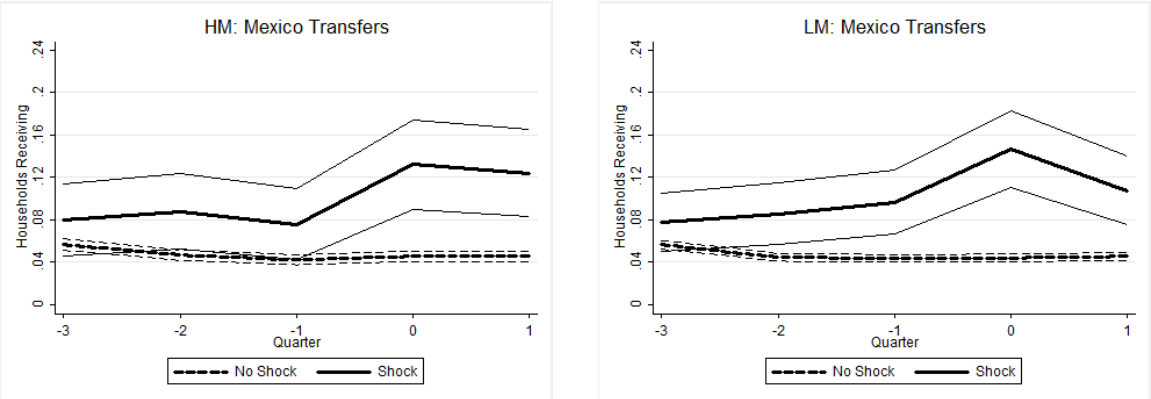
Figure 3 shows what happens when we look at receipt of any type of private transfer. On average, the probability of receipt is higher in regions with greater receipt of remittances. We also see that the proportion of households receiving some type of aid shows an increase in the quarter of the shock, although it is not clear if the size of the increase is larger among households living in areas with greater access to international migration networks.

Figure 1. U.S. Remittances



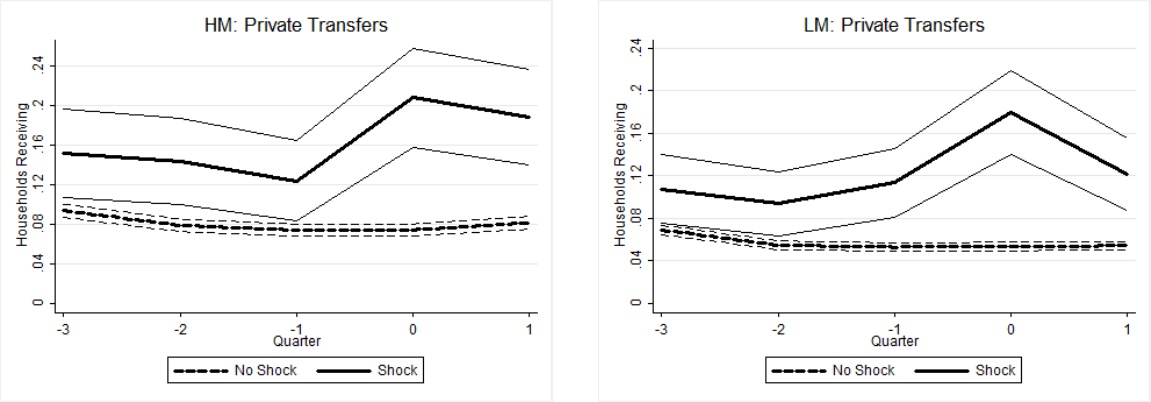
Notes. HM represents municipalities with more than 4 percent of households receiving remittances, according to the 2000 Census. LM is the rest of the country. Shock is households where household head lost employment in Quarter 4 of observation. Thin lines are 95 percent confidence intervals.

Figure 2. Mexican Transfers



See Notes Figure 1.

Figure 3. Private Transfers



See Notes Figure 1.

To determine the statistical significance of the increase in remittances, Mexican transfers, and any type of private transfers during the quarter of the shock and the following quarter, a differences-in-differences (DD) estimator is used. Table 3 shows the results. The parameter of interest is the interaction between the variables Shock and Time1. Shock is a dummy variable with value 1 for households that received a shock; Time1 is a dummy variable with value 1 for Quarters 4 and 5 of observation. Two specifications are shown in each outcome variable. In the first column, quarter effects and a set of controls are added: years of schooling, age, marital status, and sex of the household head, household size in quarter 1, and whether households are in a locality with less than 2,500 inhabitants. In the second, a specification using fixed effects (FE) shows the robustness of results.

The results demonstrate that because of the shock, the probability of receiving remittances increases an average of 0.0148 in the quarter of employment loss and the following quarter. The probability of receiving transfers from Mexico increases by 0.0389, and the likelihood of receiving any type of private transfer increases by 0.0562. In all three cases, the parameters are statistically significant. The estimator is also close in all three

cases to the average quarterly receipt of the type of aid in question. Among these households, the probability of receiving remittances in a given quarter is 0.0166, of receiving Mexican transfers is 0.0343, and of receiving any type of private transfer is 0.0495.

Table 3: Difference-in-Difference Estimation. Economic Aid

	U.S. Remittances		Mexican Transfers		Private Transfers	
	DD	FE	DD	FE	DD	FE
Shock	1.00		1.11		1.65	
	[0.93]		[0.90]		[1.16]	
Time1	-0.18		-0.54**		0.07	
	[0.35]		[0.23]		[0.56]	
Shock*Time1	1.48*	1.48*	3.89***	3.95***	5.62***	5.71***
	[0.83]	[0.81]	[1.24]	[1.42]	[1.43]	[1.45]
Quarter Effects	Y	Y	Y	Y	Y	Y
Controls	Y		Y		Y	

Notes. Sample is restricted to households with heads aged 25 to 55 employed in the first three quarters of observation. Shock: household head without employment in fourth quarter. Time1: fourth and fifth quarters. Controls: sex, age, schooling, rural, household size, and marital status. Statistical significance with errors clustered at municipality level: *** $p < .01$, ** $p < .05$, * $p < .10$. DD column uses difference-in-difference estimates. FE column shows fixed effects estimation.

Even if families can use remittances as an insurance mechanism, it is not clear that households with greater connections to migrants in the U.S. are insured to a greater extent than other households. While international remittances can be used in this way, Mexican transfers are also greatly increased. In addition, although respondents declared that they received transfers from within Mexico, the possibility that aid was originally sent from the U.S. to another family cannot be ruled out, as has been reported in India, where some households receive remittances to transfer to others as part of a risk-sharing mechanism.[12]

12 For example, see Morten, 2010.

To establish differences among households with low and high access to migratory networks in the receipt of remittances, Mexican transfers, or any type of private transfer, Table 4 shows the results of estimation in triple differences (DDD). Here the parameter of interest is the triple interaction between the variables Time1, Shock, and Hm. This parameter measures the difference in the effect of the shock among households with low and high access to migratory networks in the U.S., discounting the differences in trends between the two types. In every case the parameter is positive and significant, indicating that the effect of a shock on the likelihood of receiving any type of economic aid from other households does not differ according to access to migratory networks in the U.S. The specification in fixed effects shows similar results.

The triple differences estimator suggests that economic aid from other households is not a mechanism that allows households with greater access to migratory networks to mitigate the effect of the shock in consumption or other variables. However, this conclusion can be misleading. Figure 3 suggests that households living in regions with high receipt of remittances are on average more likely to receive some type of private transfer. This can also be analyzed with the parameters in Table 4. Before the shock, the difference between households with a shock with high versus low access is the sum of parameters in Hm and Hm*Shock. After the shock, the difference is the sum of parameters in Hm, Hm*Shock , Hm*Time1, and Hm*Time1*Shock. The parameter in Hm is significantly different from zero, while the rest are not. This means that on average, the probability is 0.0328 greater that households with high access to international migration networks will receive private transfers before and after the shock. Although households do not differ in the likelihood of additional economic assistance during a shock based on access to migratory networks, the probability of receiving aid is greater if we consider differences in trends. It is also possible that the results are only valid on the extensive margin and that once households with high access to migratory networks receive aid, the quantity received is greater. ENOE does not allow us to evaluate this possibility.

Table 4: Triple Difference Estimation. Economic Aid

	U.S. Remittances		Mexican Transfers		Private Transfers		
	DDD	FE	DDD	FE	DDD	FE	FE all
Shock	0.61		1.26		0.88		
	[1.16]		[1.20]		[1.43]		
Time1	-0.04		-0.08		-0.10		
	[0.35]		[0.58]		[0.65]		
Shock*Time1	0.55	0.56	3.42**	3.45*	5.10***	5.09***	9.47***
	[0.69]	[0.71]	[1.66]	[1.93]	[1.77]	[1.88]	[1.00]
Hm	3.63***		0.03		3.28***		
	[0.77]		[0.80]		[1.11]		
Hm*Time1	-0.51		0.98		0.56		
	[0.90]		[0.94]		[1.27]		
Hm*Shock	0.76		-0.41		1.83		
	[1.92]		[1.73]		[2.40]		
Hm*Time1*Shock	2.65	2.64	1.30	1.46	1.47	1.76	1.70
	[2.06]	[1.99]	[2.43]	[2.65]	[2.97]	[2.88]	[1.71]
Quarter Effects	Y	Y	Y	Y	Y	Y	Y
Controls	Y		Y		Y		

Notes. Sample is restricted to households with heads aged 25 to 55 employed in the first three quarters of observation. Shock: household head without employment in fourth quarter. Time1: fourth and fifth quarters. Controls: sex, age, schooling, rural, household size, and marital status. Statistical significance with errors clustered at municipality level: *** $p < .01$, ** $p < .05$, * $p < .10$. DDD column uses triple difference estimates. FE column shows fixed effects estimation. FE all includes all households with the household head at least a quartes employed. In this case the shock is defined as not being employed in the current quarter.

Three robustness tests confirm the nonsignificant difference in the receipt of economic aid according to migration networks. First, instead of defining the shock in the fourth quarter I used household heads who lost their employment in the third quarter observing the receipt of private transfers in the last three quarters with similar results as in Table 4. The second robustness test consisted in the interaction of shock with the rate of migration at municipality level in the FE specification instead of using a dummy with the cutoff of 4 per cent. Again, results showed a non significant difference in municipalities with greater connections with migrants in the US. The last robustness included all household heads with at least one quarter employed. I defined shock as the lack of employment in the current quarter and used a fixed effects approach. Results of this

robustness test appear in the column "FE all" in Table 4. We see a greater effect when we concentrate in the quarter of the shock. However, a difference according to migration networks is not significant.

Estimates on remittances and Mexican transfers show that the higher probability of receiving some type of economic aid comes precisely from remittances. None of the parameters showing differences between households with high and low access to migratory networks have differences in the receipt of Mexican transfers, while in the case of remittances the Hm parameter is statistically significant.

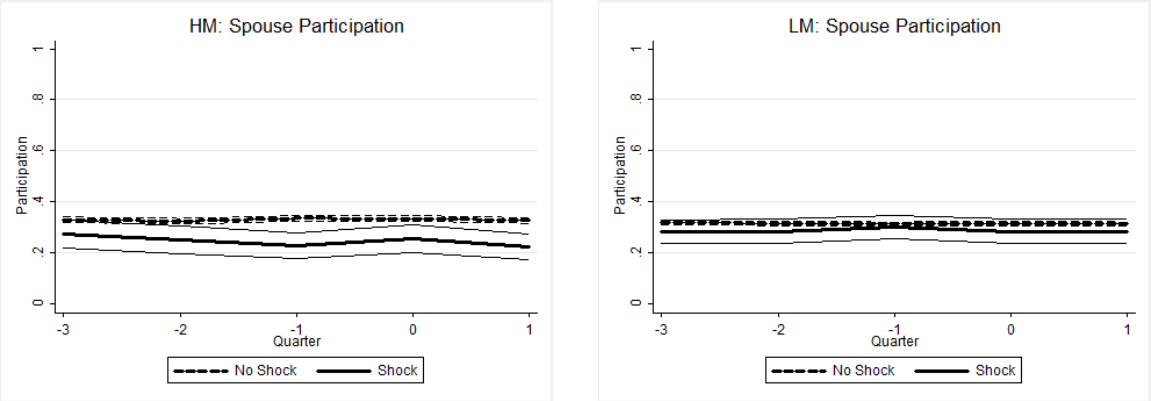
5.2 Labor Outcomes

Households can establish other types of strategies to avoid the impact of income fluctuations on consumption, especially the consumption of essential goods such as food. One of these strategies is to increase the labor supply of other household members. In theory, if households with greater access to international migration networks receive more non-labor income because of insurance through private transfers, they will tend to increase the labor supply of other household members less. This is the hypothesis that we prove in this section. To carry out a preliminary analysis of the possible impact on these variables, we can turn to Figures 4-6. As in Figures 1-3, I divide the sample between households with high and low access to migratory networks in the U.S. to see if there is evidence of a different pattern owing to access to international remittances.

Figure 4 shows the percentage of household heads with a working spouse. It shows that the shock does not seem to have an effect on labor force participation. In addition, there seems to be no substantial difference in the labor participation of the spouse between households with high and low access to migratory networks. A similar pattern appears in Figure 5, showing the hours worked by the spouse of the household head. Figure 6 shows the number of hours worked by household members other than the head. Before the shock,

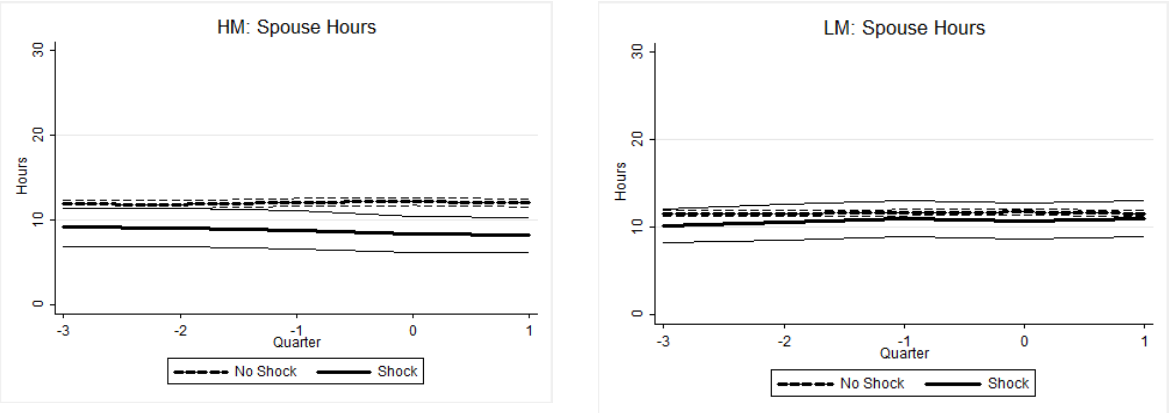
the hours worked tend to increase from Quarter 1 to Quarter 3. Contrary to what might be expected, the shock tends to have a negative impact on total hours worked by other household members.

Figure 4. Spouse Participation



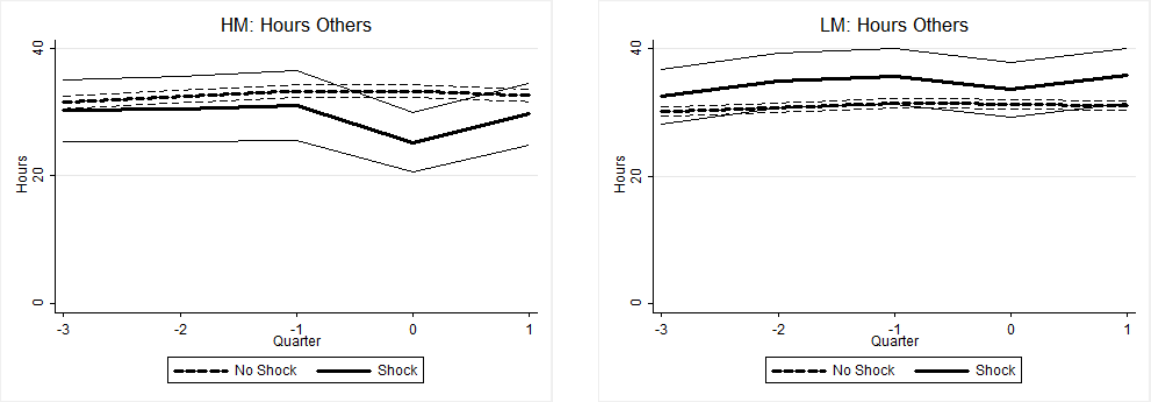
See Notes Figure 1.

