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The Effect of Remittances and Migration on Human Capital: Evidence from Mexico

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Abstract

In this paper I disentangle the effects of migration and remittances on human capital using a large data base which includes information on both the reception of remittances and the existence of migrants in the household. I am able to identify an income effect which is positive and statistically significant, as well as a negative substitution effect which is also significant. I also find that the combined effect of migration and remittances is positive for households where the migrant left less than five years ago, but that the combined effect is negative for households where the migrant left more than five years ago. Therefore, they reveal a negative interaction with time. These results are obtained using instrumental variables, based on state migration rates, municipality migration rates and the fraction of households that receive remittances at the municipality level.

Keywords: Remittances, migration, human capital
JEL classification: F22, D91, J61,D84, O15, O24

Resumen

En este artículo presento una separación de los efectos de la emigración y las remesas en el capital humano usando la base de datos del censo del año 2000, la cual incluye información sobre la presencia de emigrantes en el hogar en los Estados Unidos al momento del censo, así como sobre la recepción de remesas en el hogar. Identifico que exite un efecto de ingreso positivo y estadísticamente significativo de las remesas, así como un efecto negativo de sustitución que es también estadísticamente significativo. También encuentro que el efecto combinado de la migración y las remesas es positivo para hogares donde el emigrante dejó el hogar hace menos de cinco años. Sin embargo, el efecto combinado es negativo para hogares donde el emigrante dejó el hogar hace más de cinco años. Por lo tanto, este resultado revela una interacción negativa entre el tiempo fuera del hogar y los efectos ingreso y sustitución. Estos resultados se basan en estimaciones que utilizan como instrumentos tasas de emigración a nivel estatal, tasas de emigración a nivel municipal y la fracción de hogares que recibe remesas a nivel municipal.

Palabras clave: remesas, migración, capital humano
Clasificación JEL: F22, D91, J61,D84, O15, O24

Introduction

The increasing importance of the resources sent by migrants to family members in their origin communities has seen also an increase in the research done to determine the effects of remittances on economic development, and specifically their effects on human capital. This question has become empirically important since from a theoretical point of view there are different effects at work, some can increase education and others can reduce it.

There are different reasons as to why these monies should have a positive effect on the accumulation of education. If education is seen as consumption, then under the assumption that education is a normal good, the household should increase its expenditure on education given the increase in income generated by the remittances. If education is seen as a costly investment, and if households face credit constraints, the remittances can help to alleviate resource constraints and thereby increase education.

On the other hand, remittances can also generate negative effects. In order to generate the remittances the household has to split with some members (usually one of the parents) leaving the household to work in a different location. This movement changes the organization of the household potentially harming education. First, if the two parents leave the household, the persons in charge of the children may not have the same incentives to supervise them. Second, if the family has some type of business (*i.e.* family farm in the rural areas or family business in the urban areas) the children may be needed as labor force for the family farm or family business. Third, since migration is a costly and uncertain when the main breadwinner of the household goes away, the household may decide to increase its participation in the local labor market to provide with income while the main breadwinner establishes in his or her new location and is able to send enough remittances to the household.

The question is also relevant from the point of view of economic policy. Identifying whether remittances increase human capital investment and what factors deter such investment is fundamental to improve current public policy to accommodate for the special needs that migrant households may have.

The objective of this paper is to disentangle the effects of international remittances from the effects generated by the migration of household members. By using the 2000 Mexico census questionnaire, I am able to have a large and representative sample of Mexican individuals in the ages of 12 to 19 years old, where I know which households receive remittances and which households have migrants at the moment of the survey. I focus in the case of migration to the US and the reception of international remittances. The study

ignores the case of internal migration and internal remittances, for simplicity and not because I consider internal remittances as less important.

Using an econometric method proposed by Dubin and McFadden (1984) I am able to show that taking into account the presence of migrants in the household and the presence of remittances in the household a researcher can separate out the positive effects of remittances on education from the negative effects. The method is a generalization of the Heckman selection model for the case in which there are multiple sources of selection. The identification is possible thanks to the use of instrumental variables that provide with independent variation that helps identify why certain household have migrants and remittances and other households do not. The instruments used are the 1997 state migration rates, the 2000 migration rate at the municipality level, and the 2000 fraction of households receiving remittances at the municipality level. The first instrument follows the logic that states that have larger historic migration rates have higher migration rates nowadays (Hanson and Woodruff, 2003; Woodruff and Zenteno, 2007). The second instrument follows the logic that migration networks depend on local factors because they are based on kinship relations (Massey, 1987), geography (Borraz, 2005) or local weather (Munshi, 2003; López Córdoba, 2006). The third instrument follows the logic that migration networks have different efficiency to generate income (Adams and Cuecuecha, 2008; Adams, Cuecuecha and Page, 2008, 2008a).

This is the first paper to separate out the positive effects of remittances on education from the negative effects of migration on education. Previous literature based their efforts in identifying households receiving remittances from those not receiving remittances. Using data from the 2000 Mexican Census, Hanson and Woodruf (2003) find that for households headed by females remittances increase the education of girls, but not of boys. As an instrument for remittances they use historical data on migration patterns from Mexico to the United States at the state level. On the contrary, Borraz (2005), using the same data and instruments, but focusing on communities with less than 2500 inhabitants, finds positive effects for both boys and girls. He also includes the geographical distance from the municipalities where individuals reside to the US as an instrument. Using aggregate data López-Córdoba (2006) uses nationally representative aggregate data on municipalities and finds that among Mexican rural municipalities, remittances generate higher human development indicators. In particular, he finds that infant mortality, child illiteracy and some poverty measures tend to reduce. He uses as an instrument to identify these effects rainfall patterns at the municipal level. Using a rural survey, Meza and Pederzini (2006) find that migration has positive effects for girls but negative effects for boys.

These results are related also to the literature that has studied the effect of remittances on household consumption patterns. They are consistent with

the growing view in the literature that households receiving international remittances spend more on education. Adams and Cuecuecha (2008) find that households in Guatemala that receive international remittances spend more on education compared to the counterfactual situation in which they would not receive such income flows. Adams, Cuecuecha and Page (2008) conclude the same for Ghana.

The paper is also related to a larger literature that has look for the effects of remittances in other indicators of development or reduction of poverty in Mexico. Some authors have analyzed the relation between remittances and migration with entrepreneurial activities (Durand, Parrado and Massey, 1996; Lindstrom, 1996). Esquivel (2004) analyzes the effect of remittances on poverty.

The remainder of the paper is organized as follows: the first section presents the data, the second section presents the empirical model, the third section discusses the identification of the model, the fourth section presents the specification of the model, the fifth section presents the results, the sixth section presents robustness checks done on the estimations and the last section concludes.

