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"INTERGENERATIONAL TRANSMISSION OF ABILITIES AND SELF SELECTION OF MEXICAN IMMIGRANTS"

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Intergenerational Transmission of Abilities and Self Selection of Mexican Immigrants[†]

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Abstract

Building on Borjas (1993) I develop an intergenerational model of self-selection of migration and education that allows for a more complex selection mechanism. In particular, it allows for the possibility that immigrants are selected differently depending on the schooling level they choose. As in Mayer (2005) I assume that agents are endowed with two abilities and use the intergenerational structure of the model to infer potential earnings of a person for different levels of education and in different countries. This makes it possible to quantify the ability or self selection bias of estimates of the return to education and migration. The model is estimated using data on Mexicans in the US from the CPS and on Mexicans residents in Mexico from the Mexican census. The findings are that there is a significant loss of human capital faced by immigrants that is not transmitted to their children. While immigrants are observed to earn less because they find it difficult to adapt their skills to the host country, their children earn more because they can inherit all the abilities of their parents, including that part that could not be used for producing earnings. Moreover, Mayer (2005) proves that the positive correlation between the two abilities creates a positive correlation between parents' earnings and the probability that children attend college. In this paper, I find that this result is reinforced for migrants when they care about their children. In the case of immigrants, parents with larger amounts of intellectual ability tend to migrate more and tend to choose to remain high school educated. However, they migrate with the expectation of their children becoming college educated. Therefore, measures that rely on the earnings performance and educational attainment of immigrants underestimate the amount of human capital they bring into the host country.

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1 Introduction

This paper is motivated by some puzzling data observations regarding the performance of immigrants and their descendants. Chiswick (1978) first noticed that second generation immigrants tend to perform better in terms of earnings than the first and the third generations. More recently, Card (2004) found similar evidence despite using very different data and type of immigration into the United States. Chiswick analyzes data from immigrants that migrated mainly in the period before 1965. Immigrants from this period were subject to a quota system law passed in 1925 that favored North European immigration.[1] Card's analysis targets immigrants that migrated after 1965. Card reports that even among the least educated, and in particular Mexicans, second generation immigrants on average overcome 80% of the disadvantages their parents experienced. That is to say, most of the wage gap between first generation immigrants and natives is not observable between the second generation and natives. In this paper I provide evidence that is consistent with both Chiswick (1978) and Card (2004). Solely focusing on Mexican immigrants in the US I find the following three facts. First, there is a significant gain from migration in terms of earnings. The earnings of Mexican immigrants in the US are higher than the earnings of non-migrant Mexicans. Earnings continue to increase from the first to the second generation of Mexicans in the US, but then stop increasing or regress from the second to the third generation. Second, conditional on education, the returns from migration are higher for high school[2] educated than for college educated immigrants. Earnings also increase more for high school educated than for college educated from the first to the second generation. However, from the second to the third high school earnings decrease slightly while college earnings stabilize. Third, measuring educational attainment in terms of the share of college educated individuals, Mexican immigrants are less educated than non-migrant Mexicans. Second generation Mexicans improve substantially their education compared to their parents, while no significant difference is noticed between the second and the third generation.

Borjas (1993) was the first to introduce the concept of intergenerational transmission of

[1] "The law was influenced by the research of Brigham (1923) who classified immigrants into four categories: "Nordic", "Alpine", "Mediterranean" and "Asian", and argued that members of the Alpine and Mediterranean races had lower intelligence than Nordics[...]" Card (2004) footnote 1, pag. 2.

[2] The definition I use of high school education includes all the individuals with a high school degree or lower education College educated are those with a high school degree that attended, for at least one term, a college.

human capital in the migration literature. He finds evidence of a correlation between the earnings of immigrants and the earnings of the second generation, which he explains in terms of a stochastic process of the transmission of a set of characteristics from the parents to their children that he terms ability. He also claims that recent cohorts of immigrants are drawn from the lower tail of the ability distribution in their home country, a phenomenon that he terms negative self selection. However, the hypothesis that immigrants are negatively selected, based on one type of ability, is inconsistent with the observations on the second and the third generation of Mexicans. Given the intergenerational persistence in the ability transmission mechanism, if immigrants are drawn from the lower tail of the ability distribution, then the second generation should on average have more ability than the first, and the third more than the second. Therefore, the earnings and the educational attainment of each generation should show an improvement compared to the previous one. On the contrary, no improvement is evident from the second to the third generation in terms of both earnings and educational attainment. Rather, while the educational attainment and the earnings of college educated do not change significantly from the first to the second generation, the earnings of high school educated slightly decrease.

The hypothesis of positive or no selection, based on one ability, is also challenged by data observations. First, the earnings of the second generation Mexicans are significantly higher than the earnings of the first generation while the notion of positive selection implies that from the first to the second generation the average ability decreases. Second, while it should be expected that at higher levels of education immigrants gain more from migration, conditional on education the gain from migration is lower for college educated than for high school or lower educated. Third, while positive selection would imply that immigrants are better educated than non-migrants, their educational attainment is actually lower. Finally, while the notion of positive selection is consistent with the fact that the third generation of high school educated Mexicans earn less than the second generation with the same level of education, it also predicts that the lower earnings should be accompanied by a lower share of college educated individuals. Instead, education attainment does not change from the second to the third generation. Moreover, the notion of no selection predicts that no changes should be observed from the second to the third generation, in contrast with the above observations.

Overall, the selection mechanism based on only one ability is not capable of reconciling the facts with the theory. In this paper I provide an alternative explanation of this puzzling evidence based on three main concepts. First, I assume that immigrants have difficulties adapting their abilities in the host country. This difficulty translates into a reduced capacity toward using one's abilities to produce earnings and, therefore, results in lower earnings. Second, there is a transfer of human capital from parents to their children. In this respect, immigrants' capacity to transfer their human capital to their children is not reduced or is reduced at a lower degree. Third, as in Mayer (2005), I assume that individuals are endowed with two abilities that can be used alternatively depending on the acquired level of education. A higher level of ability (*i.e.*, the intellectual or college ability) is used if some college education is acquired. Alternatively, the lower level (*i.e.*, manual or high school ability) is used.