Figure 5. Spouse Hours Worked



See Notes Figure 1.

Figure 6. Hours Others



See Notes Figure 1.

These patterns also emerge with the DD estimator in Table 5 using the same specifications as in Table 3. Where we focus on the variables of spouse labor supply, the sample is restricted to households with a spouse living at home in Quarter 1. Controls are modified to incorporate spouse variables and other relevant variables. The control set includes sex, age, and schooling of the spouse; household size in Quarter 1; the presence of children up to 6 years; and whether the household resides in a locality with fewer than 2500 inhabitants. The sign is different than expected: rather than increasing the labor supply of the spouse, the shock tends to diminish it, although it cannot be rejected that the true effect is zero. Only when we concentrate on total hours worked by others do we find a negative effect of the shock. Table 6 shows that the triple differences estimator does not identify differences in reaction to the shock between households with high and low access to migratory networks in the U.S. This is measured by the parameter in the triple interaction Shock*Time1*Hm,which is not significantly different from zero. These patterns also hold in the fixed effects specification.

Table 5: Difference-in-Difference Estimation. Labor Outcomes

	Labor Force Spouse		Hours Worked Spouse		Hours Others	
	DD	FE	DD	FE	DD	FE
Shock	0.05		1.27		3.67	
	[0.03]		[1.14]		[1.96]	
Time1	-0.01		-0.48		0.54	
	[0.01]		[0.51]		[0.83]	
Shock*Time1	-0.04	-0.04	-1.31	-1.38	-3.69***	-3.74***
	[0.03]	[0.03]	[0.99]	[0.93]	[1.28]	[1.29]
Quarter Effects	Y	Y	Y	Y	Y	Y
Controls		Y		Y		Y

Notes. Sample is restricted to households with heads aged 25 to 55 employed in the first three quarters of observation. In the first two columns the sample includes only households with spouse living in the household in the first quarter. Shock: household head without employment in fourth quarter. Time1: fourth and fifth quarters. In Labor Force Spouse and Hours Worked Spouse columns, controls are: sex, age, and schooling of the spouse; rural, household size, marital status, and child <6 years living at home; otherwise, control set is the same as in Table 3. Statistical significance with errors clustered at municipality level: *** p < .01 , ** p < .05 , * p < .10 . DD column uses differences-in-differences estimates. FE column shows fixed effects estimation.

There are multiple explanations as to why shocks do not produce effects in workforce-related variables or even a negative impact on hours offered by others. Estimates in Table 6 show that households have different behaviors in labor supply before the shock, after considering the set of controls. The estimated parameter of the variable Shock shows that the participation of the spouse and the number of hours worked by others tend to be higher among households with a shock. If the shocks received by household heads are predictable, the labor supply of other members could increase ex ante and we would not see an effect at the moment of the shock. The interesting result for our analysis is that households with high access to migratory networks adjust the labor supply of other members similar to households without access to migratory networks in the US. This suggests that the risk coping strategies followed by households do not depend on the access to the migratory networks.

Table 6: Triple Difference Estimation. Labor Outcomes

	Spouse Participation		Spouse Hours Worked		Hours Others	
	DDD	FE	DDD	FE	DDD	FE
Shock	0.07*		1.37		5.97 **	
	[0.04]		[1.26]		[2.67]	
Time1	-0.01		-0.77		0.51	
	[0.01]		[0.64]		[0.97]	
Shock*Time1	-0.03	-0.03	-0.34	-0.50	-2.67	-2.82
	[0.04]	[0.04]	[1.37]	[1.29]	[1.70]	[1.74]
Hm	0.02		0.24		-1.90	
	[0.02]		[0.74]		[1.26]	
Hm*Time1	0.01		0.97		0.07	
	[0.03]		[1.01]		[1.84]	
Hm*Shock	-0.05		-0.33		-6.59*	
	[0.07]		[2.65]		[3.44]	
Hm*Time1*Shock	-0.02	-0.02	-2.77	-2.53	-3.00	-2.64
	[0.05]	[0.05]	[1.80]	[1.69]	[2.46]	[2.44]
Quarter Effects	Y	Y	Y	Y	Y	Y
Controls	Y		Y		Y	

Notes. Sample is restricted to households with heads aged 25 to 55 employed in the first three quarters of observation. In the first two columns sample includes only households with spouse living in household in the first quarter. Shock: household head without employment in fourth quarter. Time1: fourth and fifth quarters. Hm: municipalities with .04 of average receipt of remittances in 2000. In Labor Force Spouse and Hours Worked Spouse, controls are sex, age, and schooling of the spouse; rural, household size, marital status, and child <6 years living at home; otherwise, control set is the same as in Table 3. Statistical significance with errors clustered at municipality level: *** $p < .01$, ** $p < .05$, * $p < .10$. DDD column uses triple difference estimates. FE column shows fixed effects estimation.

5.3 Poverty and Crisis

Shocks in household income can affect households in poverty more dramatically because they could lose access to essentials. Table 7 splits the sample according to a variable strongly correlated with level of poverty. The first row shows the DD estimator with the same set of controls as in Tables 2 and 4, but only for household heads with less than 9 years of schooling. The second row shows the estimator for household heads with 9 years of schooling or more. Results indicate that the probability of receiving aid from other households, either in Mexico or abroad, is widely used in households with lower socioeconomic status; a joint analysis of both types of private transfer shows that the

parameter is significant in both types of households. Labor supply-related variables are not significantly different from zero, except for the hours worked by others. Households with low socioeconomic status tend to reduce their hours when facing a shock. [13]

After the second quarter of 2006, ENOE no longer included the question about economic support received by households in all quarters; it asked only once each year. With this limited information, we only can see the receipt of financial aid in some cases in Quarters 1 and 5. To determine whether the crisis affected results in 2005-2006, we need to make some modifications to the identification strategy.

Figure 7 shows that household labor income suffers a very strong decline during the quarter of the shock, but that it recovers significantly in the next quarter. In addition, Figures 1-3 show that economic aid tends to concentrate in the quarter of the shock. With this in mind, the sample is restricted to households whose heads were employed in the first quarter. Now, the loss of employment by the household head in Quarter 5 defines the shock. We can then observe whether there was a change in receipt of economic aid between Quarters 1 and 5. This sample design is possible for households whose first interview was prior the 2008 crisis, in Quarter 1 of 2005, or Quarter 2 of 2005 or 2006, and for those whose first interview was during the crisis and recovery, in Quarter 2 of 2007, or Quarter 1 of 2009 or 2010.[14]

The third row in Table 7 shows a strong increase in economic aid during a quarter with shock in the periods prior to the 2008 crisis. The probability of receiving remittances increases by 0.05, that of receiving Mexican transfers by 0.10, and that of receiving any type of private transfer by 0.14. However, with the 2008 crisis, the possibility of receiving economic aid from other households fell sharply. The probability of receiving remittances

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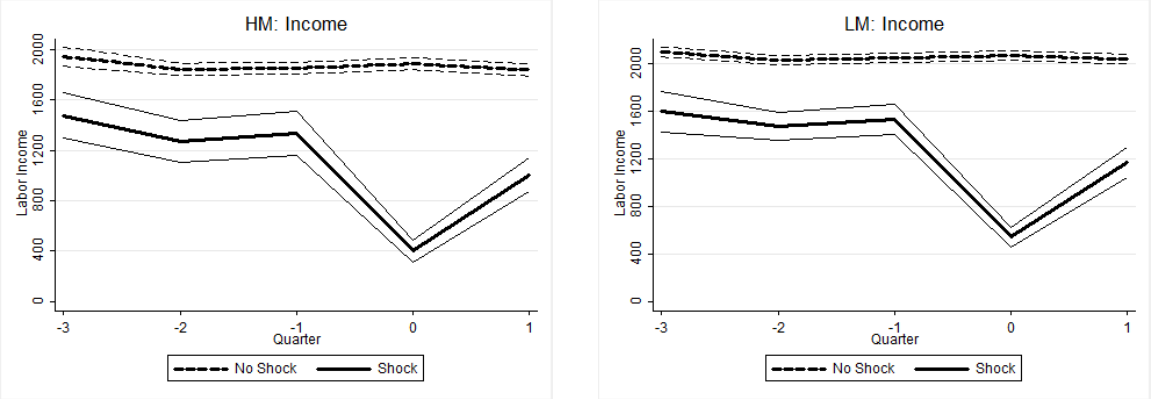
13 The parameters in a triple differences estimator also show a higher average of private transfers among households with greater connections to migrants in the U.S in both socioeconomic status.

14 The U.S. National Bureau of Economic Research officially describes the crisis as lasting from December 2007 (Q4 2007) to June 2009 (Q2 2009). If we exclude households with their first interview in Q1 2010 from the crisis, the estimation results are similar.

during the quarter of the shock does not increase; that of receiving Mexican transfers increases by 0.05, and that of receiving any type of economic aid by 0.06. Private transfers as an insurance mechanism are thus weaker in the face of an aggregate economic downturn. In the case of the 2008 crisis, it seems that the greater decrease was due to the inability to take advantage of remittances.

Figure 7. Household Labor Income



See Notes Figure 1.

Table 7: Difference-in-Difference Estimation. Groups

	U.S. Remittances	Mexican Transfers	Private Transfers	Labor Force	Hours	Hours Others
Low Schooling	1.51	4.57**	6.26***	-0.05	-1.93*	-4.54**
	[1.13]	[1.90]	[2.12]	[0.04]	[1.16]	[1.76]
High Schooling	1.30	2.73	4.39**	-0.02	-0.29	-2.14
	[1.12]	[2.12]	[2.10]	[0.04]	[1.46]	[1.89]
No Crisis	4.80***	9.92***	14.12***	-0.01	0.17	-0.61
	[1.31]	[1.46]	[1.80]	[0.02]	[0.81]	[1.87]
Crisis	0.01	5.40***	6.37***	0.00	-0.28	-1.47
	[0.77]	[1.46]	[1.60]	[0.02]	[0.85]	[1.73]

Notes. Low Schooling: household heads with < 9 years completed. High Schooling: ≥9 years completed. In low and high schooling, sample is restricted as in Tables 3 and 6. No Crisis: households with the first interview in Q1 2005, Q2 2005 and Q2 2006. Crisis: households with the first interview in Q2 2007, Q1 2009 and Q1 2010. In Crisis and No Crisis, sample is restricted to Q1 and Q5 and households with heads aged 25 to 55 employed in the first quarter. Time1: fifth quarter; Shock: household head not employed in fifth quarter. Statistical significance with errors clustered at municipality level: *** $p < .01$, ** $p < .05$, * $p < .10$.

5.4 Causality

The loss of employment by the household head does not come from a natural experiment. The results described here could be a consequence of households that know that they will receive economic aid from other households and respond optimally, reducing their labor supply. If households are behaving in this way, we can expect that the effect on labor supply will persist after the quarter of the shock. In addition, households receiving remittances could be making less effort to get new jobs. The receipt of economic aid in the fourth quarter could then have a negative effect on the search for employment in that quarter and in hours worked in the last quarter of observation. A related hypothesis is that the receipt of economic aid in the future is not the only explanation for a decrease in labor supply; lagged values of economic aid could also have an effect on the shock. This could happen if households accumulate savings to withdraw from the labor force, or because they extract information about the possibility of receiving future economic aid from lagged values of economic aid. Table 8 presents empirical evidence to determine whether any of these phenomena are taking place.

The first three columns provide data to determine whether receipt of economic aid in the past has an effect on the probability of receiving a shock. In Column 1, remittances in the three previous quarters are used as explanatory variables; Column 2 uses receipt of Mexican transfers in the previous three quarters; and Column 3 uses receipt of remittances and Mexican transfers in the third quarter. There is no significant relationship between lagged values of economic aid and the probability of receiving a shock. Column 4 includes only household heads with a shock and divides that group between job seekers and non-job seekers. The results indicate that higher receipt of remittances or Mexican transfers does not negatively affect the status of job seekers in the fourth quarter. The last column uses a Tobit model to show whether receipt of economic aid in the quarter of the shock has an impact on the labor supply of the household head in the last quarter. Results show that remittances in the quarter of the shock have no impact on the labor supply of the fifth

quarter. However, those households receiving Mexican transfers have less labor supply in the fifth quarter.

Table 8: Causality

	Shock			U	Quarter 5
	1	2	3	4	5
Remittances I	0.007				
	[0.016]				
Remittances II	-0.012				
	[0.014]				
Remittances III	0.007		0.010		
	]0.016]		[0.015]		
Remittances IV				0.015	-1.28
				[0.068]	[1.50]
Mexican Transfers I		-0.003			
		[0.008]			
Mexican Transfers II		0.009			
		[0.008]			
Mexican Transfers III		0.011	0.012		
		[0.011]	[0.010]		
Mexican Transfers IV				0.003	-3.84***
				[0.082]	[1.14]
Shock					-17.33***
					[2.05]
Controls	Yes	Yes	Yes	Yes	Yes

Notes. Sample is restricted to households with heads aged 25 to 55 employed in the first three quarters of observation. Shock: household head without employment in fourth quarter. Column 3 includes only households with shock. U is unemployment and Quarter 5 measures hours worked in fifth quarter. In column 5, estimation uses a Tobit model. Controls: sex, age, schooling, rural, household size, and marital status. Statistical significance with errors clustered at municipality level: *** p < .01 , ** p < .05 , * p < .10 .

Taken together, the evidence indicates that households do not change their labor supply if they have received economic aid in the past. In addition, once they have received a shock and economic aid, they do not reduce their job-seeking effort in comparison with

those households not receiving economic aid. In the case of remittances, they do not tend to work less in the last quarter when receiving economic aid. Only in the case of Mexican transfers do households tend to work less in the last quarter. These findings suggest a causal interpretation of the increase of private transfers, especially in the case of remittances.

6 Conclusions

Mexican households use private transfers as an insurance mechanism to cope with shocks in the labor market. The use of this mechanism does not differ between households with greater access to international migration networks and other Mexican households. From the theoretical perspective, the results support the idea that information problems can prevent households from using international migration, at least to a greater extent than internal migration, as a smoothing device against idiosyncratic shocks, as proposed by Docquier and Rapoport (2006). However, the level of transfers is greater before and after the shock, which suggests that the positive effect of remittances on welfare, as described by Esquivel and Huerta-Pineda (2006), could be due to other motives not associated with insurance. In terms policy, the results indicate that the design of public or private insurance mechanisms should also consider regions with high migration.

It is true that private transfers to some extent allow for a smoothing of consumption, but the capacity of this mechanism is diminished in the presence of an aggregate shock. This is the same result for Mexican transfers found by McKenzie (2003) in the economic crisis of 1995. Future research will need to explain the reasons for this procyclical pattern of private transfers and how it relates to the effect on poverty of the 2008 crisis. The policy implication here is that the design of public insurance mechanisms for the labor market should consider that insurance is more necessary in the presence of aggregate shocks. In addition, further research will help to determine the effects of private

transfers to Mexican households on coping with shocks at a more aggregate level, such as natural disasters. It is possible that with shocks where there are fewer information problems between international migrants and households in Mexico, remittances could perform better than Mexican transfers.

There is little evidence that households use the labor supply of other members in the short term to deal with adverse idiosyncratic shocks. This may be in part because households can anticipate the shocks and increase the labor supply of other members ex ante. The evidence also indicates that some type of correlation of the shock at the household level could explain the lack of response of the labor supply of other household members.

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III. Return Migration and Self-Selection in Mexico.

1 Introduction

International migration is not always a permanent decision. Some migrants return to their countries of origin after staying for a period of time in the country of destination. Return migrants may bring skills or capital to the home economy and thereby contribute to the positive effects of migration in the source countries. Mexico has become the largest source of immigrants in the United States. Mexican immigrants accounted for 31.3 percent of the new arrivals in the 1990s (Chiquiar and Hanson, 2005). Their return migration rate is also high. The 2010 Mexican census shows that of the 994,869 individuals who left their country to live in the United States from 2005 to 2010, 307,783 returned to Mexico by 2010. In other words, 30.9 percent of the migrants returned home.[15] In this article, we investigate the self-selection patterns among the return migrants in Mexico.