1. Data

The primary source of data for this paper is the 9.1% public sample of the 2000 Mexico census. The sample consists of individuals between the ages 12 to 19 years old that belonged to households for which the information on remittances, migration, education of the individuals, and education of the head of household was not missing. I restrict attention to the offspring from the head of household. In total I have approximately 1.2 million individuals.

The census asks the households about the amount of remittances from other countries that they receive. The census also asks the households if anybody from the family has migrated in the last five years. In principle, I should generate three types of households using these two indicator functions: *(1)* households with no remittances and no migrants, *(2)* households with remittances and migrants, and *(3)* households with migrants and no remittances. However, the data divides into four types, with the fourth type being *(4)* households that receive remittances and with migrants that left more than five years ago. The explanation for the existence of this category is as follows. The public file of the census is split into two files. One includes the general questions for the entire population, among which the remittances question is included, and the second are the answers to the supplemental questionnaire that is administered to households that declare to have migrants, among which the question about the number of migrants abroad is included. The authority deleted from the migrant files those households that reported to have migrants that left more than five years ago. Consequently,

for households in which the migrants left home more than five years ago and have not come back are reported as having no migrants and having remittances.[1] I decided to keep these households apart from households with remittances and migrants because the fact the migrants left more than five years ago can have important consequences in the household.

The individuals included in the sample are divided into these four types of households. Most of the individuals live in households with no remittances and no migrants (86%). Less than 1 % (0.2%) of the individuals live in households with migrants and remittances. Approximately 5% of the individuals belong to households with migrants that receive no remittances. Finally, 7% of the individuals live in households that receive remittances and the migrants left more than five years ago. From now on, I will refer to this group as the Long Term migrants group.

Table 1 (all tables are at the end of the document) shows which effects can potentially be found in each of the individuals of the households analyzed. The group that receives no remittances and has no migrants is clearly the control group. The groups that receive remittances and have migrants have clearly both income and substitution effects. Finally, the group that has migrants and receives no remittances has the substitution effects but not the income effects. It is important to recognize that the exposure to these effects in practice can not entirely be obtained from this classification because I do not know if the households that receive remittances have always received remittances, or if the group that does not receive remittances has always remained in such state. This would ideally be solved by a panel data set with a continuous monitoring of the households.

Table 2 shows how I use the data to identify the effects of remittances and migration. In the first row, I show the first experiment using as control group the individuals from households that do not receive remittances and do not have migrants. In the second raw, I show the second experiment that I perform by using the individuals from households with no remittances and migrants as the control group.

First, when I compare the first control group with individuals from households that live in households that receive remittances and have migrant, I can identify the combined effect of remittances and migration. Moreover, when I compare the first control group with individuals from households with long term migrants and remittances, I can identify the combined effect of remittances and migration, interacted with time. Finally, when I compare the

[1] There is also another possibility for households of type 4. The public file explains that the files of migrants that were not part of the household at the moment of the migration are also deleted. An example would be an individual that migrated to the US, married a girl in the US, and later on she came back to Mexico, while he stays in the US working. Then he would not be part of the household at moment of the migration but he would be sending remittances for his wife and kids. There is no way to know in the data how many of these cases exist.

first control group with individuals from households that do not receive remittances and have migrants I identify the substitution effect.

In the second experiment, when I use the second control group and compare it with individuals from households that do not receive remittances and do not have migrants I can identify the negative of the substitution effect. When I compare the second control group with the individuals from households that have remittances and migrants I can identify the income effect. Finally, when I compare our second control group with the children from households with remittances and long term migrants, I identify the income effect interacted with time.

If the allocation of the individuals analyzed into the mentioned households would be random, I could use ordinary least squares to identify the effects of migration and remittances. However, there are differences in characteristics both observables and unobservables that prevent me from using ordinary least squares. Table 3 shows the list of observable characteristics that will be used as control variables in the analysis. As for the unobservable characteristic I will present in the next section the empirical strategy to deal with that.

In the case of the characteristics of the individuals analyzed, the differences observed in the table are not statistically significant. The average age of the sample is 15 years old, and the sample is comprised roughly by 50% males and 50% females.

Differences statistically significant are observed once I look at the characteristics of the households. Individuals that receive remittances live on average on households that are more affluent than those individuals who do not receive remittances. The poorest individuals are those with no remittances and migrants. Surprisingly, the average education of the head of household does not follow the above pattern. The average education of the head of household is the largest for individuals that live in households with no remittances and no migrants. The least educated head of households are those for individuals that live in households with no remittances and migrants. The age of the head of household also varies greatly by household type. Individuals that live in households with no remittances and migrants have head of household that are the oldest of the sample. The number of household members in the household is similar between the different individuals, when I measure by the number of children present in the household, when I measure by the number of grandchildren of the household, or when I measure by the number of people 65 and above living in the household. Interestingly, the eldest child in the household is more likely to be male in households that receive remittances. The mother is present in 97% of the households, even though for households that receive remittances and have migrants the mother is present in only 96% of the cases. There is also a very large variation in the proportion of individuals that live in rural areas. 41% of the individuals live in rural households when they receive remittances

and have migrants, while only 1.4% of the individuals that do not receive remittances and do not have migrants live in rural areas.

Table 4 shows the education years for the individuals analyzed. The entire sample has 7.4 years of education which already shows that by an early age many of the individuals 12 to 19 years old have drop out of school. 7.4 years of education represents in Mexico an individual that has finished primary education and has 1.4 years of junior high school (*secundaria* in the Mexican education system). Table 4 shows that the individuals with the highest years of education are those found in households with remittances and long term migrants. In particular, they have 1.07% *more* education years than individuals from households with no remittances and no migrants. On the other hand, individuals that receive remittances and have recent migrants have 2% *less* education years than individuals from households with no remittances and no migrants. Finally, individuals with no remittances and migrants are the worse in education years. They have 5.2% *less* education than individuals with no remittances and no migrants. In short, without the use of any econometric technique and based only in pure statistical differences in observed education, the substitution effect of migration is clearly negative, while the combined effect of migration and remittances has a sign that is not clear. I will now present techniques that will help us determine the sign and size of these effects.

Before going into further details, Table 4 also presents the standardized years of education of the individuals analyzed. This variable is defined as the education of an individual of a given age, minus the average education for individuals of the same age and divided by the standard deviation for individuals of the same age. I standardized the education years since I am going to be comparing individuals of different ages.

2. Empirical model

The empirical strategy to obtain the effects of migration and remittances follows the literature on the evaluation of multiple treatments (Lechner, 2002). Lechner proposes that an evaluator can focus in studying the pair wise comparisons between treatments to disentangle the multiple average treatment effects that can be obtained. In particular, applying this literature to the case that I study, to estimate the Average Treatment Effect of Treatment *g* on the participants in treatment *s* the following difference needs to be estimated:

$$ATT_{sg} = E(E_s|c = s) - E(E_g|c = s) \quad (1)$$

Where $E(E_s|c=s)$ represents the expected education of participants in treatment s, conditional on the characteristics of children that belong to households of type s, and $E(E_g|c=s)$ represents the counterfactual expected education for participants in treatment s. This counterfactual represents the education that participants in treatment s would have if they would participate in treatment *g*, conditioning on the characteristics of children participating in treatment *s*.