The model I build to incorporate these three features is largely based on the work of Borjas (1993). Similar to Borjas (1993), I use a modified version of the Roy model applied to migration in which there is a transfer of abilities from parents to their children. The rate at which abilities are transferred is allowed to be lower if the transfer is between immigrant parents and their US born children, otherwise it is the same for all generations of Mexicans. In this sense I allow for the possibility that the capacity to transfer human capital is also reduced for immigrants. Like Borjas (1993) I also assume that agents are altruistic toward their children. However, while in Borjas (1993) altruism does not play a significant role, as it does not alter the results he finds for selfish individuals, here altruism has important implications. Altruistic parents expect their children to overcome the disadvantages faced by them due to their difficulty to adapt their skills. Finally, the model distinguishes between two types of individuals, regardless of the level of the two abilities: Mexican born and American born parents. Mexican born parents take into account the choice to migrate or not together with schooling. American born individuals have no interest in migrating to Mexico given that the prices for both skills are lower in Mexico than in the US.

By structurally estimating the models using the Simulated Method of Moments (SMM), I find that immigrants face a significant loss of capacity to translate their abilities into earnings. I also find that there is no loss of capacity to transfer human capital to their children. The

former explains the gap between the first and the second generations even if immigrants are positively selected. That is, immigrants may have higher average ability than the second generation Mexicans but lower earnings because they are unable to use part of their ability to generate earnings. Because the second generation Mexicans do not face this difficulty, they are capable of fully utilizing the inherited human capital significantly improving their performance compared to their parents.

The paper also provides evidence that the loss of human capital for college educated immigrants is higher than for immigrants with high school education or less. Because human capital is composed of two abilities that can be used alternatively depending on the schooling level acquired, it is possible that the loss of human capital faced by immigrants depends on the ability used. The results show that the intellectual ability is more difficult to adapt to the new country than the manual ability, hence college educated immigrants face a higher loss of human capital, which explains their lower returns from migration.

Looking at the contribution of allowing individuals to be endowed with two abilities rather than one, the estimation results suggest that for each level of schooling individuals are positively self selected into the chosen level of education with respect to the utilized ability and negatively with respect to the non utilized ability. In this case, given that more than half of the college educated second generation Mexicans have parents with only a high school degree, the estimated model predicts that immigrants are positively selected with respect to the intellectual ability. That is, high school educated immigrants are expected to have lower than average intellectual ability since they select themselves into the lower level of education. Their children are also expected to have lower than average intellectual ability and, since some of them become college educated, they tend to lower the average intellectual ability conditional on college education. Therefore, the positive selection of immigrants conditional on college education compensates this effect leading to the the stable average of the intellectual ability from the second to the third generation, explaining the absence of a change in their earnings.

Another interesting prediction of the the model is that, even among the high school educated, immigrants are positively selected with respect to the intellectual ability. This explains the fact that among immigrants the college educated represent a lower share than among non-migrants. Those immigrants that are positively selected with respect to the intellectual ability

may also have high levels of manual ability that lead them to choose a high school rather than a college education given the lower returns to education that immigrants face in the US compared to the returns in Mexico.

With respect to the manual ability, the estimated model predicts that conditional on high school education immigrants are slightly negatively or not selected, while unconditional they are positively selected. The conditional negative selection is due to the proportional loss of human capital that lowers the returns to the manual ability and represents a disincentive to migrate that is higher with higher levels of the utilized ability. A disincentive that for those immigrants that expect their children to continue to be high school educated is not compensated by the increase in future generation welfare as it is for college educated immigrants or for high school educated immigrants that expect their children to become college educated. In fact, although the returns to college education are lower in the US than in Mexico, the cost to attend college is also lower so that a college education is more attractive in the US than in Mexico. The unconditional positive selection is instead driven by the positive selection with respect to the intellectual ability and the fact that the two abilities are correlated. In this sense, with respect to the manual ability the model is consistent with Borjas (1993), which predicts that if in the host country the returns to human capital are lower immigrants are negatively selected.

Overall this paper suggests that simply looking at the educational attainment of Mexican immigrants is misleading to understand the selection mechanism. In the case of immigrants, parents with larger amounts of intellectual ability tend to migrate more and tend to choose to remain high school educated. However, they migrate with the expectation of their children becoming college educated. This has important policy implications. First, it suggests that immigrants bring more human capital than what is shown by their earnings or by their education. Second, they bring more of the intellectual ability that when transmitted to their children will enable its full utilization. Third, it also implies a fast assimilation path for Mexican Americans. In this sense, this paper reverses the pessimistic view implied by the negative selection and intergenerational transmission of abilities theory proposed by Borjas (1993). New cohorts of Mexican immigrants are among the best individuals coming from the source country in terms of the amount of human capital they bring into the US. Their poor performance in terms of earnings may be primarily explained because it is difficult for them to adapt their skills

to the new country. However, future generations of Mexican Americans should be observed to assimilate more fluidly, provided there are not other exogenous obstacles preventing this integration.

The paper is structured as follows. The next section highlights a few features from the data. Sections 3 and 4 introduce the model that is estimated and give a discussion of its identification. Section 5 discusses the estimation results and Section 6 concludes.

2 Sample Characteristics

Mexicans in the US are generally less educated than Americans. This is true for Mexican immigrants (the first generation of Mexicans) but also for the second generation, those that were born in the US from Mexican parents, and beyond. However those groups of people differ substantially in their educational choices and their earnings capacities given their education. This section provides evidence of the divide between Mexican immigrants and Americans in terms of earnings and education, and describes the dynamics of these variables across successive generations of Mexicans in the US. The focus of this section is the relationship between first, second and third generations of Mexicans in the US, and the earnings and educational dynamics from one generation to the next.

In particular it is shown that from the first generation of Mexican immigrants in the US to the second there is a jump in educational attainment and in earnings. Moreover, the jump in earnings is still present when conditioning on education, and therefore, is not entirely caused by increased education. Also, the improvement made from first to second generation is not found from the second to the third. In fact, there is evidence, although weak, that some of this improvement is lost.