Policymakers around the world are engaged in a broad debate on the implications of immigration and the optimal migration policy. One of the requirements for an informed discussion is accurately determining the skills of the migrant population. Unfortunately, no consensus exists regarding the self-selection patterns of Mexican migrants to the United States. Chiquiar and Hanson (2005) conclude that Mexican immigrants are located in the middle of the Mexican wage distribution by using the Mexican and U.S. census data from 1990 and 2000. In contrast, Fernandez-Huertas (2011) uses the labor force survey for the period from 2000 to 2004. This dataset collects information on the migrants from Mexico before the individuals migrate. He finds strong evidence of negative selection in the fact that migrant wages are less than 20 percent of the earnings of the rest of the Mexican population. After the original flow of migrants, return migrants self select in return migration. Then, our comparison of return migrants with no migrants staying in Mexico shed light only partially on the self selection patterns of Mexican migrants. However, as

[15] Other data sources provide similar results. The National Survey of Demographic Dynamics 2006 (ENADID) presents a return migration rate of 33.72 percent in 2006 for those who left the country within the previous 5 years.

will be discussed in section 2, according to the framework of Bratsberg and Borjas (1996) the type of selection of return migrants is the same pattern of the original flow.

Within the wide range of issues that have been examined by the recent literature on migration, we focus on two important questions regarding Mexican return migrants: 1) Are Mexican return migrants positively or negatively selected? 2) Do return migrants improve their productivity in the labor market of the source economy compared with their productivity had they not migrated? Given the scant empirical evidence regarding the return migration of Mexican migrants, our paper contributes to the understanding of the self-selection patterns among these migrants. The second question has implications for the analysis of labor market effects on the economy of the source country. The high proportion of return migration among Mexican migrants in the U.S. suggests that the economic effects of return migration could be large. If the migrants acquire some skills as a result of their migration, then return migration has a positive effect on the source economy.

Only a few recent articles have used data on return migrants in the Mexican labor market. Lacuesta (2006) uses the wages of return migrants to calculate the wages that the migrants remaining in the United States would have obtained in Mexico. The information is from the 2000 census in Mexico and the United States. He shows that immigrants who stay in the United States come from the middle part of the distribution of human capital. However, his paper focuses on comparisons between return migrants and nonreturning migrants.

Gitter et al. (2008) analyze the effect of return migration on the probability of employment by using the Mexican Family Life Survey (MxFLS), which was conducted in 2002. They focus on return migrants who have been in the United States between 1997 and 2002. The researchers' results indicate that migration does not affect the probability of employment. Unfortunately, their paper does not address counterfactual wage distributions.

Ambrosini and Peri (2012) use the 2002 and 2005 rounds of MxFLS and define return migrants as workers who lived in Mexico in 2005 and have spent more than one year in the US between 2002 and 2005. Because of the sample size and the short time period, the number of return migrants identified is small (i.e., only 56). Thus, making strong inferences is difficult. However, the scholars find evidence that spending some time in the US enhances one's earning abilities and accounts for some mildly positive selection among the

return migrants. The data from the Mexican census used in our estimates present an adequate sample of return migrants and allow us to observe changes over longer periods of time. However, the census does not include all of the variables that can be found in the MxFLS or the panel structure.

To determine the self-selection patterns, we calculate the counterfactual wage distributions of the return migrants had they stayed in Mexico. To calculate this counterfactual wage, we follow DiNardo et al.'s (1996) method and reweight the wage distributions of the nonmigrants such that the distribution of observable characteristics between the return migrants and the nonmigrants is as similar as possible. We use the 1990, 2000 and 2010 population censuses and focus on males and females separately. Using the census, we can identify individuals who have been in the United States within the previous 5 years. However, restricting the time frame to a short migration period may bias the results. Hence, we use different data sources that also include migration information to verify the sensitivity of our results.

The self-selection patterns among return migrants have changed over time. In 1990, the selection was slightly positive for both men and women. In 2000, the selection among the women stayed positive, but the men were drawn more from the middle of the wage distribution. The result changed in 2010. The selection among the men became negative, and the women were drawn more from the middle of the distribution, with negative selection on average. For example, in 1990, the wages that male return migrants would have experienced had they not migrated were 6 percent larger than the wages of nonmigrant males, but by 2010, this difference had declined to -14 percent. Moreover, migration allows those who return to obtain higher wages because the increase in human capital or savings can be applied to productive activities. In other words, there is a wage premium associated with migration and return. In 1990, the wage premiums for the men and women were 36 and 38 percent, respectively, whereas in 2010, the wage premiums were 5 and 7 percent, respectively. As in the case of selection, the wage premiums to migrate and return have worsened over time for both men and women.

When we analyze the geographical subgroups, we find that the self-selection patterns differ, but we find a tendency toward negative selection among every subgroup as time moves forward. Among the rural population, we observe positive selection patterns.

However, among the urban population, the selection becomes less positive or even negative. If we divide the Mexican states between those that have historically shown a high migration rate and the rest of the country, we find that the degree of negative selection is higher in states with high migration rates but that the tendency toward negative selection is present in both groups.

To confront any concerns about our estimates, we perform different robustness tests. The results vary little when we restrict our sample to only the working population or young individuals. By using additional datasets that define return migrant differently from the census, we find results consistent with those of our basic specifications, except when we concentrate on the short-term flow of return migrants. Here, the degree of selection is more negative, possibly because low-skilled individuals tend to make more than one trip. In sum, we find robust evidence that the self-selection patterns among the current return migrants are negative.

According to Bratsberg and Borjas's (1996) model, in countries such as Mexico, where payments to human capital are more unequal than those in the United States, return migrants should be selected negatively with respect to the nonmigrant population. This hypothesis only holds clearly for the men in 2010 and is clearly rejected for the 1990 census. Our results are more consistent with the observation that low-skilled individuals may face costs that prevent them from migrating in the first place. The fact that the selection tends to become negative over time supports the hypothesis that migration networks may relax the costs faced by low-skilled individuals, as suggested by McKenzie and Rapoport (2010). However, further research is necessary to establish whether other factors, such as the enforcement of immigration laws or changes in the demand for immigrants (including changes in demand by sector), explain the change in the degree of selection among return migrants.

In the next section, we review the literature on selection and examine how return migration is related to selection and productivity improvements. Section 3 explains the identification strategy. Section 4 provides more details about Mexican return migration and describes the datasets employed in this study. In section 5, we discuss the results. Finally, in section 6, we conclude this paper.

2 Selection and Return Migration

Immigrants are not necessarily a representative sample of the population in the sending countries. Incentives to migrate differ among the various groups of the population depending on their observable and unobservable characteristics. Several authors have attempted to model the selection patterns of international migration.

On the one hand, Chiswick (1999) develops a model showing that immigrants are positively selected. On the other hand, Borjas (1987) shows that immigrants are selected from groups with lower qualifications when the returns to skills are more dispersed in the sending countries compared with the dispersion in the destination economies. In contrast, immigrants tend to possess higher qualifications when the returns to skills in source economies are more egalitarian compared with the returns to skills in destination economies. Comparing theoretical predictions with US data, Borjas (1987) shows that positive selection is much more likely among immigrants from advanced countries, where the returns to skills are lower, whereas negative selection is more likely among developing countries, where the returns to skills are more unequal. Then, negative selection is expected for a country such as Mexico. A surge in empirical research has attempted to corroborate this claim.[16]

Previous studies regarding the case of Mexico have obtained mixed results. Using the US and Mexican population censuses of 1990 and 2000, Chiquiar and Hanson (2005) find evidence that Mexican immigrants in the US tend to be located in the middle of the wage distribution in Mexico, we call this "intermediate selction". Orrenius and Zavodny (2005) developed a similar model and found empirical evidence consistent with Chiquiar and Hanson's (2005) results by using data from the Mexican Migration Project (MMP).

However, the US census may provide an incomplete picture of Mexican migrants.[17] Ibarraran and Lubotsky (2007) used the 2000 Mexican census to estimate the level of

[16] Chiquiar and Hanson (2005), Fernandez-Huertas (2011), Ibarraran and Lubotsky (2007), Kaestner and Malamud (2010), Lacuesta (2006),McKenzie and Rapoport (2010) and Orrenius and Zavodny (2005). However, see also Grogger and Hanson (2011) for a model in which absolute wage differences, not relative differences, are the main determinant of migration.

[17] Ibarraran and Lubotsky (2007) point out that the migrants in the US census often overreport their education levels, possibly because of failures in translation or their inappropriate understanding of the survey options. Additionally, the researchers show that the US census underestimates the size of the illegal population, which is generally composed of low-skilled workers.

education of the Mexican migrants from 1995 to 2000. The researchers found that the Mexican migrants in the US are less educated by half a year than the remaining population in Mexico. The researchers argue that the missing migrants in the Mexican census (i.e., those who traveled with their entire families) cannot reverse the result of negative selection.

Fernandez-Huertas (2011) also challenges the empirical findings of intermediate selection. He uses the Labor Force Survey (ENE, spanish acronym of Encuesta Nacional de Empleo, a quarterly survey similar to the Current Population Survey in the US) from 2000 to 2004. In ENE, one can identify a Mexican emigrant to the United States before and after his or her departure. However, one can only identify short-term departures because ENE follows households for 5 consecutive quarters. Using the wages of these individuals before they migrate, Fernandez-Huertas (2011) finds that Mexican male immigrants from 2000 to 2004 earn lower wages and have less education than individuals who remain in Mexico. This finding provides evidence of negative selection.

McKenzie and Rapoport (2010) point out that migration networks can partially reconcile some of the conflicting findings in the literature. They show that access to migration networks can theoretically alleviate some of the migration costs, with low-skilled migrants experiencing the greatest benefits. Hence, the researchers' model predicts positive self-selection in communities with weak migration networks and negative self-selection in communities with strong migration networks. Using the *Encuesta Nacional de la Dinamica Demografica* 1997 (ENADID), McKenzie and Rapoport find that their theoretical prediction holds for males between 15 and 49 years old in areas with populations less than 100,000 people. The probability of migration increases with education in communities with weak migrant networks and decreases with education in communities with strong migrant networks.

Recent papers have not reported consistent results. On the one hand, Kaestner and Malamud (2010) use the Mexican Family Life Survey (MxFLS) to find that male Mexican migrants are selected from the middle of the observed skill distribution. However, when the researchers control for migration costs, the evidence of intermediate selection diminishes. They also point out that no relationship exists between immigrant status and the distribution of the unexplained component of wages. On the other hand, Ambrosini and Peri (2012) use the same data source to find evidence of negative selection that is similar to the evidence

found by Fernandez-Huertas (2011). Future research must explain why the same data source produces such different results.

These scholars have obtained their results while paying little or no attention to the following fact: an important proportion of migrants do not permanently reside in the country of destination. Bratsberg and Borjas (1996) developed theoretical implications of these migrants' existence. In their model, two types of individuals decide to return after migration: 1) individuals whose decisions to temporarily migrate are due to optimal decisions within their life cycles, and 2) individuals who return once they discover that their incomes in the country of destination are sufficiently lower than predicted. The model shows that return migration as an optimal life cycle decision occurs when the migrants discover that their returns to skills in their countries of origin are larger than those the migrants would have obtained had they not moved temporarily.[18]

Bratsberg and Borjas (1996) also show that return migration accentuates the selection type in the original flow. If the original flow is characterized by low-skilled individuals, then the high-skilled migrants will have incentives to return, which accentuates the negative selection among the remaining migrants in the destination economy. If the original flow is characterized by high-skilled individuals, then the low-skilled migrants will have incentives to return, which accentuates the positive selection.

Within this theoretical framework, Coulon and Piracha (2005) analyze the migrants who have returned to Albania by using information from the source country. The researchers show that the decision to migrate may temporarily be an optimal decision because the wages are greater than what they would have been had the return migrants decided to permanently stay in Albania. With respect to the type of selection, the migrants who returned exhibited negative selection whereas those who never migrated would have gained higher wages had they been paid with the same returns to skills that the returning migrants received. Rooth and Sarela (2007) concentrate on Finnish immigrants in Sweden. Finland and Sweden have free mobility of labor between themselves. The returns to observable skills are higher in Finland than in Sweden. The researchers obtain the result

[18] Other models have similar implications. Dustmann and Kirchkamp (2002) construct a model in which return migration is also related to increases in wages after the migrants' return. Their model shows how the existence of different activities after the migrants' return can lead to different optimal time periods for the migration process.

predicted by the Bratsberg and Borjas model (i.e., negative selection) by using the data regarding the performances of returning migrants in the Finnish market.

The possibility of improving skills is not the only reason that the literature has explored to explain return migration. Dustmann (2003) shows that parents' concerns about their children can increase return migration. Dustmann and Weiss (2007) constructed a theoretical model in which higher preferences for consumption in the home country or high purchasing power of the host country's currency in the migrants' home country could lead to return migration. Gibson and McKenzie's (2011) empirical evidence for a group of highly skilled migrants shows that the decision to return is strongly linked to family and lifestyle reasons rather than to the income opportunities in different countries. Determining the importance of these explanations for return migration among Mexicans is beyond the scope of our article.

For the case of Mexico, only Lacuesta (2006) and Ambrosini and Peri (2012) have investigated the type of selection among return migrants. We discussed the differences and advantages of our approach earlier. We use information from Mexican censuses to show that the degree of selection among return migrants has changed over time (i.e., from positive selection in 1990 to negative selection in 2010). Additionally, our results indicate that the increase in wages produced by migration has decreased. The changes in selection are consistent with a decline in costs produced by migrant networks, as proposed by McKenzie and Rapoport (2010).

3 Empirical Strategy

Most of the Mexican immigrant studies on self-selection patterns have attempted to assess the robustness of Chiquiar and Hanson's (2005) finding of intermediate selection. To compare our results with those obtained in that article, we also construct counterfactual densities of wages, which is a methodology originally developed by DiNardo, Fortin and Lemiux (1996). This methodology also allows us to compare the results with those obtained by Fernandez-Huertas (2011), whose study reports the highest degree of negative selection in the literature.

3.1 Counterfactual densities

We aim to calculate the distribution of the wages that return migrants would have obtained had they never migrated. We can do so by combining the wage structure of nonmigrants with the observable characteristics of the return migrant population. Then we compare this counterfactual distribution with the observed distribution of the nonmigrants' earnings to establish the type of selection among the return migrants. We refer to w as wages, z as the observed characteristics of the individual in domain Ω, f^s as the density function of the nonmigrants (s denotes stayers), f^m as the density function of the return migrants, and f_m^s as the counterfactual density function of the wages that the return migrants would have earned had they never migrated. We define I as an indicator of whether the individual is a stayer (s) or a return migrant (m).

The wage distribution for the nonmigrants is

$$f^s(w) = \int_{z\in\Omega} f^s(w \mid z) f(z \mid I = s) dz \tag{1}$$

and the wage distribution for the return migrants is

$$f^m(w) = \int_{z\in\Omega} f^m(w \mid z) f(z \mid I = m) dz \tag{2}$$

The counterfactual distribution of the wages that the return migrants would have experienced had they been paid according to the wage structure of the nonmigrants is

$$f_m^s(w) = \int_{z\in\Omega} f^s(w \mid z) f(z \mid I = m) dz \tag{3}$$

This expression represents the counterfactual density of the return migrants had they never migrated. We assume that the wage density function does not depend on the distribution of characteristics z. Therefore, we can use the characteristics of the return migrant population and integrate them over z in the function for the wage distribution of the nonmigrants. Instead of integrating, DiNardo, Fortin and Lemieux (1996) propose modifying equation (3) as follows:

$$f_m^s(w) = \int_{z\in\Omega} \psi(z) f^s(w \mid z) f(z \mid I = s) dz \tag{4}$$

where $\psi(z) = \dfrac{f(z \mid I = m)}{f(z \mid I = s)}$. Hence, we only need to know $\psi(z)$ and reweight the wage distribution for the nonmigrants to obtain the counterfactual distribution of the wages that the return migrants would have obtained had they never migrated. Using Bayes' Rule, the weight $\psi(z)$ can be rewritten as the following:

$$\psi(z) = \frac{f(I = m \mid z) f(I = s)}{f(I = s \mid z) f(I = m)} \tag{5}$$

The reweighting function $\psi(z)$ assigns higher weights to nonmigrants with values of z close to the characteristics of the return migrants and lower values to individuals with characteristics that are not so close to those of the return migrants. Thus, the reweighted population has values of z similar to those of the return migrants.