To construct the expected values for the education of children participating in each different treatment, I follow the literature on polychotomous-choice models (Lee, 1983; Dubin and McFadden, 1984; Schmertmann, 1994; Bourguinon, Fournier and Gourgand, 2004). Specifically, I assume that households can select between four states (S): *(1)* households with no remittances and no migrants, *(2)* households with remittances and migrants, *(3)* households with migrants and no remittances, and *(4)* households that receive remittances and long term migrants. Once household *j* has chosen its state, the household decides the level of education E_s for the individual *i*:

$$E_{ijs} = B_{0s} + \sum B_{ks} X_{ksij} + \sum \gamma_{hs} Z_{hsj} + \varepsilon_{sij} \quad (2)$$

Where E_{ijs} represents the standardized years of education for children *i* from household *j* that belongs to households of type *s*. X_{ksij} represents the *k*th characteristic for individual *i* from household j, Z_{hsj} represents the *h*th characteristic of household *j* . I also assume that there is a latent variable for each choice *s* (for simplicity, I abstract from now on from the sub index *i, j*):

$$I_s = a_{0s} + \sum a_{ks} X_{ks} + \sum d_{hs} Z_{hs} + \sum b_{ls} W_{ls} + \varepsilon_s \quad (3)$$

Where X are the individual characteristics, Z represents the household characteristics and W_{ls} represents the lth instrumental variable. Now I have that:

$$I=s \text{ if } Is>Max\ Ij\ (j=1,2,3,4\ j\neq s) \quad (4)$$

$$Let\ \varepsilon s = Max\ Is - \eta s\ (j=1,2,3,4\ j\neq r) \quad (5)$$

If ηs follows a type I extreme value distribution, Domencich and McFadden (1975) show that εs has the following distribution function:

$$Fs(\varepsilon)=Prob(\varepsilon s<\varepsilon)=exp(\varepsilon)/(exp(\varepsilon)+\sum j\neq s exp(a_{0j}+\sum a_{kj}X_{kj}+\sum d_{hj}Z_{hj}+\sum b_{lj}W_{lj}) \quad (6)$$

Following Dubin and McFadden (1984), I assume that:

$$E(\varepsilon_s|\eta_1,\eta_2,\eta_3,\eta_4)=\sigma_s\sum r_{sl}(\eta_l-E(\eta_l)), \text{ with } \sum r_{sl}=0 \quad (7)$$

Where σ_s is the standard deviation of ε_s and r_{sl} is the correlation coefficient between ε_s and η_l. This assumption has several important implications. First, since these correlations are going to be corrected for selection, they obtain the unconditional correlation r_{sl}. This implies that their value does not depend on the sub-sample of observations for which they were actually estimated. Second, the total number of correlations that need to be estimated are twelve of sixteen possible correlations, because these correlations must equal zero for each category s. Third, the assumption implies that:

$$E(\varepsilon_s|\eta_1,\eta_2,\eta_3,\eta_4)=\sigma_s\sum_{l\neq s} r_{sl}(\eta_l-\eta_s) \quad (8)$$

Dubin and McFadden (1984) show that with the multinomial logit model:

$$E(\eta_l-\eta_s|I_s>Max\,I_l)=\frac{P_l lnP_l}{1-P_l}+lnP_s \quad (9)$$

Where $P_s=\mathbf{Prob}(\varepsilon_s<\varepsilon)$. Consequently, equation (2) can be rewritten as (I again abstract from sub index i, j):

$$E_s=B_{0s}+\sum B_{ks}X_{ks}+\sum \gamma_{hs}Z_{hs}+\sigma_s\sum_{l\neq s} r_{sl}\left(\frac{P_l lnP_l}{1-P_l}+lnP_s\right)+v_s \quad (10)$$

Where $[E(v)_s|X,Z)=0$

In short, the Dubin and McFadden method represents a generalization of the Heckman two stage method of selection correction. The first stage is a multinomial logit that allows the estimation of selectivity terms that are then used in the second stage of the model. According to recent review of the literature on selection bias (Bourguinon, Fournier and Gurgand, 2004), the Dubin and McFadden method performs better than other selection correction methods in Monte Carlo experiments. This applies even when the independence of irrelevant alternatives is not fulfilled by the data. For this reason, the Dubin and McFadden method is used in this analysis.

Now that the method to estimate the expected values of education has been explained, I proceed to present an expression for the Average Treatment Effect of Treatment g on the participants in treatment s:[2]

$$[ATT]_{sg} = B_1 0s - B_1 0g + \sum [(B_1 ks - B_1 kg) X_j ks] + \sum (\gamma_1 hs - \gamma_1 hg) Z_j hs + \sigma_1 s \Sigma_1 (l \neq s) [\gamma_1 sl ((P_j l \ln P_j l)/(1 - P_j l) + \ln P_j s) +] \sigma_1 g [\Sigma_1 (l \neq \quad (11)$$

In particular, I am interested in estimating ATTs1which represent the ATT´s that are obtained when I set the households that receive no remittances and have no migrants as the control group, and the ATTs3 which represent the ATT that are obtained when I set the households that have migrants and receive no remittances as the control group.

3. Identification of the model

As in the Heckman method, the identification of equation (10) in the Dubin and McFadden method depends on both the existence of instrumental variables and the non-linearity of the selection part of the model.

To generate instruments for the analysis, I generated three instrumental variables coming from different sources. The three instruments are the 1997 state migration rate, the 2000 municipality migration rate, and the 2000 municipality fraction of households that receive remittances. The use of state migration rates to identify the effects of migration has been used previously in the literature (Hanson and Wodruff, 2003; Borraz, 2005; Woodruff and Zenteno, 2007) based on the idea that states with highest historical migration rates have higher migration rates today due to the work of social networks in the process of migration. This instrument is constructed using the 1997 ENADID, which is a nationally and state representative survey carried out by INEGI. Table 5 shows that the state migration rates vary by the type of household.

The use of the 2000 municipality migration rate as an instrument follows the idea that the strength of social networks is related to local factors for different reasons. First, social networks are based on kinship relations (Massey, Goldring and Durand, 1994; Massey, 1987). A second reason is that historical local events matter in the formation of networks (Woodruff and Zenteno, 2007). A third reason is that geographical factors in the large and diverse Mexican states also play a role in the formation of networks (Borraz, 2005). A final reason is that local weather affects migration patterns (López Córdoba, 2006). In this paper, the municipality migration rate is built excluding from the calculation the individuals from household *(i)*. This generates variation not only at the level of the municipality but also within

[2] This derivation is available from the author upon request.

the municipality. Table 5 shows that I observe a larger variation in the municipality migration rates than the variation observed in the state migration rates.