Table A.2 in Appendix A provides a descriptive overview of earnings and educational attainment for different generations of Mexicans working in the US. The table presents average yearly and weekly earnings, as well as educational attainment[3] from Current Population Survey (CPS) data. The data are pooled from repeated cross section data sets of the CPS March

[3]Educational attainment is measured here as the share of the referenced population with some college education.

supplement from 1994 to 2005, 1994 being the first available year in which the CPS data contain a variable that indicates the place of birth of respondents' parents.

First, averages for the pooled data are shown and then for each year of the 12 year period. Table 1 reproduces the average for the entire 1994-2005 period in Table A.2. Figures are corrected for inflation with base year 2000. The data were also corrected to take into account top-coded values[4]. As expected, the earnings of Mexicans working in the US are lower than those of Americans. However, it is also clear that there is a large difference between first and successive generations of Mexicans in the US. For all the years from 1994 to 2005 earnings of immigrants are on average about one third lower than second and third generation Mexicans, and about half those of Americans. Table 1 also shows that the first generation of Mexicans has, on average, a much lower level of education than their descendants. While less than 1 out of 5 immigrants has some college education, the percentage is more than double among second and third generations. However the educational gap with Americans stabilizes between the second and third generations at 15 percentage points lower.

It is also interesting to note that second and third generations do not differ substantially in terms of earnings and educational attainment[5]. This suggests that all the improvements made by Mexicans in the US are observed from the first to the second generation while no improvements are made beyond the second generation to close the gap with the American population.

Table 1: Descriptive Statistics

	Men				Women			
Variable	$1^{st}Gen$	$2^{nd}Gen$	$3^{rd}Gen$	US nat.	$1^{st}Gen$	$2^{nd}Gen$	$3^{rd}Gen$	US nat.
Yearly Earnings	20993	29208	30334	42108	13727	20662	20773	25064
	(129.61)	(447.76)	(274.03)	(79.81)	(122.97)	(308.72)	(188.63)	(47.16)
Hourly Earnings	10.96	15.15	15.53	20.38	9.18	12.32	12.33	14.95
	(0.074)	(0.241)	(0.140)	(0.039)	(0.096)	(0.185)	(0.112)	(0.029)
"Some College" Share	0.13	0.40	0.39	0.54	0.14	0.38	0.39	0.54
	(0.002)	(0.007)	(0.005)	(0.001)	(0.002)	(0.006)	(0.004)	(0.001)
N. obs	24782	5093	11871	359017	12586	4663	11143	339153

Standard errors in parenthesis.

[4]See Footnote A.2 for an explanation of the method used.

[5]The difference in educational attainment from the second to the third generation is 0.01 and its standard error is 0.0086. Therefore, it is not significant.

There are several factors that may explain why second and third generations earn more than the first. The data suggest that given the causal relationship between education and earnings, improved education is one factor. Other factors may be the different amount of experience due to the different age composition of immigrants and local populations, or the adaptability of the immigrant background in the host country labor market. To determine how important education and experience are in explaining the generational gap in earnings of immigrants, and how much can be attributed to other factors such as adaptability, the following regression model is estimated

$$\log(w_i) = \beta_0 + \beta_1 G_{1i} + \beta_2 G_{2i} + \beta_3 G_{3i} + \beta_4 D_i + \beta_5 D_i * G_{1i} + \beta_6 D_i * G_{2i} + \beta_7 D_i * G_{3i} + \gamma X_i \quad (1)$$

where $\log(w_i)$ represent log-hourly wages regressed on a set of dummy variables, a quadratic function of experience and other individual characteristics X_i. Dummy variables were constructed to represent the generations of Mexicans: G_1 for individuals who were born in Mexico; G_2 for individuals born in the US with at least one of their parents born in Mexico; and G_3 for US born individuals with US born parents that declare themselves to be Mexicans[6] and have both parents born in the US. A dummy variable D was also constructed for college attendance that takes the value of one if the respondent attended some college after high school graduation. Other control variables were also included such as dummies for survey years and geographical dummies.[7] The regression does not include interactions between survey year dummies and education, therefor constraints the coefficient on the return to education to be constant over the sample period. Table A.3 in Appendix A shows evidence that during the period 1994-2005 the returns to education as defined here did not see a steadily increase or decrease. This is evident at least for Americans, while is more difficult, given the smaller number of observations by year, to make the same statement for the three generations of Mexican immigrants.

Table 2 presents the results of the regression. The reference group in the regression is all non-Mexican residents in the US. Therefore, the intercept coefficient in row 1 gives the average log hourly wage in 2000 US dollars of the high school or lower educated group of all

[6]The CPS questionnaire specifically asks respondents if they are "Mexicanos", "Mexican-American" or "Chicanos".

[7]I included five dummy variables representing the six minus one categories of metropolitan status. The dummy excluded represents large cities.

Table 2: Earnings Gaps Between First, Second and other Generations of Mexicans

Dependent Var.: Log Hourly Wage	Men	Women
Intercept	1.6592	1.7506
	(0.0090)	(0.0088)
1st Gen. Imm.	-0.3671	-0.3031
	(0.0050)	(0.0068)
2nd Gen. Mexicans	-0.0923	-0.0857
	(0.0130)	(0.0138)
3rd Gen. Mexicans	-0.1220	-0.1073
	(0.0089)	(0.0091)
Americans with Coll.	0.3878	0.3879
	(0.0027)	(0.0027)
1st Gen. Imm. Coll.	0.3779	0.3871
	(0.0141)	(0.0165)
2nd Gen. Mexicans Coll.	0.3354	0.3812
	(0.0205)	(0.0199)
3rd Gen. Mexicans Coll.	0.3669	0.3877
	(0.0136)	(0.0129)
Exp	0.0574	0.0338
	(0.0006)	(0.0005)
$Exp^2/100$	-0.0783	-0.0484
	(0.0009)	(0.0009)
N.OBS.	326465	299027
R^2	0.1778	0.1276

Reference is the group of Americans with high school or less. Data are from CPS 1994 to 2005, hourly wages are adjusted for inflation and dummies for survey years are also included in the regressions.