A possible bias in the methodology lies in the role of unobservable characteristics. For example, if the return migrants tend to have greater motivation, then our methodology will assign excessively low counterfactual wages. Conversely, if the migrants tend to be less motivated, then we will give them excessively high counterfactual wages. In a recent article, Kaestner and Malamud (2010) showed that there is little evidence of selection in the unobservables between migrants and nonmigrants in Mexico. This finding suggests that the potential bias caused by variables outside the vector z is small. Nevertheless, in the robustness test section, we implement a flexible estimation procedure by using different observable characteristics of z.

To estimate the weight $\psi(z)$, we notice that $f(I = s)$ and $f(I = m)$ are the proportions of the nonmigrants and the return migrants in the population. The other two elements, $f(I = s \mid z)$ and $f(I = m \mid z)$, are the conditional probabilities of being a nonmigrant (s) or a return migrant (m). We can easily estimate the conditional probabilities from the pooled population by using probit or logit conditioning on the set of

characteristics *z*. After obtaining $\psi(z)$, we introduce it into the wage distributions for the nonmigrants, as in equation (4), to calculate the counterfactual wage distribution of the return migrants. We calculate the wage distributions by using nonparametric distributions.

Following Chiquiar and Hanson (2005) and Fernandez-Huertas (2011), we focus on the distribution of the wages that the return migrants would have obtained had they not migrated $f_m^s(w)$. After obtaining this counterfactual distribution, we compare it with the wage distribution of the nonmigrants and obtain the type of selection. In other words, we nonparametrically characterize the wage distributions to obtain the following:

$$f_m^s(w) - f^s(w) = \int_{z\in\Omega} (\psi(z) - 1) f^s(w \mid z) f(z \mid I = s) dz \tag{6}$$

A positive difference indicates that a greater proportion of the migrants returned rather than stayed at the given level of wages. If the difference is negative, then the proportion of return migrants is lower. For negative selection, we must note a positive difference in low wages and a negative difference in high wages. However, if the selection is positive, then we must observe a negative difference in low wages and a positive difference in high wages.

An alternative way to characterize the counterfactual distribution of wages is to simply use the new factor $\psi(z)$ to compute the reweighted statistics in the distribution of the nonmigrants. These new statistics characterize the distribution of the wages that the return migrants would have obtained had they not migrated. We can compare these wages by utilizing the statistics arising from the observed distribution of the nonmigrants to determine the differences. We can calculate the standard errors of the statistics by bootstrapping the procedure.

The described methodology considers the full population of return migrants and nonmigrants regardless of whether the individuals work. However, the manner in which the characteristics in vector *z* affect the rate of labor market participation can differ between the return migrants and the nonmigrants. To eliminate any differences that might arise because of different labor market participation rates, in the robustness test section, we estimate the

model by restricting the sample to only the individuals who are working and show that this procedure does not affect the main estimates.

4 Data and Descriptive Statistics

We use the Mexican Population Census for the years 1990, 2000 and 2010. One can obtain these data from the website of the National Institute of Statistics in Mexico.[19] The census includes a question about the place of residence 5 years before the survey took place. Additionally, in the 2000 and 2010 censuses, we can identify the individuals who have migrated within the 5 years preceding the census but then returned during that period. We use these questions to identify the return migrants.

Two different types of people qualify as return migrants from the United States. First, we include individuals born in Mexico who lived in the United States 5 years prior to the census and resided in Mexico when the Census took place. Second, we include individuals born in Mexico who lived in Mexico 5 years prior to the census but migrated to the United States during that period and resided in Mexico when the census information was collected.

We restrict our sample to the individuals born in Mexico who were between 20 and 59 years old.[20] Unfortunately, the census does not allow us to identify international migratory activities beyond the 5 years prior to the census's survey date. Hence, individuals who may have migrated before that period are considered as nonmigrants by design. However, to counteract this possible bias, we use other data sources that do not restrict the time period of the return migration to verify the sensitivity of this result, as explained below.

In addition to the information about migration, the census includes important socio-demographic data. We use the following variables: sex, education, age, indigenous

[19] The 10 percent samples are available through the INEGI website (http://www.inegi.org.mx).
[20] The 1990 census recorded 3,433,584 nonmigrants and 6,868 return migrants. The 2000 census recorded 4,535,926 nonmigrants and 38,112 return migrants. Of the return migrants in 2000, 17,235 are return migrants who lived sometime within the last 5 years in the US. In 2010, there were 5,521,552 nonmigrants and 108,691 return migrants. Of the return migrants in 2010, 21,978 were return migrants who lived sometime within the last 5 years in the US.

membership, income from employment, hours worked, type of activity, unemployment, geographical location and marital status.

To estimate the wage distribution, we only use individuals who reported a positive hourly wage.[21] However, it is important to emphasize that the reweighting procedure uses the full population of return migrants and nonmigrants, not just the working population. Additionally, we consider the individuals who reported more than 100 hours worked to have earned an invalid wage. Later, we analyze the sensitivity of our results by considering the differences in the participation rates between the return migrants and the nonmigrants.

4.1 Descriptive Statistics

Table 1[22] shows the main features of the return migrants (column *RM*) and the stayers (column *S*) among the three censuses. The return migrants tend to be younger than the rest of the population by 1 to 3 years. In addition, the return migrants are mostly composed of men; the proportion of men among the return migrants increased from 66 percent in 1990 to 76 percent in 2010.

We classified the six groups of states in accordance with their migration rates in 1950.[23] Using this classification, we try to identify the individuals' access to migration networks. High-migration states are Aguascalientes, Durango, Guanajuato, Jalisco, Michoacan, San Luis Potosi and Zacatecas. All of them are located at the center of Mexico. Low-migration states are Campeche, Chiapas, Quintana Roo, Tabasco, Veracruz and Yucatan. All of these states are located in southern Mexico. The third group is composed of states that exhibited an intermediate rate of migration in 1950: Colima, Mexico State, Guerrero, Hidalgo, Morelos, Nayarit Oaxaca, Puebla, Queretaro, Tlaxcala and Sinaloa. The fourth group consists of the states located in northern Mexico: Baja California, Baja California Sur, Chihuahua, Coahuila and Sonora Tamaulipas. Finally, we consider the state of Nuevo Leon (NL) and Mexico City as isolated regions because of their economic importance.

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[21] In 1990, 1,581,113 nonmigrants and 3,083 return migrants had valid hourly wages; 2,154,906 nonmigrants and 17048 return migrants had valid hourly wages in 2000; and 2,429,803 nonmigrants and 54,235 return migrants had valid hourly wages in 2010.

[22] We used the weights provided in each of the censuses in our descriptive statistics and estimates, except when we defined the size of the sample N.

[23] We follow the classification proposed by Hanson (2007).

Table 1. Descriptive statistics: Full population.

	1990		2000		2010	
	S	RM	S	RM	S	RM
N	3,433,584	6,868	4,535,926	38,067	5,521,552	108,691
Age	34.4	33.3	35.1	32.5	36.6	34.3
Male	0.48	0.66	0.47	0.73	0.47	0.76
Rural	0.25	0.28	0.22	0.32	0.20	0.36
High Migration Region	0.21	0.5	0.2	0.45	0.21	0.35
Low Migration Region	0.15	0.01	0.15	0.04	0.15	0.09
Intermediate Migration Region	0.34	0.15	0.36	0.28	0.37	0.36
North Region	0.14	0.25	0.14	0.16	0.14	0.16
Mexico City	0.12	0.05	0.10	0.04	0.09	0.02
NL	0.04	0.03	0.04	0.03	0.04	0.02
High Migration: Rural	0.06	0.20	0.05	0.19	0.05	0.15
Low Migration: Rural	0.06	0.00	0.06	0.01	0.06	0.05
North Region: Rural	0.02	0.03	0.02	0.02	0.02	0.02
Intermediate Migration: Rural	0.10	0.05	0.09	0.10	0.08	0.14
Indigenous	0.08	0.02	0.07	0.03	0.07	0.04
Years of Schooling	6.36	6.93	7.98	7.91	9.26	8.42
No Education	0.15	0.08	0.07	0.03	0.05	0.02
Primary Incomplete	0.25	0.24	0.19	0.19	0.11	0.12
Primary	0.26	0.32	0.25	0.30	0.20	0.28
Secondary	0.20	0.21	0.24	0.27	0.28	0.35
High School	0.10	0.11	0.21	0.18	0.28	0.20
College	0.04	0.04	0.05	0.03	0.07	0.03

Notes: The sample is restricted to individuals who are 20-59 years old. Indigenous is a dichotomic variable representing the population that speaks an indigenous language. The states were divided into the following groups. i) High migration: Aguascalientes, Durango, Guanajuato, Jalisco, Michoacán, San Luis Potosí and Zacatecas; ii) low migration: Campeche, Chiapas, Quintana Roo, Tabasco and Veracruz; iii) intermediate migration: Colima, Estado de México, Guerrero, Hidalgo, Morelos, Nayarit Oaxaca, Puebla, Querétaro, Tlaxcala and Sinaloa; iv) north region: Baja California, Baja California Sur, Chihuahua, Coahuila and Sonora Tamaulipas. Nuevo Leon (NL) and Mexico City are considered separately. Rural represents the population living in areas with 2500 inhabitants or fewer. Years of schooling includes only the completed years. Primary incomplete, Primary, Secondary, High School and College indicate 1-5 years of schooling, 6-8 years of schooling, 9-11 years of schooling. 12-16 years of schooling and 17 years of schooling or more, respectively.

The table shows how the geographical location patterns of the return migrants have changed over time. The number of migrants returning to states with historically high migration rates has declined from 50 percent to only 35 percent, whereas the proportion of nonmigrants is only 21 percent. More migrants have returned to the states with low and

intermediate migration rates with each census. Although the number of migrants returning to the north declined from 1990 to 2000, this number remained stable from 2000 to 2010. At the same time, the proportion of the nonmigrant population was stable across all regions in the three censuses. Mexico City and Nuevo Leon showed a low rate of return migration, and the importance of these states to the return migrant population has decreased over time.

Another characteristic of the geographical location patterns of the return migrants is the growing importance of the rural sector. Although the rural sector accounted for 28 percent of the return migrant population in 1990, by 2010 that proportion had risen to 36 percent. This change occurred even though the importance of the rural sector to the nonmigrants decreased from 25 percent in 1990 to 20 percent in 2010.

The locations of the return migrants in different regions of the rural sector have followed a pattern similar to that of the total population. The proportion of return migrants in the rural sector has decreased in the high-migration states but has increased in states with low and intermediate migration rates and has remained stable in the north.

The indigenous population has produced fewer return migrants than nonmigrants. However, the proportion of the indigenous population serving as return migrants increased from 2 to 4 percent, whereas the proportion of indigenous people among the nonmigrant population has decreased from 8 in 1990 to 7 percent in 2010.

With regard to the years of education, the difference between return migrants and nonmigrants has changed over time. Whereas in 1990, the return migrants had 0.57 more years of education than the nonmigrants, in 2010, the return migrants had 0.84 fewer years of education than the nonmigrants. The average education level has increased for both groups.[24]

In terms of educational groups, the results indicate that the selection of return migrants has evolved toward negative selection. Over the years, the proportion of return migrants with no formal education is lower compared with the proportion of nonmigrants in the same level. In addition, the proportion of return migrants with incomplete primary schooling is similar to that of nonmigrants. Nevertheless, whereas in 1990, the proportion

[24] We define the educational groups by six consecutive levels: No Education, Primary Incomplete, Primary, Secondary, High School and College. Primary Incomplete, Primary, Secondary, High School and College indicate that the individual completed 1-5 years, 6-8 years, 9-11 years, 12-16 years and 17 years or more of schooling, respectively. This classification reflects the structure of the Mexican educational system.

of individuals in secondary and higher educational groups was similar for both return migrants and nonmigrants, by 2010, the proportion of nonmigrants in high school and college had become larger than the proportion of return migrants in high school and college.

4.2 Male and Female Differences

Most of the previous studies on selection and Mexican migration to the United States have focused on men. However, women represent an important proportion of return migrants (i.e., 34 percent in 1990 and 24 percent in 2010). Hence, it is important to investigate any possible gender differences. Table 2 shows the main characteristics of the male population, and Table 3 contains the characteristics of the women. Both tables include important labor market characteristics, such as wages, and labor market participation rates.

In both cases, the return migrants are younger than and exhibit almost the same propensity to be married as the nonmigrant population. However, the two populations differ in many other respects. For example, with regard to the size of locality, the female return migrants exhibit a lower tendency to reside in rural areas than the males. The female rural population represented less than 30 percent of the return migrants, whereas the male rural population constituted more than 30 percent of the return migrants in the three censuses.

In terms of education, the female return migrants have a higher level of education than the nonmigrants. Conversely, the male return migrants exhibit less education than the nonmigrant population. In 1990, the difference in education levels between the female return migrants and nonmigrants was 1.37 years, which decreased to 0.28 in 2010. In contrast, the difference between the male return migrants and nonmigrants was -0.11 years in 1990. By 2010, the negative difference had become -1.34 years. Positive selection in terms of education is disappearing among the women and becoming more negative in the case of the men.

Both the male and female return migrants exhibit larger rates of unemployment. We measure this rate as the proportion of the population who stated that they had sought work the week before the census. Additionally, in both cases, fewer return migrants are employed compared with the nonmigrant population.

The return migrants have higher wages than the nonmigrants, except for the men in 2010. As in the case of education, the wage differences for both the men and the women are more favorable for the return migrants in 1990 than in 2010. For the males in 1990, the log wage difference was 0.42, which decreased to 0.13 in 2000 and became a negative difference of -0.09 in 2010. For the women, the difference has always been positive in favor of the return migrants. It was 0.49 in 1990 but decreased to 0.25 in 2001 and to only 0.05 in 2010. Using our estimation methodology, we aim to explain the part of these differences that are attributable to the differences in human capital prior to the migration and to the migration process itself.

Table 2. Descriptive Statistics: Men

	1990		2000		2010	
	S	RM	S	RM	S	RM
N	1,643,304	4,537	2,142,705	28,962	2,584,619	85,208
Age	34.5	33.4	35.2	32.5	36.5	34.3
Married	0.74	0.73	0.73	0.73	0.70	0.72
Rural	0.26	0.32	0.22	0.35	0.2	0.39
Years of Schooling	6.87	6.76	8.3	7.66	9.46	8.12
No Education	0.12	0.09	0.06	0.04	0.04	0.03
Primary Incomplete	0.24	0.26	0.18	0.20	0.11	0.13
Primary	0.26	0.32	0.24	0.31	0.20	0.30
Secondary	0.20	0.19	0.25	0.28	0.29	0.36
High School	0.12	0.10	0.21	0.15	0.28	0.17
College	0.05	0.04	0.06	0.03	0.08	0.02
Unemployed	0.021	0.031	0.012	0.020	0.045	0.073
Employed	0.73	0.59	0.74	0.59	0.71	0.65
Log hourly wage	3.11	3.53	3.02	3.15	3.20	3.11
Hours worked	46.3	45.4	48.9	47.3	49.2	48.0
Self employment	0.24	0.29	0.21	0.26	0.21	0.24
Entrepeneur activities	0.03	0.05	0.03	0.04	0.03	0.04
Health insurance			0.58	0.37	0.57	0.32
Schooling if working	7.15	7.31	8.62	8.13	9.65	8.31

Notes: The sample is restricted to individuals who are 20-59 years old. Married includes marriages without civil contracts. Persons are unemployed if they have searched for a job within the last week. Our calculation of wages excludes unknown or invalid wages. Hourly wages are in constant pesos as of June 2010 according to the Consumer Price Index of Banco de Mexico. Health Insurance is a dummy variable indicating whether the worker's current job provides him with health insurance.

With respect to the number of hours worked per week, both the men and the women tend to work less if they are return migrants, although the difference is small. Interestingly, both the male and female return migrants exhibit a greater tendency to become entrepreneurs or to be self-employed. This trend remained stable during the period of the study. However, the return migrants are employed in a lower proportion of jobs that offer health insurance (i.e., formal sector jobs) as part of the employment benefits.