The use of the 2000 fraction of households that receive remittances in the municipality follows the idea that certain networks are more efficient than others (Adams and Cuecuecha, 2008; Adams, Cuecuecha and Page, 2008, 2008a). To understand this concept, suppose that we are comparing two social networks. Holding size constant, the network that generates more income is said to be more efficient. In the paper, I built this variable excluding the household *(i)* from the estimation. This generates again variation not only between municipalities but also within the municipality. Table 5 shows that the fraction of households that receive remittances has variation and it shows stark differences between networks. For example, children that belong to households with remittances and long term migrants are found in municipalities where on average there are many households receiving remittances, while municipality migration rates are relatively small. This contrast particularly with children that live in households with remittances and migrants that live in communities where on average there are large municipality migration rates, but there are relatively few households receiving remittances.[3]

4. Specifying the econometric model and econometric issues

An important step in the empirical modeling is the selection of the control variables, since the identification in statistical terms is after all conditional on keeping different factors constant, unless an experiment or a natural experiment is present. All control variables presented here were included in both the first and the second stage of the empirical method. The characteristics of the individuals that are included in the analysis are the age and the gender because they are exogenous to the household choices. The characteristics of the household include those related to human capital (a fourth degree polynomial on the education of the head of household, a second degree polynomial on the age of the head of household), because according to the basic human capital model, human capital variables are likely to affect migration because more educated people enjoy greater employment and expected income-earning possibilities in destination areas (Schultz, 1982; Todaro, 1970).[4] I also include those related to the demographic structure of the household (number of children of the household, number of grand children in the household, an indicator for whether people 65 or above live in the

[3] To check for the validity of the instruments used in the paper a formal analysis is presented later on.

[4] While early work on the human capital model found that education had a positive impact on migration (Schultz, 1982; Todaro, 1976), more recent empirical work in Egypt (Adams, 1993) and Mexico (Mora and Taylor, 2005; Taylor, 1987) has found that migrants are not necessarily positively selected with respect to education.

household), because some analysts (Adams, 1993; Lipton, 1980) have suggested that migration is a life-cycle event in which households with older heads, more males over age 15 and fewer children under age 5 are more likely to participate.

I also include an indicator for whether the mother is present in the household and an indicator for whether the oldest child is male. The presence of the mother in the household has been recognized as a positive factor in the effects of migration on human capital (Hanson and Woodruff, 2003). The second variable is included since the gender of the eldest child is an exogenous variable that can determine the total number of children of the family. As an attempt to control for factors related to the size of community, I include the population living in the municipality. Finally, I control for the level of income of the family because I want to control for the heterogeneity that exists in the choice of education by the households. Specifically, I introduce the inverse of the income of the household, and the square of the inverse of the household income.

Besides these variables, I also include an interaction between the number of children in the household, an interaction between the number of children in the household and the square of the education of the head of household, and an interaction between the number of children in the household and the age of the head of household.

Finally, I also include four regional dummies because it has been shown in the literature that there are important economic differences between economic regions in Mexico (Chiquiar, 2005). Table 5 shows how the children distribute in these regions.

In the first stage of the Dubin and McFadden method I also included the instrumental variables mentioned before. The main identification assumption is that conditional on the control variables, the instrumental variables help determine the type of family in which an individual lives. Moreover, the instrumental variables are not correlated to the education choices of the family through any other channel.

Table 6 presents a formal test of this hypothesis for a linear version of the model. The model is linear because I run a linear regression model where I assumed that all differences in education between households are explained by changes in the intercept. That is I introduce in the model three dummies, one for each type of household that I am analyzing, with the category *(1)* household has no migrants and receive no remittances as the omitted category. The Kleibergen-Paap rk-LM statistic shows that the model is not under identified. Moreover, the Kleibergen-Paap rk-Wald statistic shows that the model does not suffer from the weak instrument problem. These two tests

show that the three instruments used in this study are well suited to identify the model.[5]

Another two potential problems for the analysis are that the instruments generate by construction correlation by municipality and that I am using a two stage procedure. To solve these problems, I clustered the standard errors at the level of the municipality and I bootstrap the standard errors using 1000 repetitions.

Finally, since in the estimations I use as a control variable the income of the family, it is possible that the introduction of this potentially endogenous variable can generate some bias in the estimations. I will show the robustness of the results in section 6.

5. Results

Table 7 presents the results for the first stage of the Dubin and McFadden method. It shows the results from a multinomial logit regression, where the dependent variable takes four values: *(1)* if the household has no remittances and no migrants, *(2)* if the household has remittances and migrants, *(3)* if the household has long term migrants and receives remittances, and *(4)* if the household does not receive remittances and has migrants. The most important results for the first stage refer to the significance of the instrumental variables in explaining the probability of belonging to a given type of household. A test for the joint significance of the instrumental variables shows that the three instruments are highly significant.

In particular, the table shows that living in a state where the migration rate is higher increases the probability that an individual will live in a household that receives remittances and has migrants. However, this variable reduces the probability of living in a household that receives remittances and has long term migrants, as well as the probability of living in a household with migrants and no remittances.

The municipality migration rate is found to increase positively the probability of living in households receiving remittances, regardless of the time that the migrants have abroad. Finally, it reduces the probability of living in households that have migrants and no remittances.

The fraction of households receiving remittances is found to increase the probability of living in household with remittances and migrants and to increase the probability of living in household with no remittances and migrants. However, it is found to reduce the probability of living in a household with remittances and long term migrants.

Table 8 presents the estimation for the education equation for each type of household. The table shows that older individuals tend to have more

[5] I use the Stock-Yogo (2005) significance values for the second test.

education years and that male individuals tend to have less education years. These signs are consistent for all equations in which the estimates are statistically significant. The table also shows that individuals whose mother is present in the household tend to have more education years. I now focus in the parameters for the selection terms. While they are not significant for all equations, they are shown significant in the equation for individuals that live in households with no remittances and no migrants, the equation for individuals that live in households with remittances and long term migrants and in the equation for households with no remittances and migrants. These results demonstrate that estimations based on ordinary least square would be biased.

I now proceed to analyze the estimations for the average treatment effects. Table 9 shows the average education years for the individuals of the different household types. The first column shows observed education years, while the second column shows estimated education years. The columns three and four present two counterfactual education years, the first representing the education years obtained when the equation estimated for households with no remittances and no migrants is used for the other households, adjusting by selection terms. Column four presents the education years that are obtained when we use the equation for individuals from households with no remittances and migrants for all the other individuals.