non-Mexicans in the US. The coefficient on the dummy for college in row 5 gives the average percent gain of having at least some college compared with high school or less for a non-Mexican American. In rows 2 to 4, the coefficients on the dummies for generations of Mexicans in the US give the difference in log wages between non-Mexican and Mexican Americans, with high school or less. Mexican immigrants with a high school degree or less earn on average 36% less than non-Mexicans[8], their children earn about 9% less, and the third generation still faces a

[8]Particular caution must be put in interpreting this particular result since the group of high school or less educated Mexican immigrants is much more heterogeneous than the equivalently defined group of non-Mexicans. Evidence of this fact is reported by Chiquiar and Hanson (2005) and Caponi (2006). Table A.5 in Appendix A reports the returns to years of schooling for each generation of Mexicans immigrants and for non-Mexicans. From the table and the evidence reported in the cited works it is possible to conclude that the lower earnings faced by Mexican immigrants with high school or lower education is due to lower returns to schooling together

gap of about 12%. The generation dummies are interacted with the college dummy to obtain the proportional gain of having some college education over having only high school education or less for each generation (rows 6-8). The gain for immigrants is about 38%, so that a Mexican with some college earns slightly more than a non Mexican with high school or less. Similar gains can be observed for the third generation Mexicans, while the gain is a little lower for the second generation.

In order to compare the performance of college educated Mexicans of different generations to college educated Americans, in Table 3 the value of the estimate β_4, the coefficient indicating the returns to college for Americans, is subtracted from the estimates of the returns to college for each generation of Mexicans. The latter are obtained by summing the estimates of the coefficients relative to the generation and to the generation interacted with education. The first row of Table 3 shows that college educated male immigrants earn 38% less than college educated male Americans. The second and third rows show that the second and the third generation college educated male Mexicans earn 14% less. It is interesting to notice that the gap between college educated Americans and US born Mexicans is the same for the second and the third generations of Mexicans.

The last two rows of Table 3 show the difference between log wages of third and second generation Mexicans for each level of education. It can be seen from the fourth row that the third generation of Mexicans with high school degree or less earns about 3% less than the second generation of Mexicans with the same level of education. This difference is significant at the 10% confidence level. The earnings of Mexicans with some college education do not show a significant difference between second and third generation (row 5 Table 3).

Consistent with the previous literature on generations of immigrants in general and on Mexicans in particular[9], Tables 2 and 3 clearly demonstrate that Mexican immigrants have significant lower earnings than other non-Mexican US residents. Moreover, this difference drastically decreases, although does not disappear, with the second generation. As documented by Trejo (2001), it also shows that the third generation does not perform significantly better

with a lower educational attainment within the defined group compared to the other generations.

[9]See for example the already cited work of Card (2004) for immigrants in general and Trejo (2001) for Mexicans.

Table 3: Additional Tests

Dependent Var.: Log Hourly Wage	Men	Women
$\hat{\beta}_1$ +$\hat{\beta}_5$-$\hat{\beta}_4$	-0.3770	-0.3039
	(0.0135)	(0.0152)
$\hat{\beta}_2$ +$\hat{\beta}_6$-$\hat{\beta}_4$	-0.1447	-0.0924
	(0.0162)	(0.0147)
$\hat{\beta}_3$ +$\hat{\beta}_7$-$\hat{\beta}_4$	-0.1429	-0.1074
	(0.0106)	(0.0096)
$\hat{\beta}_3$ -$\hat{\beta}_2$	-0.0297	-0.0216
	(0.0155)	(0.0162)
$\hat{\beta}_7$ -$\hat{\beta}_6$	0.0315	0.0066
	(0.0246)	(0.0237)

Where the β's are from the regression model: $\log(w_i) = \beta_0 + \beta_1 G_{1i} + \beta_2 G_{2i} + \beta_3 G_{3i} + \beta_4 D_i + \beta_5 D_i * G_{1i} + \beta_6 D_i * G_{2i} + \beta_7 D_i * G_{3i} + \gamma X_i$

than the second generation, and for lower educated males the performance is even worse. There is a jump in hourly wages from the first generation of Mexicans to the second of about 26%. This improvement is not repeated from the second to the third generation so as to close the gap between Mexican-origin and non-Mexican US residents. These facts motivate the next section of the paper which introduces a theoretical model capable of replicating these features of the data.

3 Model

Presented here is a partial equilibrium intergenerational altruistic model where a person chooses the level of education and the country of residence. Following Borjas (1993), I assume that the choice of the country of residence is based on earnings capacity of an individual represented by ability endowments and the alternative returns of the endowments across locations. Following Mayer (2005) I additionally assume that the ability endowments are of two types: s_L and s_H. The former is the more physical type of ability that can be used in the marketplace if the person acquires up to a high school degree; the latter is the more intellectual ability that can be used if the person acquires at least some college education. Therefore, agents not only

choose their location, but the level of schooling they want to acquire, or, in other words, which of the two abilities they want to use for producing earnings. Acquiring an education has a cost, and the cost is different for the two levels of education. Moreover, the reward is different, considering that the wages paid to college educated individuals are higher than those paid to people who only have high school education or less. Further, wages and schooling costs differ across countries. It is also assumed that the returns to the abilities, or skill prices, are higher in the US than in Mexico for each ability. As such, a Mexican born individual may have an incentive to migrate, while a US born individual does not. This implies that the model predicts unidirectional migration from Mexico to the US, as in fact is observed in the data.

Therefore, Mexican born individuals can choose from the following four options: high school and working in Mexico, going to college and working in Mexico, high school and working in the US, and going to college and working in the US. The last two choices imply that the individual migrates. The choices of American born individuals are only between the two levels of education considered; in this sense their choices are identical to those in Mayer (2005).

As the description of the model suggests, I have reproduced Mayer's model with the extension to include the choice to migrate or not for Mexican born agents. In the following sections, the focus of the set up of the model and the econometric analysis is on how the choice to migrate is characterized.