Table 3. Descriptive Statistics: Women

	1990		2000		2010	
	S	RM	S	RM	S	RM
N	1,790,280	2,331	2,393,221	9,105	2,936,933	23,483
Age	34.3	33	35	32.4	36.6	34.2
Married	0.73	0.77	0.70	0.71	0.67	0.73
Rural	0.25	0.2	0.21	0.24	0.21	0.27
Years of Schooling	5.9	7.27	7.7	8.64	9.09	9.37
No Education	0.17	0.07	0.08	0.03	0.06	0.02
Primary Incomplete	0.25	0.20	0.19	0.14	0.12	0.09
Primary	0.27	0.33	0.25	0.28	0.21	0.24
Secondary	0.20	0.24	0.23	0.27	0.28	0.33
High School	0.09	0.12	0.21	0.24	0.28	0.28
College	0.02	0.03	0.04	0.04	0.06	0.04
Unemployed	0.004	0.005	0.003	0.004	0.011	0.018
Employed	0.22	0.18	0.33	0.26	0.37	0.31
Log hourly wage	3.17	3.66	3.02	3.27	3.19	3.24
Hours worked	40.8	39.9	40.2	40.2	40.5	39.9
Self employment	0.13	0.19	0.20	0.25	0.23	0.31
Entrepeneur Activities	0.02	0.04	0.02	0.04	0.02	0.04
Health insurance			0.64	0.54	0.62	0.49
Schooling if Working	8.57	9.24	9.50	10.24	10.53	10.35

Notes: The sample is restricted to individuals who are 20-59 years old. Married includes marriages without civil contracts. Persons are unemployed if they have searched for a job within the last week. Our calculation of wages excludes unknown or invalid wages. Hourly wages are in constant pesos as of June 2010 according to the Consumer Price Index of Banco de Mexico. Health Insurance is a dummy variable indicating whether the worker's current job provides him with health insurance.

The descriptive statistics suggest that the selection in terms of education and wages are becoming more negative for both the men and the women. This pattern also holds

regardless of whether we focus on the full population or the working population (i.e., the last row in tables 2 and 3). Hence, we can infer that excluding the women from the analysis can skew the results toward negative selection. We account for this bias in our analysis by estimating the selection among the men and the women as separate cases.

5 Results

Following the previous literature, we construct the counterfactual distribution of the wages that the return migrants would have obtained had they never migrated. As a first step, we look into the distributions of log hourly wages before estimating the counterfactuals. We consider the distributions of the men and women separately in each of the censuses.

To estimate $f(I = s \mid z)$ and $f(I = m \mid z)$, we used a logit model for the full sample, with a dependent variable indicating whether the individual was a return migrant. We divided age into 8 groups of 5 years, and we formed indicative variables for each group. To consider the high dependence of return migration on geographical variables, we used dummies for each of the following regions: high-migration states, low-migration states, intermediate-migration states, North, Mexico City, NL, rural, high-migration rural, low-migration rural, intermediate-migration rural and north rural. In addition, we used an indigenous membership variable. To include education, we used dummies for each aforementioned level of education. Using the logit estimates, we obtained the weight $\psi(z) = \dfrac{f(I = m \mid z) f(I = s)}{f(I = s \mid z) f(I = m)}$ and constructed the counterfactual distribution of the wages that the return migrants would have obtained had they never migrated, as indicated in equation (4), by using kernel methods.

5.1 Selection by year

Figure 1[25] shows the results for the men in the 1990 census. Figure 1a shows the observed wage distributions for the return migrants and the nonmigrants. Figure 1c shows

[25] We constructed all of the figures by using an Epanechnikov kernel. We used two times Silverman's (1986) optimal bandwidth. As in the analysis of Chiquiar and Hanson (2005), we found that the appearance of

the difference between the two distributions. There is a vertical line at the median of the nonmigrants. We can see that the wage distribution of the return migrants is clearly to the right of the distribution of the nonmigrants. This finding implies positive selection.

Figure 1b shows the observed wage distribution of the nonmigrants and the counterfactual distribution of the wages that the return migrants would have obtained had they not migrated. Figure 1d shows the difference between these two distributions. Compared with the nonmigrants, a greater proportion of the return migrants are located in the middle and upper parts of the distribution, and fewer migrants are located in the lower part of the distribution. This evidence suggests positive selection among the male return migrants in 1990.

Table 4 shows another approach to observing these patterns. The table contains statistics on the observed wage distributions and the counterfactual wage distributions for the men and the women in each year. For the men in 1990, we can see that the average wage and the wage in each percentile of the return migrants' wage distribution are higher than those for the nonmigrants. On average, the return migrants earn 42 percent more than the nonmigrants. The same is observed for the counterfactual distributions. Each percentile of the return migrants' counterfactual distribution is located to the right of the percentiles of the nonmigrants' distribution, except for the 90th and 95th percentiles. In 1990, the return migrants would have earned, on average, 6 percent more than the nonmigrants had the return migrants never left the country (i.e., 3.17 *minus* 3.11). The difference between the observed wages that the return migrants received and the wages that they would have obtained equals 36 percent, which is a large positive effect. We call this effect the wage premium for migrating and returning.

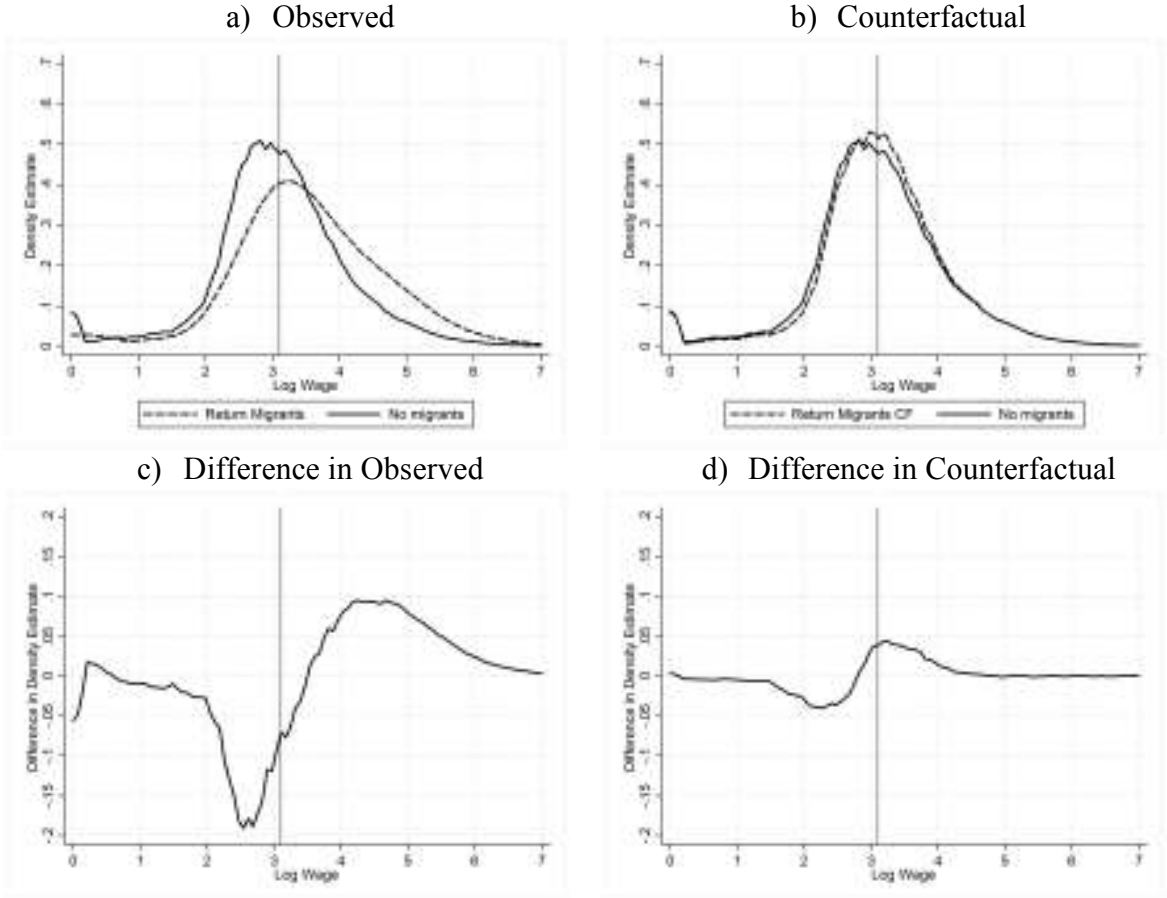
One can note a similar pattern of positive self-selection in the case of the women in 1990 in Figure 2. The wage distribution of the return migrants has fewer individuals in the median of the nonmigrant wage distribution and a larger mass in the right tail of the wage distribution. After we estimate the counterfactual, we observe a decrease in the differences across both distributions, but evidence of positive selection still exists. Table 4 shows that the wages for the female return migrants are 49 percent higher than the nonmigrants'

densities resulting from the use of the optimal bandwidth presented problems for our analysis. Two times the optimal bandwidth resulted in figures similar to those reported previously in the literature. Furthermore, the bandwidth chosen has no effects on the counterfactual statistics that use the reweighting factor.

wages. If the female migrants had not migrated, then they would have obtained wages that are 11 percent higher. The wage premiums for migrating and returning equals 38 percent.

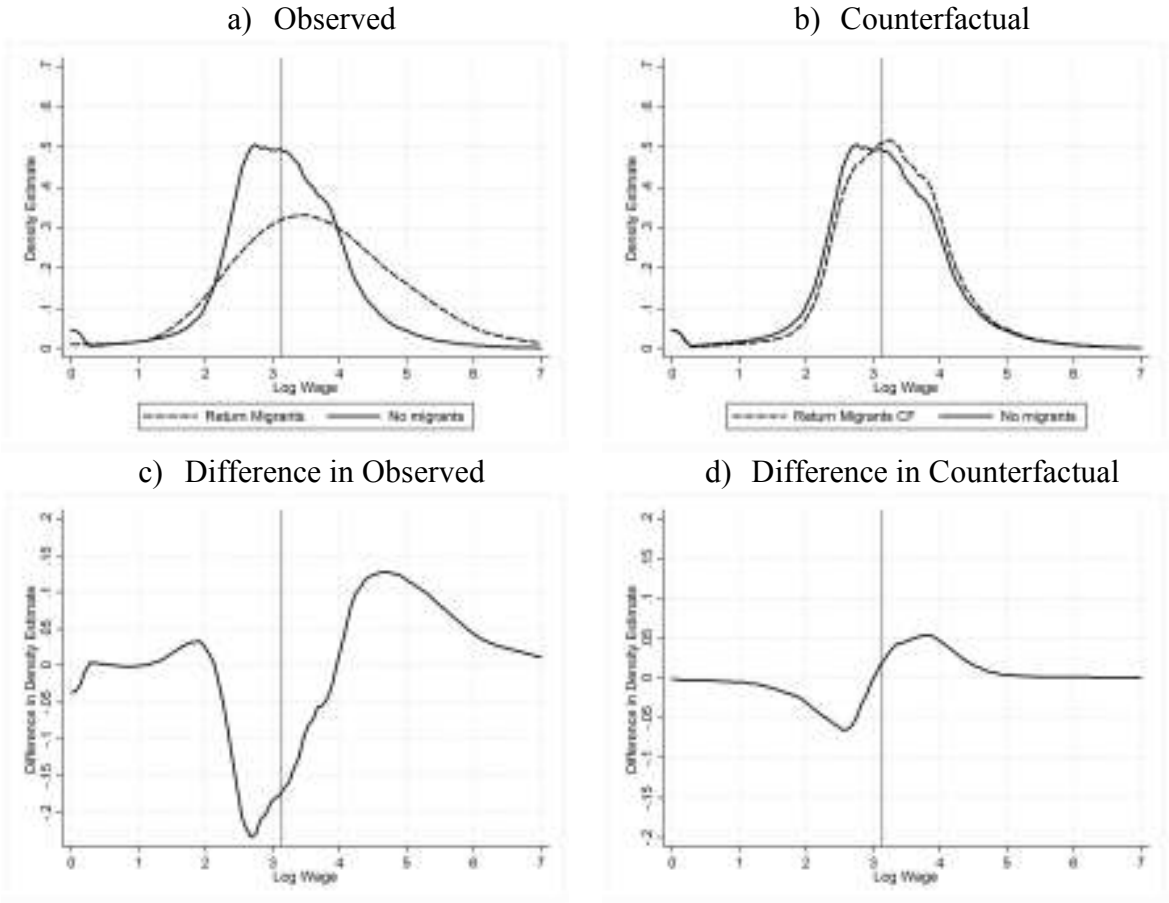
The distributions of the men in the 2000 census can be seen in Figure 3. The wage distributions show that fewer return migrants are in the lower part of distribution and that more return migrants are in the middle and upper parts of the distribution. After we estimated the counterfactual distribution, we found that the positive selection pattern observed in 1990 changes. The return migrants are drawn more from the middle of the distribution and less from the upper and lower parts of the distribution. In the graph, it is difficult to know whether the selection is positive or negative.

Figure 1. 1990 men.



Notes: The sample is restricted to male individuals between 20 and 59 years old. Panel a plots the observed wage distributions; Panel b plots the counterfactual distribution of wages that the return migrants would have earned had they never migrated; Panel c plots the difference in the observed wage distributions; and Panel d plots the difference between the counterfactual distribution and the observed distribution of the nonmigrants. All nonparametric distributions use the Epanechnikov kernel. The counterfactual reweights the nonmigrants' distribution for the characteristics of the return migrants.

Figure 2. 1990 women.



See Notes in Figure 1.

Table 4 also shows the statistics of the wage distributions in the year 2000. For the men, the percentiles of the wage distribution for the return migrants are still to the right of the percentiles of the distribution for the nonmigrants, but the average difference between the two groups has decreased. However, when we analyze the statistics in the counterfactual distribution, the return migrants are only located to the right of the nonmigrants in the 5th to 25th percentiles, whereas the nonmigrants tend to receive higher wages in the higher percentiles. This finding shows that the return migrants tend to be located disproportionally in the middle of the distribution. As a result, the wages that the return migrants would have obtained had they not migrated is slightly less than the nonmigrants' wages by 5 percent on average. Additionally, whereas the return migrants'

wages were more than 36 percent higher than the nonmigrants' wages in 1990, this number had decreased to 18 percent by 2000.