To obtain the ATT, I subtract from column 2 either column 3 or column 4. Table 10 shows these estimations. The first two columns in table 10 show the difference between column 2 and column 3 from table 9. In this case, the control group becomes the children from households with no remittances and no migrants. Columns 3 and 4 from Table 10 show the difference between columns 2 and 4 from table 9. In this case, the control group becomes the children from households with migrants and no remittances.

The combined effect of migration and remittances (*i.e.* the comparison between individuals from households with remittances and migrants versus individuals from households with no remittances and no migrants) is found to be positive and significant. In particular, it shows that the combined effect of remittances and migration is to increase education in 5.72 years, which represents a 352% increase in education compared to the counterfactual under which the individuals would not have migrants or remittances. This number seems astonishing, but as one reviews Table 9 it seems a plausible number. This is because for individuals from households with migrants and remittances the size of this effect implies that the combined effect is the difference between having children dropping out from school at secondary level versus a counterfactual of children dropping out in second grade of primary school.

Most of the above effect is produced by the income effect: table 10 shows that when I compare individuals from households with migrants and

remittances versus the counterfactual under which they would have the migrants but would not have the remittances, I find an effect of 4.47 education years. This represents a 155.3% change relative to the counterfactual level of education.

Table 10 also shows that migration and remittances are not a guarantee that human capital will increase. When I compare individuals from households where there are long term migrants and remittances with the individuals from households with no migrants and no remittances the combined effect becomes negative. The negative effect is 1.50 years of education or a reduction of 16% versus the counterfactual. This reverse in fortune can be explained as follows: given the resources those individuals from households where long term migrants and remittances are found to have, they should be finishing junior high school and dropping out from school during their first year of high school. Instead, we estimate (and observe them too) that they drop out in junior high school. In this paper, I do not attempt to explain why this is the case, since it could be that the individuals supervising them cannot control them any more at that age, or that these individuals are preparing to become migrants themselves, or it could also be explained by a reduction in the resources received from abroad, among other reasons.

Table 10 provides evidence that the income effect reduces with time, which could be explained by any of the above reasons. I obtain this result by analyzing the income effect in households with long term migrants. I compare this type of individuals with the counterfactual under which they would have short term migration and receive no remittances. I find still a positive income effect but it is now only.68 years of education, which represents a 10% increase with respect to the counterfactual. Therefore, the positive income effect seems to vanish, either because the resources are not as large as initially or because the individuals no longer have the incentives to attend school, in spite of having the extra resources.

Table 10 also shows the substitution effect (*i.e.* the comparison of individuals from households with no remittances and migrants, versus the counterfactual under which they would not receive remittances and still would have migrants). This effect is found to be negative and equal to .77 education years, which represents a 10% reduction versus the counterfactual.

These results show that inside the combined effect of migration and remittances there may be more effects at work than just the income and substitution effect. This is because I find a positive income effect that is smaller than the combined effect, and a negative substitution effect. Consequently, there seems to be at work a third factor pushing up the education of individuals when the migrants have recently migrated. A possibility is that at that moment the contacts between the children and the parents are still strong or that children prepare in that stage to be a migrant by attending school. Since public junior high school in Mexico is characterized

for teaching some technical skills, it is possible that those skills may still be transferable from one country to another, and therefore junior high school is still a valuable investment.

6. Robustness of the results

The identification of this paper hinges upon the validity of the instrumental variables, which has been proven for a simpler version of our empirical model. Since the results are based on a cross section, it is still possible that unobservable factors could still be contaminating the results. As a first robustness check for the results, I proceed to show how the different estimated ATT correlate with some specific characteristics like rural status, presence of the mother in the household, single parenthood status, age and gender of the children. Table 11 presents OLS results where the dependent variables are the different ATT estimated, and all variables used previously in the estimation are included as regressors, with the exception of single parenthood which is added in these regressions.

I expect that individuals in rural environments to be less exposed to the labor market forces, and consequently be more likely to be found in school. Similarly, I expect that children where the mother is present in the household will have more supervision and experience less negative effects. Single parenthood is expected to have the opposite effect. Older children are more exposed to labor market forces and consequently are expected to have more negative effects. Finally, due to labor market differences in wages in favor of males in Mexico, we expect males to be more negatively affected by labor market forces.

The results shown in Table 11 show the expected sign for rural status: all positive effects are more positive for rural areas, while all negative effects are less negative for rural individuals, with the exception of the income effect interacted with time which is found to be less positive for rural individuals. The presence of the mother in the household increase all positive effects, except that of the income effect interacted with time, and generates a larger substitution effect. Single parenthood is found to be insignificant for all ATTs. Older individuals are found to have all positive effects lower, and also a lower substitution effect. All males are found to have larger combined effects and substitution effects, but lower income effects. This suggests that relative prices seem to affect more male individuals.

A second important aspect of the identification of this paper depends upon the use of household income as a control variable. To the extent that income is correlated to unobservable components and that this correlation biases our estimation of the ATT, I can get biased estimates of the effects of migration and remittances. I perform a robustness analysis by calculating the ATT for the bottom 40% of the sample, ordered by household income, and the top 20%

of the sample. I do find evidence that the size of the ATT varies with income group analyzed, even though not for all cases and not in signs. In particular, effects are found stronger for the bottom 40% of the sample or equal to the effects found for the top 20%, while signs are similar to those reported before. These results suggests that the positive effects of migration and remittances are stronger among poorer households, where migration and remittances seem to be a very powerful tool used by households to increase their available resources and thereby increase their investment in human capital.

TABLE 1. PARTITION OF THE SAMPLE ACCORDING TO THEIR MIGRATION AND REMITTANCE STATUS AND EFFECTS THAT CAN POTENTIALLY BE FOUND IN THOSE CELLS, MEXICO CENSUS 2000

	Household type			
Effects of migration and remittances	No remittances and no migrants	Remittances and migrants	Remittances and LT migrants	No remittances and migrants
Income	No	Yes	Yes	No
Substitution	No	Yes	Yes	Yes

Note: The substitution effect includes supervision effect, labor market effects, household labor supply, and dynamic effects.

TABLE 2. COMPARISONS BETWEEN ESTIMATED EDUCATION YEARS AND COUNTERFACTUAL EDUCATION YEARS. EFFECTS POTENTIALLY IDENTIFIED SHOWN IN THE CORRESPONDING CELL, MEXICO CENSUS 2000

	Household type used as base to compare			
Household type used to construct counterfactual	No remittances and no migrants	Remittances and migrants	Remittances and LT migrants	No remittances and migrants
No remittances and No migrants	Not applicable	Combined effect of remittances and migration	Combined effect of remittances and migration (interacted with time)	Substitution effects
No remittances and migrants	Substitution effect (the negative of)	Income effect	Income effect (interacted with time)	Not applicable

Note: The substitution effect includes supervision effect, labor market effects, household labor supply, and dynamic effects.