As in Borjas (1993) I assume that migrants face some costs of migration. However, as in Caponi (2006) I assume that there are two costs: a psychological cost, migrants will be homesick for the rest of their working life; and an ability cost, part of their ability endowment cannot be used for producing earnings. Borjas (1993) only assumes one cost (psychological or pecuniary) that is not reflected in reduced earnings capacity of the immigrant. That is, while for Borjas (1993) the observed earnings of immigrants are a good indication of their abilities, here it is assumed that since part of their abilities cannot be used because of imperfect transferability, immigrants may possess higher levels of abilities than can be inferred from their earnings.

This distinction is important when considering that abilities are transferred from parents to their children. In particular, if the ability level to be transferred from immigrant parents to their

children is higher than what market performance would suggest, then the predicted earnings of the second generation Mexicans are higher than those of their parents. A jump in earnings from the first to the second generation should be observed but not from the second to the third. However, I allow for the possibility that the loss of abilities faced by the first generation is more permanent across generations, and, as implied by Borjas (1993), that the second generation of Mexicans do not substantially improve their earnings capacities as compared to their parents.

I follow Borjas (1993) in assuming that second and successive generations of immigrants inherit the human capital by their parents, and use the intergenerational framework in Mayer (2005) to model the intergenerational transmission of abilities from parents to children. Therefore, the endowment of an individual depends stochastically on the endowment of her parent (each parent has one child). Skills are transmitted following a bivariate autoregressive process, in which each skill is allowed to be transmitted at a different rate. The process is assumed to be the same for Mexican and American born individuals and their children that stay in the parental country. However, it can be different if parents and children are born in different countries in the sense that the transmission of skills can be affected by the loss of capacity to transmit human capital faced by immigrants.

Finally, parents care about their children and they maximize the value given by their own lifetime utility plus the discounted utility of their children. Given this structure, if the Mexican born parent wishes to migrate she has to take into account the ability loss, the psychological cost of moving and the gain for future generations of being born in the host country. This gain depends on the intergenerational transfer of ability between parents and children born in different countries.

The decision process of a Mexican born agent can be divided into two steps. In the first step the agent chooses the education level conditional on living in one location. Conditional on remaining in Mexico, given the optimal choice about education the agent obtains a value indicated by v_0. Conditional on migrating to the US, given the optimal choice about education, the agent obtains a value indicated by v_1. In the second step the the agent compares these values and chooses if migrating or not in order to pick the higher one.

I start by describing the educational decision conditional on the migration decision. Let s_k

with $k = L, H$ be the ability levels of an individual's endowment. If the individual was born in the same place where his parents were born, his endowment depends on the ability endowment of his parents as follows

$$\tilde{s}_{k,g+1} = \tilde{s}_{k,g}^{b_k} e^{u_{k,g+1}}, \qquad k = L, H \tag{2}$$

where g indicates the generation, so that $g+1$ corresponds to the generation of children and g to the generation of parents, or first generation. b_k are the parameters that describe the degree of intergenerational persistence in the ability transmission mechanism, and $u_{k,g+1}$ are error terms assumed to be normally distributed

$$\begin{pmatrix} u_L \\ u_H \end{pmatrix} \sim N \left(\begin{array}{c|cc} 0 & \sigma_L^2 & \sigma_{LH} \\ 0 & \sigma_{LH} & \sigma_H^2 \end{array} \right),$$

which implies that lifetime earnings are log-normally distributed. Taking logs and setting $\log \tilde{y} = y$,

$$s_{k,g+1} = b_k s_{k,g} + u_{k,g+1}. \tag{3}$$

The transmission mechanism from immigrant parents to their children takes into account the reduction of capacity to transmit human capital. This reduction is assumed to be proportional to the human capital or abilities originally possessed by the immigrant and is indicated by the factor x. Therefore, let I_g be an indicator that takes value 1 is the generation g migrated and 0 otherwise, the transmission mechanism is given by

$$s_{k,g+1} = b_k(s_{k,g} - xI_g) + u_{k,g+1}. \tag{4}$$

The earnings of an individual are proportional to the level of the ability used, which depends on the chosen level of schooling, and the skill price $\pi_{a,k}$, which depends on the country of residence $a = mx, us$, for Mexico or US, and the schooling level $k = L, H$, for high school or college. Therefore, for a Mexican non-migrant the earnings net of schooling costs are represented by

$$\tilde{w}_{0,k,g} = \frac{\tilde{\pi}_{mx,k}\tilde{s}_{k,g}}{\tilde{\tau}_{mx,k}}, \tag{5}$$

where $\tilde{\tau}_{mx,k}$ is the cost of the chosen schooling level. Taking logs

$$w_{0,k,g} = \pi_{mx,k} + s_{k,g} - \tau_{mx,k}, \tag{6}$$

I assume that $\tau_{\cdot,L} = 0$ for any group of individuals, while the cost of college education is assumed to be proportional to potential earnings reflecting the importance of opportunity costs.

The log-earnings of Mexican residents in the US of the second and third generations are represented by

$$w_{1,k,g+i} = \pi_{us,k} + s_{k,g+i} - \tau_{us,k}, \qquad i = 1, 2, \tag{7}$$

where in $w_{1,k,g+i}$ the subscript 1 indicates that the individual resides in the US, and $g + i$ $(i = 1, 2)$ indicates that the individual belongs to the second or third generation.

As for immigrants their earnings differ from the second and third generations with respect to the schooling costs and because of the loss of human capital that reduces the capacity to use the immigrants' ability to produce earnings. Because the cost of education reflects opportunity costs as well as direct and psychological costs associated to going to college, it is reasonable to assume that immigrants face different costs from both non-migrants and second and third generations of Mexicans in the US. The direct and psychological costs faced by immigrants may be close to the ones faced by non-migrants given that the education is acquired in Mexico, while the opportunity costs may be closer to the ones faced by second and third generations given that they work in the US. Therefore, the combination of the two sources of costs is likely different than from each of the other group. The earnings of immigrants are given by

$$w_{1,k,g} = \pi_{us,k} + s_{k,g} - z_e - \tau_{m,k}, \tag{8}$$

where z_e is the loss of human capital, which is proportional to the ability used to produce earnings, and $\tau_{m,k}$ is the cost of education for an immigrant.