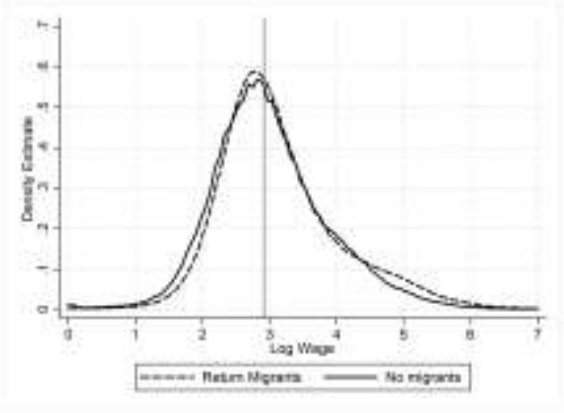
Table 4. Wage distributions statistics

	1990			2000			2010		
	S	RM	CF	S	RM	CF	S	RM	CF
MEN									
N	1194679	2659		1477186	15095		1599986	48671	
Mean	3.11	3.53	3.17	3.02	3.15	2.97	3.20	3.11	3.06
Var	1.10	1.45	1.05	0.78	0.83	0.64	0.65	0.59	0.51
5 per	1.41	1.75	1.56	1.78	2.04	1.89	2.11	2.11	2.11
10 per	2.09	2.41	2.21	2.07	2.24	2.11	2.33	2.33	2.29
25 per	2.56	2.88	2.66	2.45	2.58	2.47	2.69	2.66	2.64
50 per	3.10	3.45	3.12	2.92	2.98	2.87	3.11	3.02	2.98
75 per	3.66	4.20	3.69	3.49	3.56	3.35	3.61	3.43	3.42
90 per	4.34	4.98	4.34	4.18	4.44	3.97	4.25	4.05	3.91
95 per	4.82	5.42	4.82	4.59	4.96	4.37	4.65	4.59	4.34
WOMEN									
N	386434	424		677720	1973		829817	5564	
Mean	3.17	3.66	3.28	3.02	3.27	3.10	3.19	3.24	3.17
Var	0.90	1.39	0.86	0.83	1.02	0.75	0.74	0.88	0.67
5 per	1.82	2.18	2.01	1.66	1.91	1.85	1.95	1.88	2.00
10 per	2.23	2.41	2.38	1.99	2.17	2.11	2.27	2.27	2.29
25 per	2.64	2.92	2.74	2.42	2.58	2.51	2.66	2.66	2.66
50 per	3.14	3.50	3.25	2.94	3.12	3.01	3.12	3.13	3.09
75 per	3.72	4.42	3.79	3.61	3.86	3.63	3.71	3.77	3.67
90 per	4.21	5.05	4.28	4.20	4.52	4.22	4.30	4.52	4.23
95 per	4.64	5.67	4.68	4.52	4.93	4.52	4.64	5.00	4.59

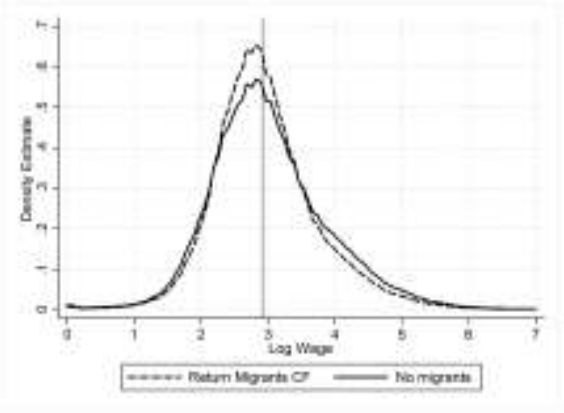
Notes: N corresponds to individuals with valid hourly wages each year. The sample is restricted to individuals who are 20-59 years old. S and RM represent columns for the observed wage distributions of nonmigrants and migrants, respectively. CF is the counterfactual distribution of the wages that the return migrants would have earned had they been paid as nonmigrants. The counterfactual reweighting procedure uses the full population of nonmigrants and return migrants. To estimate the reweighting factor, we use the following variables: i) eight groups of age; ii) regional dummies for North, Mexico City, NL rural, high-migration rural, low-migration rural, intermediate-migration rural and north rural; iii) dummies for each of the following levels of education: no education, primary incomplete, primary, secondary, high school and college; and iv) an indicator of an indigenous condition.

Figure 3. 2000 men.

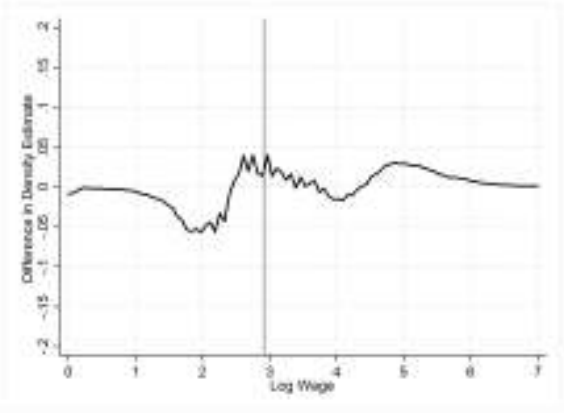
a) Observed



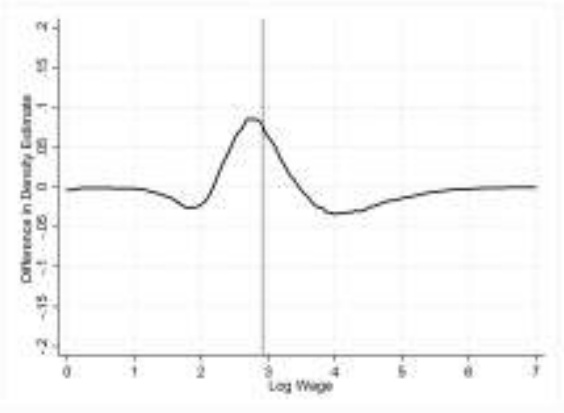
b) Counterfactual



c) Difference in Observed



d) Difference in Counterfactual



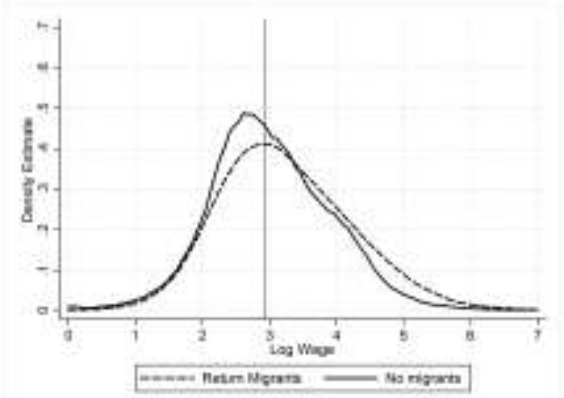
See Notes Figure 1.

Figure 4 shows the data on the women in the 2000 census. The wage distribution of the return migrants is clearly to the right of the nonmigrants' wage distribution. The counterfactual distribution shows a pattern in which the return migrants are drawn more from the middle and the upper middle parts of the distribution and less from the lower part. This finding suggests a pattern of positive selection for the women in the 2000 census. The percentiles in Table 4 show that the selection pattern remains positive for the women. In both cases, the wages obtained after migrating are higher than the wages that the women would have obtained had they not migrated. Additionally, the percentiles of the return migrants' wage distributions are higher than the percentiles of the nonmigrants' distribution. On average, the return migrants' wages are 25 percent higher than the

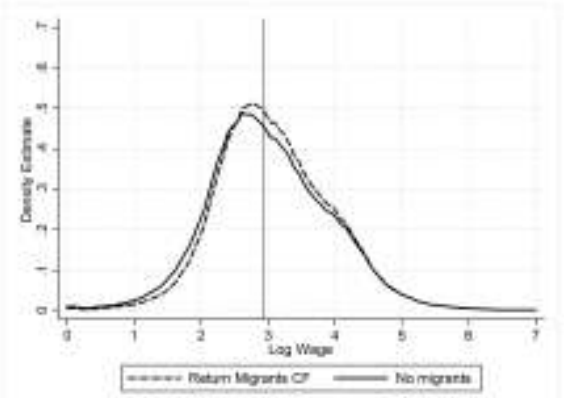
nonmigrants' wages, and the counterfactual wages of the return migrants are 8 percent larger than the nonmigrants' wages.

Figure 4. 2000 women.

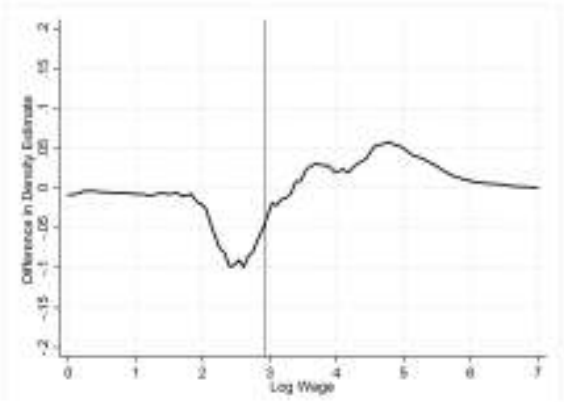
a) Observed



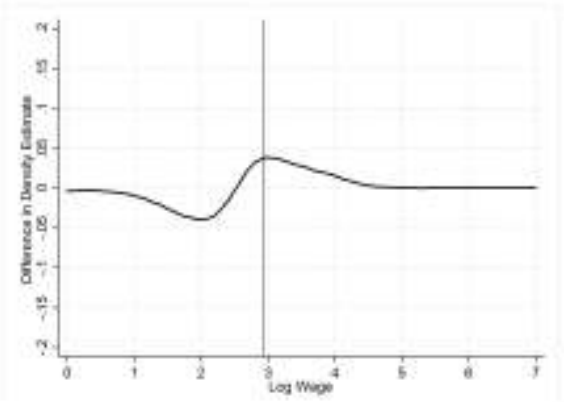
b) Counterfactual



c) Difference in Observed



d) Difference in Counterfactual



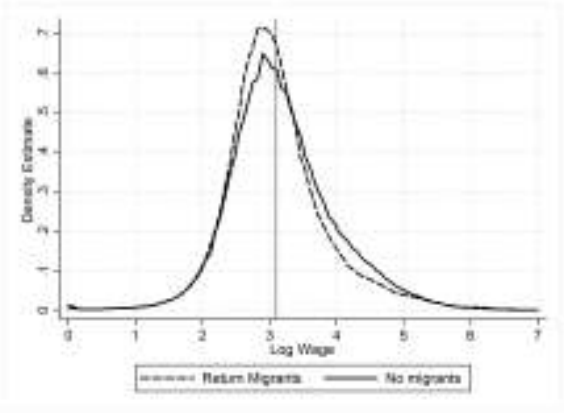
See Notes Figure 1.

In 2010, the pattern of selection is negative for men, as shown in Figure 5. Using the counterfactual distribution, we can show that there are more return migrants in the lower-to-middle part of the wage distribution. If we analyze the statistics shown in Table 4 for the men in 2010, then the counterfactual distribution of the return migrants and the distribution of the nonmigrants only coincide in percentile 5. In the rest of the percentiles, the return migrants are to the left of the nonmigrants. This finding indicates that the return migrants have lower wages than those of the nonmigrants. The difference between the wages that the return migrants would have obtained had they not migrated and those of the

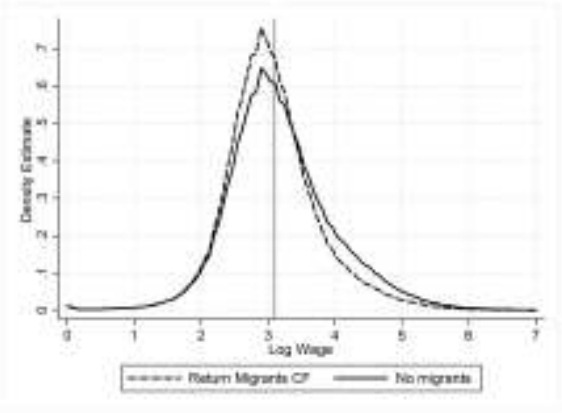
nonmigrants is -14 percent. The wage premium of migrating and returning is equal to 5 percent. Hence, this wage premium has also decreased over time.

Figure 5. 2010 men.

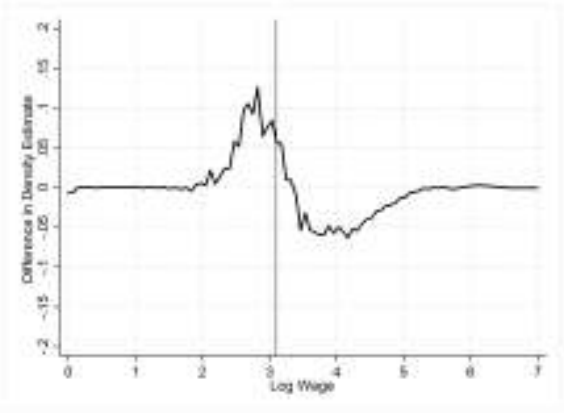
a) Observed



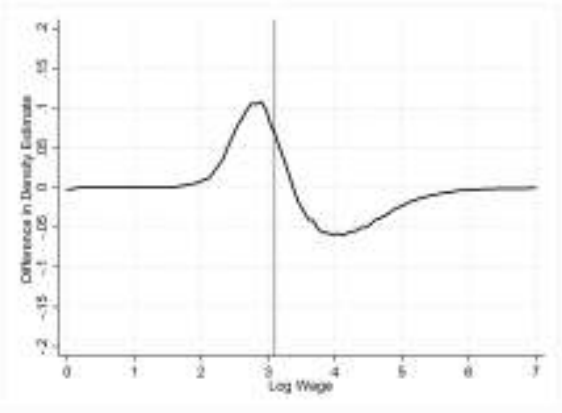
b) Counterfactual



c) Difference in Observed



d) Difference in Counterfactual



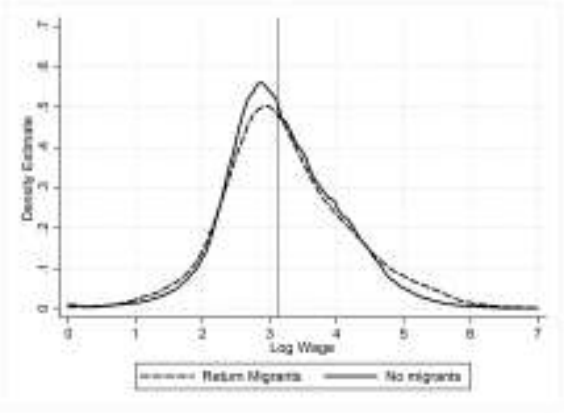
See Notes Figure 1.

Figure 6 shows the self-selection patterns for the women in 2010. The return migrants are somewhat more concentrated near the median of the nonmigrants' wage distribution and less among the high and low wages. According to Table 4, the difference between the wages that the return migrants would have experienced had they not migrated and those of the nonmigrants is -2 percent. In the lower part of the distribution (i.e., in the 5th and 10th percentiles), the return migrants are located to the right of the nonmigrants' distribution, whereas in the higher wages, the return migrants are to the left of the

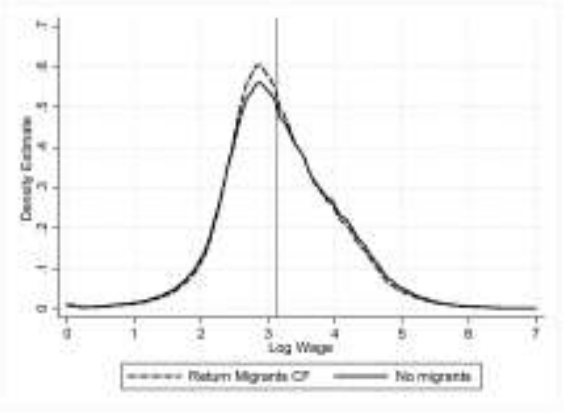
nonmigrants. This finding indicates that the return migrants are selected from the middle of the distribution.

Figure 6. 2010 women

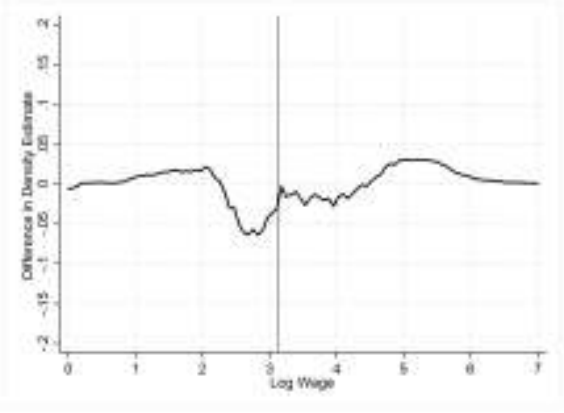
a) Observed



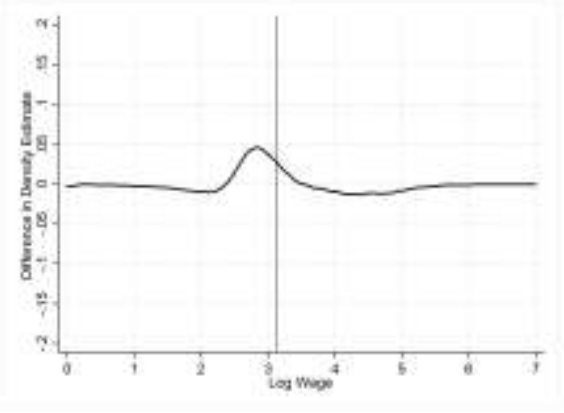
b) Counterfactual



c) Difference in Observed



d) Difference in Counterfactual



See Notes Figure 1

To determine whether the differences between the nonmigrants' wage distribution and the counterfactual distribution of the wages that the return migrants would have earned had they not migrated are statistically significant, we calculate the standard error of the difference by using 250 bootstrap repetitions. Table 5 shows the results. Overall, the standard errors are small, and most of the differences are statistically significant, except for the women in 2010 in the 20th and 25th percentiles of the wage distribution.

Table 5. Wage differences. Men and Women 1990-2010.