TABLE 3. SUMMARY DATA ACCORDING TO HOUSEHOLD TYPE, INDIVIDUALS 12 TO 19 YEARS OLD, MEXICO 2000

Variable	All	No remittances and no migrants	Remittances and migrants	Remittances and LT migrants	No remittances and migrants
Children characteristics					
Age	15.2	15.2	15.2	15.1	15.2
Males (%)	51.6	51.5	53.2	52.6	52
Household characteristics					
Family income (annual pesos per capita)	6192	6024	7349	8398	5380
Education yrs. of head of household	7.02	7.24	5.56	6.45	4.37
Age of household head (years)	44	43.8	48.9	41.8	51.7
Number of children of the head of household	3.78	3.78	3.60	3.83	3.70
Number of grand children of the head of household	.17	.17	.16	.16	.16
People 65 or older present in household (%)	7.31	7.3	6.7	6.5	7.3
Eldest child in household is male (%)	53.2	53	56.3	55.3	53.3
Mother present in household (%)	97	98	96	97	98
Rural households (%)	5.95	1.4	41	54.9	.49
Municipality characteristics					
Population in municipality	13,196	13,262	16,600	12,276	13,420
N (children)	1,268,000	1,100,000	2,270	9,608	6,780

Source: 2000 Mexico Census. Sample includes only children of the head of household.

TABLE 4. EDUCATION YEARS, MEXICO 2000, INDIVIDUALS 12 TO 19 YEARS OLD

Variable	All	No remittances and no migrants	Remittances and migrants	Remittances and LT migrants	No remittances and migrants
Education years	7.40	7.43	7.27	7.48	7.03
Standardized education years	.12	.14	.08	.16	-.02
Difference with respect to households with no migrants and no remittances	-	-	-.15**	.08**	-.39**
N (children)	1,268,000	1,100,000	2,270	9,608	6,780

Notes: Individuals´ Education is standardized with respect to the mean and standard deviation corresponding to the age of the individual.
Source: 2000 Mexico Census. Sample includes only children of the head of household.
**Significant at 1% level.

TABLE 5. INSTRUMENTAL VARIABLES BY HOUSEHOLD TYPE AND DISTRIBUTION OF INDIVIDUALS BY REGIONS

Variable	All	No remittances and no migrants	Remittances and migrants	Remittances and LT migrants	No remittances and migrants
Migration rate in state in 1997 (ENADID)	2.84 (2.81)	3.14 (2.12)	2.26 (2.20)	2.11 (2.22)	2.94 (2.88)
Migration rate in municipality excluding household (i) (Census 2000)	2.17 (.06)	19.13 (2.64)	19.48 (2.75)	.28 (2.30)	.56 (3.27)
Remittances as percentage of income in municipality excluding household (i) (Census 2000)	2.89 (.04)	2.39 (1.91)	1.06 (1.73)	7.23 (7.25)	2.80 (4.31)
Border (%)	15	58	40	10	12
North, Center and Capital (%)	66	12	10	76	71
South (%)	19	30	50	11	14

Notes: The sample for the census includes only children of the head of household, for whom information on their education, the education of the head, and the migration information of the households is available. The sample for ENADID includes all individuals in survey. Border: all Mexican states in the US border. North: Baja California Sur, Nayarit, Zacatecas, Aguascalientes, San Luis Potosi. Center: Jalisco, Colima, Guanajuato, Michoacan, Queretaro, Hidalgo, Puebla, Tlaxcala, Veracruz, Morelos. Capital: DF, Estado de Mexico. South: All others. This classification of Mexican states follows Chiquiar (2005).
Source: 2000 Mexico Census and 1997 ENADID.

TABLE 6. TESTS FOR VALIDITY OF INSTRUMENTS, LINEAR IV MODEL

	Tests		
Instruments	**Kleibergen-Paap rk-LM statistic**	**Kleibergen-Paap rk-Wald Statistic**	**Sargan (Over-identification)**
Migration rate at the state level (1997) Migration rate at municipality level, excluding household (i) census 2000 Remittances as percentage of municipality income, excluding household (i) census 2000	308.78** Chi^2 (1) at 5% 3.85	102.792 Stock-Yogo (2005) values 5% max IV size 9.53 10% max IV size 6.61	NA (exactly identified)

Notes: The tests are performed in a linear version of the model. Dependent variable: standardized education years. Exogenous and control variables: A fourth degree polynomial on the education of the head of household, the age of the head, the age of the head squared, the number of children in the household, the number of grandchildren, whether the mother is present in the household, whether the household is rural, the inverse of the household income, the inverse of the square of the household income, the population in the municipality, four region dummies and interactions between the education and the number of children, an interaction between the education squared and the number of children, an interaction between the age and the number of children, and a constant. Instrumented variables: three indicator variables for the events (1) Household has migrants and remittances, (2) Household has long term migrants and remittances and (3) Household has migrants and no remittances.
Source: 2000 Mexico census. Sample includes only children of the head of household.

TABLE 7. FIRST STAGE RESULTS. MULTINOMIAL LOGIT MODEL, INDIVIDUALS 12 TO 19 YEARS OLD

Variable	Remittances and migrants	Remittances and LT migrants	No remittances and migrants
Children characteristics			
Age	.005* (.003)	-.001 (.001)	.0015* (.0006)
Males	.010 (.014)	.029*** (.005)	.015*** (.003)
Household characteristics			
Education of Head	.173*** (.017)	.056*** (.0005)	.119*** (.004)
Education of Head^2	-.050*** (.004)	-.033*** (.001)	-.042*** (.001)
Instrumental variables			
State Migration Rate (1997)	110.098*** (1.725)	-1.356*** (.381)	-4.636*** (.077)
Municipality Migration Rate in 2000 (excluding household (i))	35.775*** (.183)	33.335*** (.048)	-.371*** (.074)
Fraction of households with remittances in municipality in 2000 (excluding household (i))	10.848*** (.139)	-1.346*** (.124)	8.652*** (.022)
Pseudo R^2 (%)	49.53		
Chi ^{2} for joint test of significance for IV's	7600***		
N	1,268,000		

Notes: Table reports the coefficients of multinomial logit, where the dependent variable takes the value of (1) if the households have migrants and remittances, (2) if the household have long term migrants and remittances, (3) if the household have migrants but no remittances and (4) if the household has neither migrants nor remittances. The regression includes the following exogenous and control variables not shown in the table: education of the head of household raised to the third and fourth powers, the age of the head, the age of the head squared, the number of children in the household, the number of grandchildren, whether the mother is present in the household, whether the household is rural, the inverse of the household income, the inverse of the square of the household income, the population in the municipality, four region dummies and interactions between the education and the number of children, an interaction between the education squared and the number of children, an interaction between the age and the number of children, and a constant. All values are weighted. Standard errors are clustered by municipality. They are bootstrapped standard errors.
Source: 2000 Mexico census. Sample includes only children of the head of household.
*** Significant at the 0.01 level. ** Significant at the 0.05 level. * Significant at the 0.10 level.