One of the objectives of the following sections is to test the hypothesis that $z_e = x$. That is, if the loss of capacity to use one's ability to produce earnings is equivalent to the loss of capacity to transmit human capital. If this is the case, then the capacity to transmit human capital from immigrant parents to their children is approximated well by their earnings. If instead it is found that $x = 0$, then the capacity to transmit human capital from immigrant parents to their children is higher than what can be inferred by looking at immigrants' earnings.

Mexican born individuals make a joint schooling-migration decision. However, it is possible to analyze the schooling decision separately conditional on the migration choice. In fact, given that the schooling decision conditional on the migration decision does not affect the state of future generations, it can be analyzed without taking into account the altruistic feature of the model. Therefore, a Mexican that remains in Mexico decides to attend college if the lifetime earnings net of college costs that can be obtained by being college educated are higher than the lifetime earning obtained by being high school or lower educated. That is, if

$$w_{0,H,g} = \pi_{mx,H} + s_{H,g} - \tau_{mx,H} > w_{0,L,g} = \pi_{mx,L} + s_{L,g}, \tag{9}$$

or

$$\pi_{mx,H} - \pi_{mx,L} - \tau_{mx,H} > s_{L,g} - s_{H,g}. \tag{10}$$

In contrast, immigrants choose to attend college if

$$\pi_{us,H} - \pi_{us,L} - \tau_{m,H} > s_{L,g} - s_{H,g}, \tag{11}$$

and second and third generation Mexicans choose to attend college if

$$\pi_{us,H} - \pi_{us,L} - \tau_{us,H} > s_{L,g+i} - s_{H,g+i}, \qquad i = 1, 2. \tag{12}$$

Another important feature of the theory presented here is altruism. The fact that parents care about their children implies that they take into account the effect of their choices on the

welfare of future generations. In particular, the migration decision made by Mexican born parents affects the state of their children since it determines their place of birth. Therefore, a Mexican born agent decides to migrate or not depending on which option is valued more, where the value of each option takes into account the effects of this decision on the welfare of future generations. To compare these options I start by analyzing the value of migrating.

The value for a Mexican born agent conditional on migrating to the US is composed of a part that describes the gain from migrating of the current generation given by their earnings $\tilde{w}$ minus a psychological cost, plus the (discounted) expected value to future generations of being born in the US. Assuming log utility, and given that one period is equivalent to one generation and that there is no need to borrow or save for the future,

$$v_1(s_{L,g}, s_{H,g}) = \max_k \Big\{ w_{1,k,g} + \beta E v_{11}(s_{L,g+1}, s_{H,g+1}) \Big\} - z_m, \tag{13}$$

where z_m is a stochastic utility cost of migrating, distributed normally with mean μ_z and variance σ_z^2. In the above Bellman's equation k represents the schooling choice that is made in order to maximize the value function, while the state space of each individual is determined by his endowment (s_L, s_H). The value (v_{11}) of being born in the US is given by

$$v_{11}(s_{L,g+i}, s_{H,g+i}) = \max_k \Big\{ w_{1,k,g+i} + \beta E v_{11}(s_{L,g+1+i}, s_{H,g+1+i}) \Big\}. \tag{14}$$

Moreover since the choice of education of one generation does not affect the state space of the next generation is possible to write

$$v_{11}(s_{L,g+i}, s_{H,g+i}) = \sum_{j=1}^{\infty} \beta^j \max_k \Big\{ E w_{1,k,g+i+j} \Big\}. \tag{15}$$

An agent that decides to remain in Mexico takes into account that his descendants will be born in Mexico and will have the opportunity to migrate in the next period. Since the agent cares about future generations, the expectation about their welfare reflects this possibility. Therefore, the value of an agent conditional on not migrating is given by his current earnings plus the expected value of a Mexican born agent

$$v_0(s_{L,g}, s_{H,g}) = \max_k \Big\{ w_{0,k,g} + \beta E\Big[v_0(s_{L,g+1}, s_{H,g+1}) + P\Big(v_1(s_{L,g+1}, s_{H,g+1}) - v_0(s_{L,g+1}, s_{H,g+1}) \Big) \Big] \Big\}, \tag{16}$$

where

$$P = Prob\Big\{ v_1(s_{L,g+1}, s_{H,g+1}) - v_0(s_{L,g+1}, s_{H,g+1}) \geq 0 | s_{L,g}, s_{H,g} \Big\}, \tag{17}$$

is the probability that their children migrate given their endowment.

Finally, the decision to migrate or not is made in order to maximize the following

$$v(s_{L,g}, s_{H,g}) = \max \Big\{ v_0(s_{L,g}, s_{H,g}), v_1(s_{L,g}, s_{H,g}) \Big\}. \tag{18}$$

Equation (18) simply states that, depending on his ability endowments, a Mexican born agent chooses to migrate or not and the level of schooling such that the best option available is obtained. The next section discusses how the model is identified and estimated.

4 Identification and Estimation

Structural estimation of the model is implemented using the method of moments. Since the moments of the model that have data counterparts cannot be analytically derived, the method of moments is implemented using model simulations. McFadden (1989) provides the theoretical foundation to the Simulated Method of Moments (SMM).

As shown in the previous section, the model studied is closely related to Mayer (2005). In particular, although Mayer estimates his model using data on Americans, the process that determines the intergenerational transmission of abilities is assumed to be identical for Americans and for Mexicans. This allows the utilization of the work already done by Mayer (2005) and the ability to use his parameter estimates while concentrating on estimating the remaining parameters related to the behavior of Mexicans. In this sense the estimation performed here can be viewed as a second stage of a two Stage Simulated Method of Moments estimation

(2SSMM) which was first proposed by Newey and McFadden (1994) and Gourinchas and Parker (2002)[10].