	Men			Women		
	1990	2000	2010	1990	2000	2010
Mean	0.058	-0.051	-0.134	0.108	0.076	-0.017
	[0.005]	[0.003]	[0.002]	[0.009]	[0.007]	[0.006]
Var	-0.051	-0.142	-0.143	-0.038	-0.084	-0.068
	[0.005]	[0.003]	[0.003]	[0.005]	[0.003]	[0.004]
5 per	0.152	0.105	0.000	0.194	0.186	0.049
	[0.023]	[0.000]	[0.005]	[0.016]	[0.010]	[0.006]
10 per	0.116	0.041	-0.041	0.151	0.118	0.017
	[0.013]	[0.002]	[0.000]	[0.007]	[0.006]	[0.011]
25 per	0.097	0.028	-0.049	0.107	0.097	0.009
	[0.006]	[0.000]	[0.000]	[0.008]	[0.010]	[0.006]
50 per	0.023	-0.049	-0.126	0.110	0.067	-0.031
	[0.012]	[0.003]	[0.007]	[0.008]	[0.014]	[0.010]
75 per	0.036	-0.145	-0.187	0.072	0.017	-0.037
	[0.010]	[0.007]	[0.003]	[0.005]	[0.016]	[0.013]
90 per	0.004	-0.219	-0.342	0.069	0.013	-0.069
	[0.013]	[0.009]	[0.016]	[0.012]	[0.012]	[0.008]
95 per	0.000	-0.223	-0.310	0.041	0.000	-0.049
	[0.008]	[0.011]	[0.008]	[0.019]	[0.008]	[0.006]

Notes: For each statistic, the table shows the difference between the log hourly wages of the nonmigrants and the log hourly wages of the return migrants' counterfactual distribution in Table 4. We calculate the standard errors by using bootstrap with 250 repetitions. The standard errors are in brackets.

5.2 Selection over time

The above results show that the self-selection among the return migrants tends to become negative over time. The same is true for both the men and the women. One concern about comparing changes in self-selection by using the estimates in each year is that doing so may confound the changes in the compositions of immigrant and resident populations with the changes in skill prices.[26] To address this concern, we must keep the skill returns constant. In the case of the return migrants in 1990, we estimate the following weighting function:

[26] Chiquiar and Hanson (2005) p. 264.

$$\psi_{m90}^{s10} = \frac{f(I = m, y = 1990 \mid z)}{f(I = s, y = 2010 \mid z)} \tag{7}$$

With this weight, we adjust the characteristics of the nonmigrants in 2010 according to the characteristics of the return migrants in 1990. Using this weight over the distribution of the nonmigrants in 2010 generates the counterfactual distribution of the wages that the return migrants would have earned in 1990 had they been paid as nonmigrants in 2010. For the nonmigrants in 1990, we calculate the following:

$$\psi_{s90}^{s10} = \frac{f(I = s, y = 1990 \mid z)}{f(I = s, y = 2010 \mid z)} \tag{8}$$

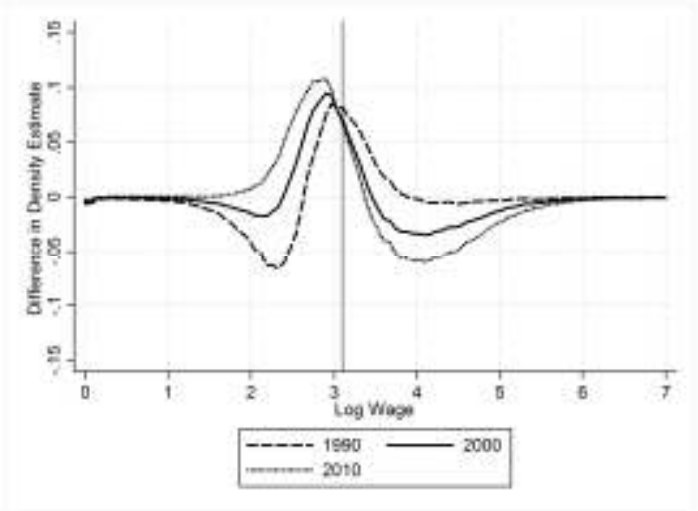
Applying this weight over the distribution of the nonmigrants in 2010 generates the counterfactual distribution of the wages that the nonmigrants would have earned in 1990 had they been paid as nonmigrants in 2010. Using equations (7) and (8), we can nonparametrically estimate the degree of selection for the return migrants in 1990 by evaluating this estimate in terms of the skill prices in 2010:

$$f_{m90}^{s10}(w) - f_{s90}^{s10}(w) = \int_{z \in \Omega} (\psi_{m90}^{s10} - \psi_{s90}^{s10}) f^{s10}(w, z) dz \tag{9}$$

Following a similar approach, we can estimate the degree of selection in 2000 by evaluating equation (9) in terms of the skill prices in 2010. For the 2010 census, we only use the 2010 estimates generated in the previous section.

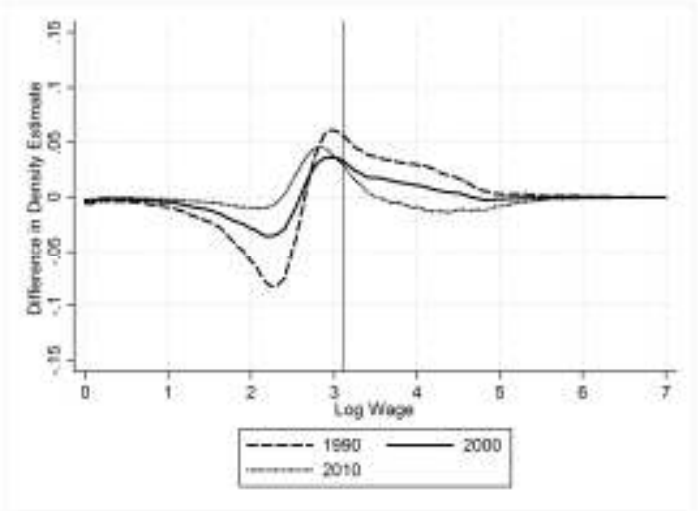
Figures 7 and 8 show the difference between the return migrants' wage distribution and nonmigrants' wage distribution when their characteristics are priced as nonmigrants in 2010 for the men and the women, respectively. The vertical line shows the median log wages in 2010 for the nonmigrants. For the men, Figure 7 shows a pattern of positive selection in 1990, intermediate selection in 2000 and negative selection in 2010. For the women, Figure 8 shows positive selection in 1990 and 2000 but intermediate selection in 2010.

Figure 7. Men
Differences between return migrants counterfactual and non-migrants wage distributions with 2010 skill prices.



Notes: The sample is restricted to male individuals between 20 and 59 years old. All nonparametric distributions use the Epanechnikov kernel. The counterfactual reweights the non-migrants wage distribution fixing the wage structure of non-migrants to the 2010 level with the characteristics of return migrants.

Figure 8. Women
Differences between return migrants counterfactual and non-migrants wage distributions with 2010 skill prices.



See Notes Figure 7.

The results of these estimates also appear in Table 6. For the men, we find a positive selection of 5 percent in 1990, a negative selection of 5 percent in 2000 and a negative

selection of 14 percent in 2010. Similar to the pattern obtained in the previous section, the results show that the degree of selection becomes more negative. For the women, the results also show that the degree of selection becomes more negative. In 1990, the women show an average positive selection of 12 percent. They show a positive selection of 5 percent in 2000 and a negative selection of 2 percent in 2010. In the column DIF, we show the differences in the statistics and the bootstrapped standard errors of the difference. Again, the differences in the distributions are statistically significant at the mean, variance and almost every percentile. The previous results show that the growing negativity in the degree of selection is not due to a change in the returns of the nonmigrants' characteristics.

5.3 Extensions

Previous studies on self-selection among permanent migrants have shown that the type and degree of selection tends to differ if we focus on different groups. Fernandez-Huertas (2011) finds that in the rural sector, selection is positive, whereas in the urban sector, selection is negative. McKenzie and Rapoport (2010) show that the degree of selection depends on the people's access to migration networks. In areas with highly developed migration networks, selection will tend to be negative, whereas in areas with underdeveloped networks, selection could be positive. We determine whether these patterns hold among the male return migrants.

Table 7 shows the results of the wage differences (only males) between the return migrants and the nonmigrants in the urban and rural sectors. The type of selection has always been positive in the rural areas. In 1990, the male return migrants would have obtained wages that are 21 percent higher than those of the nonmigrants if the migrants had never left the country. In 2000, this difference was equal to 17 percent, and in 2010, this difference declined to 4 percent. The 10th, 50th and 90th percentiles are higher in the return migrants' counterfactual distribution than in the nonmigrants' distribution in the rural sector in 1990 and 2000. In 2010, only the 10th percentile is higher in the counterfactual distribution of the return migrants, whereas the 50th percentile is the same for both distributions, and the 90th percentile is higher in the nonmigrants' distribution. This finding indicates that a small number of return migrants are low-wage workers and that this effect dominates the fact that few migrants with high wages exist in the rural sector in 2010

Table 6. Return migrants and non-migrants paid as non-migrants in 2010.

	1990			2000			2010		
	S	RM	DIF	S	RM	DIF	S	RM	DIF
MEN									
Mean	3.02	3.07	0.046	3.11	3.06	-0.050	3.20	3.06	-0.134
			[0.005]			[0.002]			[0.002]
Var	0.57	0.48	-0.086	0.6	0.49	-0.118	0.65	0.51	-0.143
			[0.005]			[0.003]			[0.003]
5 per	1.97	2.11	0.134	2.04	2.11	0.069	2.11	2.11	0.000
			[0.006]			[0.002]			[0.005]
10 per	2.26	2.33	0.071	2.29	2.33	0.041	2.33	2.29	-0.041
			[0.009]			[0.000]			[0.000]
25 per	2.58	2.66	0.089	2.64	2.66	0.021	2.69	2.64	-0.049
			[0.000]			[0.002]			[0.000]
50 per	2.98	2.98	0.000	3.02	2.98	-0.041	3.11	2.98	-0.126
			[0.009]			[0.001]			[0.007]
75 per	3.39	3.39	0.000	3.49	3.39	-0.105	3.61	3.42	-0.187
			[0.005]			[0.002]			[0.003]
90 per	3.93	3.90	-0.036	4.12	3.9	-0.219	4.25	3.91	-0.342
			[0.006]			[0.008]			[0.016]
95 per	4.40	4.34	-0.065	4.52	4.3	-0.219	4.65	4.34	-0.310
			[0.018]			[0.011]			[0.008]
WOMEN									
Mean	2.93	3.05	0.122	3.07	3.12	0.048	3.19	3.17	-0.017
			[0.008]			[0.005]			[0.006]
Var	0.64	0.59	-0.053	0.69	0.63	-0.058	0.74	0.67	-0.068
			[0.007]			[0.004]			[0.004]
5 per	1.75	1.95	0.204	1.87	2	0.129	1.95	2.00	0.049
			[0.013]			[0.011]			[0.006]
10 per	2.10	2.29	0.183	2.18	2.29	0.111	2.27	2.29	0.017
			[0.010]			[0.006]			[0.011]
25 per	2.49	2.60	0.108	2.58	2.64	0.069	2.66	2.66	0.009
			[0.011]			[0.005]			[0.006]
50 per	2.85	2.97	0.123	2.98	3.02	0.041	3.12	3.09	-0.031
			[0.012]			[0.002]			[0.010]
75 per	3.34	3.43	0.090	3.54	3.56	0.020	3.71	3.67	-0.037
			[0.018]			[0.014]			[0.013]
90 per	3.90	4.05	0.153	4.16	4.18	0.020	4.30	4.23	-0.069
			[0.015]			[0.011]			[0.008]
95 per	4.34	4.44	0.092	4.52	4.52	0.000	4.64	4.59	-0.049
			[0.020]			[0.000]			[0.006]

Notes: The sample is restricted to individuals who are 20-59 years old. S and RM represent columns for the observed wage distributions of nonmigrants and migrants, respectively. CF is the counterfactual distribution of the wages that the return migrants would have earned had they been paid as nonmigrants. The counterfactual reweighting procedure uses the full population of nonmigrants and return migrants. Standard errors are calculated using bootstrap with 250 repetitions. Standard errors in brackets.

In the urban sector, the type of selection changes from positive in 1990 to negative in 2000 and 2010. In other words, the selection is becoming more negative over time. In 1990, the percentiles of the return migrants' counterfactual wage distribution are larger than those of the nonmigrants' distribution, although the difference is only 2 log points in the 90th percentile. This finding suggests that, although the average difference is positive, the difference is due to the greater presence of return migrants in the middle of the distribution and not at the top. Although in 2000, the wages of the return migrants and the nonmigrants in the 50th percentile are equal, the return migrants' wages are greater than the nonmigrants in the 10th percentile and lower in the 90th percentile. In 2010, the percentiles of the return migrants' counterfactual wage distribution are lower than those of the nonmigrants' distribution. In sum, the evidence from the urban sector indicates a change toward negative selection.

Overall, the rural sector exhibits positive selection, and the urban sector changes from positive to negative selection. However, the pattern is becoming more negative in both sectors. Thus, the change in the type of selection from 1990 to 2010 is not a result of the increased number of rural workers becoming return migrants. In both rural and urban areas, the return migrants receive higher wages than the wages they would have obtained had they not migrated (i.e., the observed wage of the return migrant minus the counterfactual wage). This difference has fallen over time in both groups. In 1990, the male return migrants in the rural sector obtained hourly wages that were 35 percent higher than the wages they would have obtained had they not migrated. In the urban sector, this difference was 34 percent. In 2000, the increase in wages dropped to 14 percent within the rural population and to 19 percent within the urban population. In 2010, the difference was 7 and 3 percent in the rural and urban sectors, respectively. Thus, the wage premium for migrating to the US and returning back to Mexico has fallen over time.

To investigate the effect of migration networks, we divide the Mexican states between those with a long migratory tradition and the rest.[27] We expect that the migration networks are more developed in states in which the rate of migration has been historically

[27] The states with the highest rates of migration in 1950 were Aguascalientes, Durango, Guanajuato, Jalisco, Michoacan, San Luis Potosi and Zacatecas.

high. If McKenzie and Rapoport's (2010) proposal is true, then we should find more evidence of negative selection in states with a tradition of high migration rates.

Table 7. Wage distributions for subgroups. Men.

	1990			2000			2010		
	S	RM	CF	S	RM	CF	S	RM	CF
RURAL									
N	255636	597		421374	5842		563870	23748	
Mean	2.55	3.11	2.76	2.48	2.79	2.65	2.81	2.92	2.85
10 per	1.17	1.71	1.49	1.62	2.07	1.89	2.06	2.24	2.15
50 per	2.59	3.10	2.81	2.42	2.76	2.58	2.80	2.86	2.80
90 per	3.75	4.53	3.87	3.43	3.68	3.45	3.67	3.71	3.61
URBAN									
N	939043	2062		1055812	9253		1036116	24923	
Mean	3.26	3.65	3.31	3.13	3.28	3.09	3.27	3.20	3.17
10 per	2.34	2.56	2.41	2.19	2.31	2.26	2.41	2.39	2.39
50 per	3.21	3.51	3.26	2.98	3.09	2.98	3.20	3.09	3.09
90 per	4.44	5.05	4.46	4.30	4.59	4.12	4.34	4.05	4.05
HIGH									
N	232892	1209		284071	6944		318680	17362	
Mean	3.15	3.30	3.07	3.06	3.03	2.93	3.24	3.07	3.07
10 per	2.18	2.29	2.13	2.21	2.24	2.16	2.44	2.38	2.37
50 per	3.10	3.25	3.08	2.96	2.90	2.83	3.13	2.98	3.02
90 per	4.34	4.59	4.20	4.15	4.03	3.83	4.23	3.90	3.87
OTHER									
N	961787	1450		1193115	8151		1281306	31309	
Mean	3.10	3.72	3.27	3.01	3.24	3.00	3.19	3.13	3.06
10 per	2.07	2.56	2.32	2.04	2.22	2.07	2.29	2.29	2.29
50 per	3.07	3.61	3.24	2.92	3.03	2.92	3.09	3.02	2.98
90 per	4.34	5.15	4.47	4.19	4.66	4.08	4.25	4.12	3.96

Notes: The sample is restricted to male individuals who are 20-59 years old. S and RM represent columns for the observed wage distributions of nonmigrants and migrants, respectively. CF is the counterfactual distribution of the wages that the return migrants would have earned had they been paid as nonmigrants. The counterfactual reweighting procedure uses the full male population of nonmigrants and return migrants.