TABLE 8. PARAMETERS FOR SECOND STAGE, DUBIN AND MCFADDEN METHOD. DEPENDENT VARIABLE IS STANDARDIZED EDUCATION YEARS. A DIFFERENT EQUATION BY HOUSEHOLD TYPE, MEXICO 2000, INDIVIDUALS 12 TO 19 YEARS OLD

Variable	No remittances and no migrants	Remittances and migrants	Remittances and LT migrants	No remittances and migrants
Children Characteristics				
Age	.011*** (.002)	-.014 (.013)	.011*** (.004)	.010*** (.003)
Male	-.092*** (.003)	-.047 (.056)	-.016*** (.019)	-.079*** (.010)
Household Characteristics				
Mother in Household	.116*** (.009)	.195 (.183)	.186*** (.033)	.136*** (.029)
Rural	.013 (.045)	.023 (.079)	.033 (.024)	-.025 (.113)
Selection Parameters				
$\sigma_s r_{s1}$	-.650*** (.209)	na	-.436 (.799)	-1.153*** (.393)
$\sigma_s r_{s2}$	.337*** (.095)	-.422 (.576)	na	-.729*** (.218)
$\sigma_s r_{s3}$	.263*** (.117)	.911 (1.132)	.065 (.900)	na
$\sigma_s r_{s4}$	na	-.425 (.579)	.294** (.231)	.345** (.175)
Implied residual standard error (σ_s)				
Adjusted R^2(%)	11	14	15	12
N	1,100,000	2,700	9,608	6,780

Notes: Table reports the coefficients for the second stage of the Dubin McFadden method. The dependent variable is the standardized education years. The regression includes the following exogenous and control variables not shown in the table: a fourth degree polynomial on the education of the head of household, the age of the head, the age of the head squared, the number of children in the household, the number of grandchildren, whether the mother is present in the household, whether the household is rural, the inverse of the household income, the inverse of the square of the household income, the population in the municipality, four region dummies and interactions between the education and the number of children, an interaction between the education squared and the number of children, an interaction between the age and the number of children, and a constant. All values are weighted. Standard errors are clustered by municipality. They are bootstrapped standard errors.
NA: not applicable.
Source: 2000 Mexico census. Sample includes only children of the head of household.
*** Significant at the 0.01 level. ** Significant at the 0.05 level. * Significant at the 0.10 level.

TABLE 9: AVERAGE EDUCATION YEARS: OBSERVED, ESTIMATED AND COUNTERFACTUALS BY HOUSEHOLD TYPE. 12 TO 19 YEARS OLD INDIVIDUALS

	Education				
Family type	Observed	Estimated	Counterfactual 1	Counterfactual 2	N
No remittances and no migrants	7.43	7.61	NA	7.36	1,100,000
Remittances and migrants	7.27	7.34	1.62	2.87	2,700
Remittances and LT migrants	7.48	7.62	9.13	6.95	9,608
No Remittances and Migrants	7.03	7.08	7.85	NA	6,780

Notes:
Observed: obtained from raw data.
Estimated: obtained using coefficients shown and not shown from the Dubin McFadden method.
Counterfactual 1: obtained using data from household (s) using coefficients from equation for children from households with no remittances and no migrants, adjusting for the selection term as indicated in equation 10 in the text.
Counterfactual 2: obtained using data from household (s) using coefficients from equation for children from households with no remittances and migrants, adjusting for the selection term as indicated in equation 10 in the text.
NA: Not applicable.
Source: 2000 Mexico Census. Sample includes only children from the head of household.

TABLE 10: AVERAGE TREATMENT EFFECT ON THE TREATED (ATT), MEXICO 2000, INDIVIDUALS 12 TO 19 YEARS OLD

	Counterfactual 1: Comparison versus children with no remittances and no migrants		Counterfactual 2: Comparison versus children with migrants and no remittances	
Family type	ATT	% Change	ATT	% Change
No remittances and no migrants	NA	NA	.25***	3.35
Remittances and migrants	5.72***	352.08	4.47***	155.93
Remittances and LT migrants	-1.50***	-16.46	.68***	9.75
No remittances and migrants	-.77***	-9.76	NA	NA

Notes:
Counterfactual 1: obtained using data from household (s) using coefficients from equation for children from households with no remittances and no migrants, adjusting for the selection term as indicated in equation 10 in the text.
Counterfactual 2: obtained using data from household (s) using coefficients from equation for children from households with no remittances and migrants, adjusting for the selection term as indicated in equation 10 in the text.
ATT: Pair-wise average treatment effect on the treated. Defined as: Estimated education years for household (s) minus counterfactual education for household (s)
%Change: Defined as ATT/(Counterfactual education years)
NA: not applicable.
Source: 2000 Mexico Census. Sample includes only children from the head of household.
*** Significant at the 0.01 level. ** Significant at the 0.05 level. * Significant at the 0.10 level.

TABLE 11. CORRELATION BETWEEN ESTIMATED ATT´S AND SELECTED VARIABLES, MEXICO 2000, INDIVIDUALS 12 TO 19 YEARS OLD

Variable	Dependent variable				
	ATT 1: Combined effect	ATT 2: Combined effect interacted with time	ATT 3: Substitution effect	ATT 4: Income effect	ATT 5: Income effect interacted with time
Household characteristics rural	.151*** (.029)	.065*** (.008)	-.543*** (.034)	.064*** (.023)	-.437*** (.018)
Single parent	-.006 (.013)	-.001 (.002)	.002 (.003)	-.001 (.011)	.0003 (.0006)
Mother in household	.098*** (.030)	.070*** (.004)	.027*** (.005)	.024 (.025)	-.048*** (.002)
Children characteristics age	-.027*** (.002)	-.0006*** (.0002)	-.002*** (.0002)	-.027*** (.002)	-.001*** (.0001)
Male	.066*** (.012)	.078*** (.0006)	.015*** (.001)	-.013 (.010)	-.063*** (.0006)
Adjusted R^2(%)	86	79	68	82	95
N	2104	86725	61700	2104	61700