More formally, let $x(u_n, \chi_0)_{n=1}^N$, be a series of observed data, and $x(u_n^s, \chi)$, $n = 1, ..., N$ and $s = 1, ..., S$ be a set of S series of simulated data, conditional on χ. Denote $\mu(x(u_n, \chi_0))$, or simply $\mu(x_n)$, a vector of moments of the data. The SMM procedure consists in minimizing an objective function representing a measure of the distance between moments from data observations and the simulations obtained from the model that can be represented by

$$Q(\chi) = \left[\sum_{n=1}^{N}\left(\mu(x_n) - \frac{1}{S}\sum_{s=1}^{S}\mu\Big(x(u_n^s, \chi)\Big)\right)\right]' W_\chi^{-1}\left[\sum_{n=1}^{N}\left(\mu(x_n) - \frac{1}{S}\sum_{s=1}^{S}\mu\Big(x(u_n^s, \chi)\Big)\right)\right], \quad (19)$$

where W_χ^{-1} is a matrix that defines the relative weights of the moments.

In this case $\mu(x_n)$ can be partitioned into two vectors $m(x_n)$ and $g(x_n)$ of moments. The first vector represents moments related to observations on Americans, and the second related to observations on Mexican residents in Mexico as well as first, second and third generation Mexican immigrants in the US. The set of parameters can also be partitioned into two sets θ and γ, such that the set of parameters θ does not affect the moments $m(x_n)$. These parameters are the ones that only affect the behavior of Mexicans and not the behavior of Americans. Because $m(x_n)$ and $g(x_n)$ are independent moments and, most importantly, because $m(x_n)$ is independent from θ, it is possible to estimate γ independently and use the estimates in a second stage to estimate θ. The parameters Mayer estimates, taken as coming from the first stage, are

$$\gamma = [b_H, b_L, \sigma_H, \sigma_L, \rho], \quad (20)$$

while I estimate the following set of parameters

$$\theta = [\pi_{mx,H}, \pi_{us,L}, \pi_{us,H}, \tau_{m,H}, \tau_{mx,H}, z_e, x, \mu_z]. \quad (21)$$

Note that the skill prices in the US are included in the set of parameters that is assumed not to affect the moments derived from American data. To estimate the model, I use only data

[10] Newey and McFadden (1994) provide the foundation of the two step GMM procedure, while Gourinchas and Parker (2002) extend this procedure to the simulated method of moments.

on Mexican generations in the US and Mexico, and I do not use data on Americans. Although I do assume that the intergenerational autoregressive process is the same for Americans and Mexicans, it is not necessary to assume that Americans and Mexicans in the US face the same set of skill prices. There may be several reasons to believe that the opportunities that the US offers to Mexicans are different than that offered to other ethnic groups. Neighborhood effects, the quality of schools usually attended by Hispanics, and other reasons can explain why a Mexican with the same abilities as an American may have different earnings. Therefore, in what follows $\pi_{us,k}$, should be interpreted as the skill prices for Mexicans in the US.

There are four more parameters in the model that are not estimated but are calibrated or normalized to appropriate values. The discount parameter β is assigned the value of 0.3079. Assuming that a period is about 30 years long, the value reflects a discount factor of 0.9615 per year, which would generate an interest rate equal to 0.04. The cost of college education in the US is set to 0.2. This value is calculated by Mayer (2005) as the necessary earnings increase needed to compensate for forgone earnings due to college attendance. Because the utility cost is independent of other shocks, its variance (σ_z^2) only affects the probability of migrating and is not separately identified from the mean of the distribution. I therefore set it equal to 1. Finally, since the skill prices can only be identified up to scale, I fix the lower skill price in Mexico to be equal to zero, *i.e.* $\pi_{mx,L} = 0$.

Given the partition of the moments and parameter vectors and taking $\hat{\gamma}$ as given from Mayer's estimation, I proceed with the second stage of the 2SSMM procedure as in Gourinchas and Parker (2002), minimizing

$$Q(\theta) = \left[\sum_{n=1}^{N}\left(g(x_n) - \frac{1}{S}\sum_{s=1}^{S} g\Big(x(u_n^s, \theta, \hat{\gamma})\Big)\right)\right]' W_\theta^{-1} \left[\sum_{n=1}^{N}\left(g(x_n) - \frac{1}{S}\sum_{s=1}^{S} g\Big(x(u_n^s, \theta, \hat{\gamma})\Big)\right)\right]. \tag{22}$$

Importantly, the fact the Mayer's estimates can be used in the 2SSMM context, allows usage of the information on the precision of $\hat{\gamma}$, its covariance matrix, in order to obtain correct standard errors in my estimation. Let the Jacobian of the $g(x_n^s, \hat{\theta}, \hat{\gamma})$ moment functions with respect to θ be G_θ, and the Jacobian of the same moment functions with respect to γ be G_γ. Let

Ω_γ be the covariance matrix of the γ estimates, and Ω_g the covariance matrix of the data moments. It can be proved[11] that a consistent estimator of the covariance matrix of θ in a 2SSMM procedure is obtained by

$$\Omega_\theta = Var(\theta) = (G'_\theta W_\theta^{-1} G_\theta)^{-1} G'_\theta W^{-1} [\Omega_g + \Omega_g^s + G_\gamma \Omega_\gamma G'_\gamma] W^{-1} G_\theta (G'_\theta W_\theta^{-1} G_\theta)^{-1}, \qquad (23)$$

where $\Omega_g^s = \frac{1}{S}\Omega_g$ is the simulation correction. The weighting matrix I use is obtained by inverting the data moments covariance matrix, $W^{-1} = \Omega_g^{-1}$ so that it is possible to rewrite equation (23) as follows:

$$Var(\theta) = (1 + \frac{1}{S})(G'_\theta \Omega_g^{-1} G_\theta)^{-1} + (G'_\theta \Omega_g^{-1} G_\theta)^{-1} G'_\theta \Omega_g^{-1} G_\gamma \Omega_\gamma G'_\gamma \Omega_g^{-1} G_\theta (G'_\theta \Omega_g^{-1} G_\theta)^{-1}. \qquad (24)$$

The part that characterizes this estimator as different from the usual SMM covariance estimator is given by $G_\gamma \Omega_\gamma G'_\gamma$, which is the contribution to the covariance matrix of the uncertainty from the first step. $Var(\theta)$ increases if the covariance Ω_γ of the first step estimates increases, and also increases if G_γ, the sensitivity of the second step moments to the first step estimates, is higher.