Table 7 shows the results. The difference between the nonmigrants' wages and the wages that the return migrants would have earned had they never migrated increased from 8

percent in 1990 to 17 percent in 2010 in states with a history of high immigration rates. The 10th, 50th and 90th percentiles of the counterfactual wage distribution for the return migrants are always to the left of the percentiles of the nonmigrants' distribution. This finding provides evidence of negative selection. In the rest of the states, the pattern changed from positive selection of 17 percent in 1990 to negative selection of 13 percent in 2010. The percentiles in the rest of states show that in 1990, the counterfactual wage distribution of the return migrants lay to the right of the nonmigrants' wage distribution. However, the selection pattern has become more negative over time.

The states with high migration rates show a greater degree of negative selection each year. This finding is consistent with McKenzie and Rapoport's (2010) hypothesis. Moreover, the type of selection has become more negative over time in both types of states. Interestingly, the wage premium associated with migration differs between the states with high migration rates and the rest. In the states with high migration rates, the wage premium is lower than that in the rest of the states. In 1990, return migration was associated with a wage premium of 23 percent in the states with high migration rates and 45 percent in the rest of the country. In 2000, the wage premium was 10 percent in states with high migration rates and 24 percent in the rest of the country. In 2010, the premium was null in states with high migration rates and equal to 7 percent in the rest of the states.

5.4 Robustness

To establish the validity of the results shown in Figures 1 to 8 and Table 4, we perform some robustness tests. One possible critique of our study is that the unobserved components may bias the results. However, Kaestner and Malamud (2010) use a different survey and find little evidence of selection bias from unobservables. Hence, if the unobservables are correlated with the nonlinear functions of the observable characteristics, then adding these nonlinear functions should mitigate the possible bias. To do so, we estimate $f(I = s \mid z)$ and $f(I = m \mid z)$ by using the interactions between the respondents' years of education and each of the six geographical areas, the interactions between the years of education and each of the age groups, the interactions between the age and the six geographical areas, and the interactions between the rural sector and each educational level. The counterfactual wage distributions changed only slightly. The average counterfactual

wage changed by no more than 2 log points. Table 8 shows the results under the column ALL. The first column (OR) in the table for each year shows the counterfactual estimates of Table 4.

Table 8. Robustness tests in counterfactual distribution for return migrants.

	1990			2000			2010		
	OR	REST	ALL	OR	REST	ALL	OR	REST	ALL
MEN									
Mean	3.17	3.19	3.18	2.97	2.98	2.97	3.06	3.06	3.06
Var	1.05	1.04	1.06	0.64	0.65	0.64	0.51	0.51	0.51
5 per	1.56	1.64	1.57	1.89	1.89	1.89	2.11	2.08	2.10
10 per	2.21	2.23	2.22	2.11	2.11	2.11	2.29	2.29	2.29
25 per	2.66	2.69	2.67	2.47	2.47	2.47	2.64	2.64	2.64
50 per	3.12	3.16	3.14	2.87	2.89	2.87	2.98	2.98	2.98
75 per	3.69	3.72	3.72	3.35	3.39	3.35	3.42	3.42	3.41
90 per	4.34	4.35	4.36	3.97	4.01	3.99	3.91	3.91	3.90
95 per	4.82	4.84	4.86	4.37	4.42	4.41	4.34	4.34	4.32
WOMEN									
Mean	3.28	3.26	3.29	3.10	3.11	3.12	3.17	3.16	3.17
Var	0.86	0.91	0.88	0.75	0.76	0.77	0.67	0.67	0.67
5 per	2.01	1.93	2.00	1.85	1.86	1.86	2.00	1.99	2.00
10 per	2.38	2.34	2.37	2.11	2.11	2.11	2.29	2.29	2.29
25 per	2.74	2.72	2.76	2.52	2.54	2.53	2.66	2.66	2.66
50 per	3.25	3.25	3.28	3.01	3.02	3.03	3.09	3.05	3.08
75 per	3.79	3.79	3.82	3.63	3.65	3.68	3.67	3.65	3.67
90 per	4.28	4.31	4.31	4.22	4.25	4.26	4.23	4.23	4.23
95 per	4.68	4.71	4.71	4.52	4.55	4.55	4.59	4.59	4.59

Notes: OR represents the counterfactual estimates for return migrants in Table 4. RES follows the same procedure except that restricts the reweighting procedure to individuals with valid hourly wage. In ALL we include more variables when we estimate the reweighting factor in the full sample: interactions between years of schooling and each of the six geographical areas, interactions between the years of schooling and each of the age groups, interactions between the age and the six geographical areas, and interactions between the rural sector and each educational level.

Additionally, we obtained the wage distributions of both the return migrants and the nonmigrants from the individuals with valid wages, but we constructed the counterfactual

distribution while considering the characteristics of all of the migrants, as if they had participated in the labor market in the same manner as the nonmigrants. Doing so may also have biased our results. To determine whether this decision has important effects on our estimates, we restrict the sample to only those with valid wages. The second column (REST) in Table 8 shows the estimates generated by using the restricted sample. Once again, the results show no major changes, and the counterfactual average wage does not differ by more than 2 log points from the results in Table 4. The type of selection still becomes more negative over time, and the wage premia still decline because of migration.

Another concern is that the results could be due to the differences in the age structures between the migrant population and the nonmigrants. To determine if the age structure changes our results, we restricted the male sample to only the migrants between 20 and 35 years old. Table 9 shows the results. In terms of selection, the results are similar to those provided in Table 4. There is a positive selection of 4 percent in 1990, a negative selection of only 3 percent in 2000 and a negative selection of 10 percent in 2010. The immigration wage premium also follows the same pattern as that shown in Table 4.

Table 9. Robustness test: Men 20-34.

	1990			2000			2010		
	S	RM	CF	S	RM	CF	S	RM	CF
N	656020	1698		770578	10039		747004	28845	
Mean	3.08	3.46	3.12	2.94	3.09	2.91	3.10	3.05	3.00
10 per	2.17	2.41	2.23	2.07	2.22	2.11	2.33	2.33	2.29
50 per	3.06	3.40	3.10	2.86	2.92	2.82	3.02	2.98	2.96
90 per	4.21	4.81	4.21	3.96	4.25	3.83	4.04	3.90	3.78

Notes: The sample is restricted to male individuals who are 20-34 years old. S and RM represent columns for the observed wage distributions of nonmigrants and migrants, respectively. CF is the counterfactual distribution of the wages that the return migrants would have earned had they been paid as nonmigrants. The counterfactual reweighting procedure uses the male population of nonmigrants and return migrants who are 20-34 years old.

The census only captures the migrants who returned within five years before the data were collected. Thus, it is difficult to know whether the migrants have temporarily or permanently returned to Mexico. A second weakness in the census is that we are only aware of the international migratory activities over a period of 5 years. Many individuals

who have migrated in the past are considered nonmigrants in the census. The census does not contain information that allows us to resolve the potential bias caused by these characteristics of the census. However, we use a survey that may counteract this possible bias. The 2006 Social Mobility Survey (EMS) asked individuals if they had traveled to the United States to work for a month or more at least once in their life.[28] Using this survey, we can completely separate the population that has migrated at least once to work in the United States from those who have not.

We apply the same methodology by using the EMS as a robustness test. We concentrate on men because the survey was designed to interview mostly men. Table 10 shows the results. In 2006, the wages that the return migrants would have obtained had they not migrated is 3 percent lower than the wages of the nonmigrants. The immigration wage premium is 7 percent. The evidence suggests that the return migrants are more concentrated to the left of the median of the nonmigrants' wage distribution given that the 10th percentile is larger for the migrants, but the 90th percentile is higher for the nonmigrants. This result is similar to our observation in the 2000 census for men. Additionally, the fact that the average selection is less negative in the EMS does not eliminate the possibility of a slightly positive selection in the earlier years, as we estimated from the 1990 census. Hence, the census's restriction of immigrant status to the previous 5 years does not affect the main results and, in fact, the EMS supports the evidence provided by the 1990 and 2000 censuses.

Recent articles about the self-selection among Mexican migrants (e.g., Fernandez-Huertas 2011, Kaestner and Malamud 2010, and Ambrosini and Peri 2012) focus on the period from 2000 to 2005. We also use a survey conducted in 2006. This survey captures information about the return migrants in that period by using the same methodology employed in the 2000 census. The National Survey of Demographic Dynamics (ENADID) asked if any of the members of the respondents' households traveled to the United States with the objective of living in that country since 2001 and whether the same member had returned within the same period. The survey also asked for the locations in which the

[28] The survey was designed by Centro de Estudios Espinosa Yglesias, a civil association funded by Fundacion Espinosa Rugarcia (http://www.ceey.org.mx).

members of the household had lived five years before the census took place.[29] Table 10 provides the results of this survey for the men. The difference between the wages that the return migrants would have earned had they not migrated and the wages of the nonmigrants is 4 percent. The immigration wage premium is equal to 11 percent. Although ENADID uses the same methodology as the census, the results are similar to those found by the EMS. Nevertheless, both surveys do not show the large negative difference found in the 2010 census. This finding suggests that the self-selection pattern among the return migrants became more negative after 2006. The shocks suffered by the US economy after 2006 may explain part of the increasingly negative self-selection pattern.

Table 10. Robustness test: Different datasets.

	ENADID			EMS			ENOE		
	S	RM	CF	S	RM	CF	S	RM	CF
MALE									
N	23231	415		3767	585		221648	1048	
Mean	2.97	3.04	2.93	2.66	2.70	2.63	-0.25	-0.56	-0.44
Var	0.62	0.80	0.52	0.69	0.59	0.59	0.59	0.51	0.51
10 per	2.09	2.15	2.12	1.60	1.73	1.68	-1.04	-1.32	-1.17
50 per	2.89	3.00	2.87	2.71	2.66	2.64	-0.29	-0.54	-0.43
90 per	3.98	4.14	3.83	3.63	3.69	3.52	0.70	0.22	0.33

Notes: ENADID: National Survey of Demographic Dynamics, conducted in 2006. EMS: Social Mobility Survey, conducted in 2006. ENOE: National Survey of Employment and Occupation. We use the surveys from the third quarter of 2005 to the second quarter of 2007. We restrict the sample to men between 20 and 59 years old, except in the given EMS for which data were only available for men between 25 and 59 years old. S and RM represent the columns for the observed wage distributions of the nonmigrants and the migrants, respectively. CF is the counterfactual distribution of the wages that the return migrants would have earned had they been paid as nonmigrants. The counterfactual reweighting procedure uses the male population of the nonmigrants and the return migrants. The variables used to calculate the reweighting factor are the same as those in Table 4, except in the case of ENOE in which the indigenous variable is not available.

We can make an additional comparison by using the information regarding the return migrants in a survey that employs a methodology similar to that of the labor force survey used by Fernandez-Huertas's (2011). This survey reports the greatest negative selection regarding Mexican migrants in the literature. The National Survey of Employment and Occupation (ENOE) is a Mexican survey designed to capture the evolution of

[29] The survey is available at INEGI (http://www.inegi.org.mx).

employment and unemployment since 2005. Each household is interviewed for 5 consecutive quarters. From the second interview on, the households report whether a new member is immigrating or whether the household has lost a member because of migration. We use the same methodology employed for the men in Table 4 for the data extracted from the third quarter of 2005 to the second quarter of 2007. However, before taking the logarithm of the wages, we estimate the wages relative to the average wages of the quarter to avoid seasonal effects, as proposed by Fernandez-Huertas (2011).

Table 10 provides the results under the column ENOE. The wages that the return migrants would have earned had they not migrated is 19 percent less than the wages of the nonmigrants. Contrary to all previous estimates, the wages obtained by the return migrants is 12 percent less than the counterfactual wages. In sum, after the migrants return, the return migrants earn a wage that is 31 percent less than that of the nonmigrants. This finding suggests that the return migrants become more negatively selected if we analyze the flow and not the stock, possibly because of the existence of low-skilled migrants who tend to make more trips. Nonetheless, three different surveys of the census show negative selection for the return migrants.

5.5 Implications

An important aspect to consider is whether the return migrants exhibit different skills from the permanent migrants. According to the discussion in section 2, these skills should be different in the Bratsberg and Borjas (1997) framework. However, with our datasets, we cannot directly test this prediction. Nonetheless, our results are similar to the findings regarding Mexican permanent migrants that were reported in the recent literature. For example, using the 2000 Census, Ibarraran and Lubotsky (2007) find that male Mexican migrants have 0.56 fewer years of schooling than the males in nonmigrant households. This finding almost coincides with our statistics, which indicate that the male return migrants have 0.64 fewer years of schooling than the nonmigrants. With respect to Chiquiar and Hanson's (2005) results, we also find evidence of positive selection among both the men and the women in 1990 as well as evidence of positive selection among the women and intermediate selection among the men in 2000. This finding suggests that the

differences in skills between the return migrants and the permanent migrants who settle in the United States could be small.

The evidence suggests that migration networks play an important role in alleviating the migration costs experienced by low-skilled individuals, as suggested by McKenzie and Rapoport (2010). The tendency to find negative selection increases as time goes on, regardless of the subgroups being considered. Moreover, in states with a long migration tradition, the self-selection patterns are negative, as predicted by Bratsberg and Borjas (1996), whereas in states with weak migration networks, the self-selection patterns tend to be positive or less negative. Future research should tackle the importance of alternative hypotheses to explain why the selection among the Mexican return migrants becomes more negative over time. Factors such as changes in the demand for labor because of shocks to both economies and the effect of changes to the enforcement of migration laws may play an important role. By example, evidence in Taylor, Charlton and Yunez-Naude (2012) suggest that changes in demand of agricultural labor in Mexico have implications for the composition of rural international migration.

There are important differences in the selection patterns between the men and the women among the return migrants. Not considering the women in the analysis biases the results toward finding negative selection. If these differences also exist among permanent migrants, as Chiquiar and Hanson's (2005) results suggest, then omitting women from the analysis of the selection patterns may produce misleading conclusions.

6 Conclusions

In this article, we analyzed the self-selection patterns of return migrants in Mexico by using the censuses for the years 1990, 2000 and 2010. In particular, we followed DiNardo et al.'s (1996) methodology to calculate the counterfactual wages that the return migrants would have earned had they not migrated. This methodology has been used to analyze the selection of Mexican immigrants into the United States (Chiquiar and Hanson 2005; Fernandez-Huertas 2011) but has not been utilized to analyze the selection of return migration into Mexico. We presented evidence suggesting that the self-selection patterns among the Mexican return migrants have changed over time (i.e., from positive selection in

1990 to negative selection in 2010). For example, the wages that the male return migrants would have earned had they not migrated is 6 percent larger than the wages of the male nonmigrants. However, by 2010, this difference had declined to -14 percent. The growing negativity of the degree of positive selection is robust to the analysis of specific subgroups: rural and urban, men and women, and states with high migration rates and low migration rates. Furthermore, the negative selection results are robust with respect to the dataset used. We employed different datasets that measure the flow and stock of return migrants in different ways. The negative selection result is stronger in the sample that measures the flow of the return migrants.

Important differences exist among the different subgroups. Women tend to show more positive selection than men. For men in the rural sector, selection has been positive since 1990. However, states with high migration rates have shown negative selection since 1990. This last result is consistent with the role of migration networks in alleviating migration costs.

In general, the self-selection patterns tend to coincide with the results found in the literature on Mexican migrants living in the United States. For example, previous studies indicate that women are positively selected and that men show intermediate selection. We also find similar results for the censuses taken in the years 1990 and 2000. However, we find that the selection of the return migrants became more negative from 1990 to 2010. The similarity between our results and those of previous studies on Mexican migrants in the United States suggests that the differences in skills between return migrants and permanent migrants could be small.

An interesting result is that the observed wages of the return migrants are higher than the wages that they would have earned had they not migrated. In other words, there is a wage premium to migrate and return. This premium shows that migration has a positive effect on the Mexican economy. The previous literature on Mexican migration to the United States has neglected to study this effect. Hence, further research is necessary to understand the factors driving migrants to return to Mexico. Such research would help policymakers design return migration policies that may reduce the concern of a massive permanent migration wave to the United States.

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