Notes:
ATT 1: Difference between estimated education years for children with remittances and migrants and counterfactual education years 1.
ATT 2: Difference between estimated education years for children with remittances and LT migrants and counterfactual education years 1.
ATT 3: Difference between estimated education years for children with no remittances and migrants and counterfactual education years 1.
ATT 4: Difference between estimated education years for children with remittances and migrants and counterfactual education years 2.
ATT 5: Difference between estimated education years for children with remittances and LT migrants and counterfactual education years 2.
Counterfactual education years 1: Used characteristics of children from households (s) with coefficients from equation for children with no remittances and no migrants, adjusted for selection according to equation 10.
Counterfactual education years 2: Used characteristics of children from households (s) with coefficients from equation for children with no remittances and migrants, adjusted for selection according to equation 10.
All regressions also include the following exogenous and control variables not shown in the table: a fourth degree polynomial on the education of the head of household, the age of the head, the age of the head squared, the number of children in the household, the number of grandchildren, the inverse of the household income, the inverse of the square of the household income, the population in the municipality, four region dummies and interactions between the education and the number of children, an interaction between the education squared and the number of children, an interaction between the age and the number of children, and a constant. All values are weighted. Standard errors are clustered by municipality.
Source: 2000 Mexico census. Sample includes only children of the head of household.
*** Significant at the 0.01 level. ** Significant at the 0.05 level. * Significant at the 0.10 level.

TABLE 12. ESTIMATED ATT´S FOR THE BOTTOM 40% OF THE HOUSEHOLD INCOME DISTRIBUTION AND THE TOP 20% OF THE HOUSEHOLD INCOME DISTRIBUTION, MEXICO 2000, INDIVIDUALS 12 TO 19 YEARS OLD

Income Group	Selected ATT				
	ATT 1: Combined effect	ATT 2: Combined effect interacted with time	ATT 3: Substitution effect	ATT 4: Income effect	ATT 5: Income effect interacted with time
Bottom 40%	2.38***	-.56***	-.30***	1.85***	.25***
Top 20%	1.94***	-.56***	-.26***	1.52***	.25***

Notes:
ATT 1: Difference between estimated education years for children with remittances and migrants and counterfactual education years 1.
ATT 2: Difference between estimated education years for children with remittances and LT migrants and counterfactual education years 1.
ATT 3: Difference between estimated education years for children with no remittances and migrants and counterfactual education years 1.
ATT 4: Difference between estimated education years for children with remittances and migrants and counterfactual education years 2.
ATT 5: Difference between estimated education years for children with remittances and LT migrants and counterfactual education years 2.
Counterfactual education years 1: Used characteristics of children from households (s) with coefficients from equation for children with no remittances and no migrants, adjusted for selection according to equation 10.
Counterfactual education years 2: Used characteristics of children from households (s) with coefficients from equation for children with no remittances and migrants, adjusted for selection according to equation 10.
Households ordered according to the percentiles of the Household Income distribution.
Source: 2000 Mexico census. Sample includes only children of the head of household.
*** Significant at the 0.01 level. ** Significant at the 0.05 level. * Significant at the 0.10 level.

Conclusions

This paper has used a large nationally-representative random sample of the 2000 Mexico census to analyze the impact of international remittances and migration on human capital in Mexico. Four key findings emerge.

First, it shows that the combined effect of migration and remittances on households that have migrants that left less than five years ago is positive and significant. In particular, remittances and migration increase 5.7 years of the education of the individuals 12 to 19 years old relative to the counterfactual situation under which they would not have remittances or migrants.

Second, the income effect of remittances is positive and statistically significant. In particular, individuals that live in households that receive remittances and have migrants have 4.47 years of education more relative to the counterfactual situation under which they would not have remittances and would still have migrants.

Third, the substitution effect of remittances is negative and significant. In particular, individuals from households that receive no remittances and have migrants have minus .77 years of education relative to the education they would have without migrants and without remittances.

Fourth, the combined effect of migration and remittances interacts with the time that migrants spent away from home negatively. In particular, individuals from households where they have long term migrants and receive remittances have minus 1.5 years of education compared to the counterfactual under which they would not have migrants or remittances.

These results are subject to different robustness checks that show that, in general, the estimated effects correlate with the characteristics of the children and the households in a way that economic theory would predict. In particular, they show that households where the mother is present get better results, that rural individuals get better results, that older individuals get worse results, that males get more exposed to relative price changes and that in poorer households the effects are stronger.

Finally, these results give support to the growing view that remittances are used productively by the households to increase the accumulation of human capital. This study also highlights the importance of better modeling the enormous challenges that households face when they engage in the risky strategy of sending migrants and receiving remittances, since the migration process itself exerts pressure over the choices of the household that represent a challenge for the accumulation of human capital. By doing so, it highlights the need for public policy that could help the households in their efforts to accumulate human capital to increase their economic well being, specifically targeted to the needs of the migrant communities in Mexico.

Notes

There is also another possibility for households of type 4. The public file explains that the files of migrants that were not part of the household at the moment of the migration are also deleted. An example would be an individual that migrated to the US, married a girl in the US, and later on she came back to Mexico, while he stays in the US working. Then he would not be part of the household at moment of the migration but he would be sending remittances for his wife and kids. There is no way to know in the data how many of these cases exist.

[1] This derivation is available from the author upon request.

[1] To check for the validity of the instruments used in the paper a formal analysis is presented later on.

[1] While early work on the human capital model found that education had a positive impact on migration (Schultz, 1982; Todaro, 1976), more recent empirical work in Egypt (Adams, 1993) and Mexico (Mora and Taylor, 2005; Taylor, 1987) has found that migrants are not necessarily positively selected with respect to education.

[1] I use the Stock-Yogo (2005) significance values for the second test.

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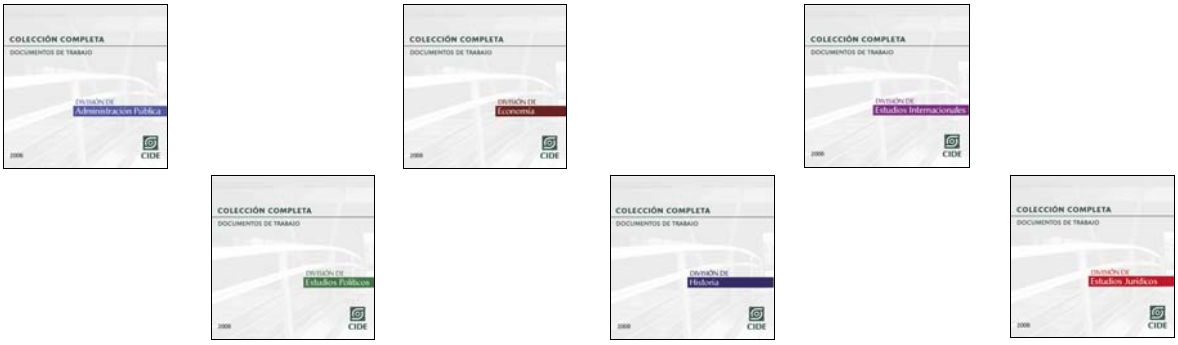

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