4.1 Identification Strategy

Mayer (2005) provides a discussion about the identification of the parameters γ in the first stage estimation. He uses the Panel Study of Income Dynamics (PSID). The major advantage of using the PSID in his study is given by the fact that it is possible to link observations of parents to observations of children. Mayer (2005) uses observations collected between 1968, when the PSID started to collect information, and 1976 for parents, and observations collected between 1992 and 2001 for children. He collects information on schooling and earnings for each individual. He first collects earnings information at every year and then uses the individual time series to create a measure of lifetime earnings. He uses the information on lifetime

[11] See Laibson, Repetto, and Tobacman (2005) for a proof based on Newey and McFadden (1994) and Gourinchas and Parker (2002).

earnings and schooling on each parent-child couple to calculate the moments that are used in his SMM estimation procedure. The main moments used are the averages and variances of earnings for each generation, conditional and unconditional on schooling, the averages and variances of earnings of children conditional on schooling of their parents, the share of college educated children and parents, and the correlation between earnings and school choices of parents and children. Mayer states that the variation of earnings conditional on schooling choice and the intergenerational persistence in earnings identify the parameters σ_L, σ_H, b_L and b_H. The relationship between the parents earnings and educational attainment of their children identify the parameter ρ.

Table 4: Data Moments for the SMM Estimation: Males only

Moment	Data	s.e.
Migration Rate	0.2671	0.0014
College Mex. in Mex.	0.1573	0.0013
College 1st Gen. in US	0.1356	0.0022
College 2st Gen. in US	0.4357	0.0070
College 3st Gen. in US	0.4178	0.0046
Earnings HS 1st Gen. in US	1.1346	0.0053
Earnings HS 2st Gen. in US	1.3944	0.0131
Earnings HS 3st Gen. in US	1.3831	0.0091
Earnings C. Mex. in Mex.	1.0843	0.0085
Earnings C. 1st Gen. in US	1.4996	0.0136
Earnings C. 2st Gen. in US	1.7270	0.0173
Earnings C. 3st Gen. in US	1.7440	0.0112

Data for Mexican residents in Mexico is from Mexican census. Data for Mexicans resident in the US from CPS. The sources are pooled together. Average earnings are expressed as differences from the lowest earner group: Mexicans in Mexico with High school or less.

My focus here is on the identification strategy for the second stage. The moments available for the second stage estimation are summarized in Table 4. Information about Mexican born individuals living in the US is obtained using the pooled 1994-2005 CPS data. In order to obtain an estimate of the Mexican population living in the US in 2000, I reweight the CPS observations in each survey year different from 2000 to obtain an aggregate number of the Hispanic population equal to the number present in 2000. Then I divide the weight of all observations by the number of surveys used. The reweighting guarantees that the sum of all weighted observations from the pooled CPS data reproduce the Mexican population present in

the US in 2000. Information on Mexicans living in Mexico is obtained using the 2000 Mexican census. I use a public use micro sample of 1% of the Mexican population in order to obtain an estimate of the total Mexican male population between 22 and 75 years old. I then pool the Mexican census with the CPS data to obtain one big data set containing all the information on Mexicans living in Mexico and in the US. Once I have the unified data set with the corrected weights, I select all male individuals between 22 and 75 who have positive earnings, work full time and do not attend school. Then I build four dummies that identify the generations of Mexicans: Mexicans who live in Mexico, the first generation of immigrants, the second and the third generations. I also build a dummy for Mexican born individuals, and one for college educated.

The first moment in Table 4 is the migration rate given by the share of all Mexican born individuals in the data set who live in the US. The moment is obtained by selecting in the data set all the observations on Mexican born individuals and then calculating the share of these living in the US. The moments in the second to the fifth rows are the shares of individuals with college education relative to the total of individuals in the same generational group. These moments are calculated taking the share of college educated individuals over the total belonging to that generation.

The remaining rows in Table 4 show information on earnings. All of the earnings moments reported in Table 4 are expressed in log hourly wages and are averages relative to the lowest earner group represented by Mexicans living in Mexico with a high school education or lower. To obtain the earnings reported, I first run a regression[12] of log hourly wages on eight generation-education dummies (without intercept), a quadratic function of experience and a set of dummies for survey years and for geographical locations. The generation-education dummies are obtained by multiplying the generation dummies by the college education dummy, for the four generations with college education, and multiplying the generation dummies by 1 minus the college education dummy for the four generations with high school or less. The scope of the regression is to net out the effect of experience and other exogenous variables such as survey years and geography[13] on earnings in order to obtain a proxy for lifetime earnings

[12]The results of the regression are in Table A.1 in Appendix A.

[13]Clearly geography cannot be considered entirely exogenous, especially in a migration model. The reason to include geographical dummies is to take into account the different cost of living, and therefore purchasing

for the different groups comparable to the model simulated counterparts. It is important to net out experience given the different age structure of the different generations considered. Simply taking means from the data without considering the different age structure, would lead to biased estimates of the difference in earnings of different groups. Also, in order to maintain the comparability of earnings across different groups, I need to impose that experience has the same effect on all individuals, hence the pooled regression.

Once I have all the coefficients on the dummies representing the generations together with the schooling levels, I subtract the coefficient on the dummy of high school and Mexican in Mexico from all the other coefficients obtaining the earnings relative to the lowest earner category.

The second column of Table 4 shows the standard errors of each moment. The standard errors for the first five moments are simply calculated dividing the sample variances by the number of observations for each group. For earnings, rather than taking the standard errors from the pooled regression, in order to avoid imposing the same error structure across the different groups, I take the squares of the residuals from the pooled regression and calculate the means of the squared errors for each group identified by the generation/education dummies. Once I have the correct variances for each estimated earnings mean, the variance of the lowest earner group is added to all the others. Let $\hat{\mu}_i$ be the mean earnings of group i, and $\hat{\mu}_0$ the mean earnings of Mexicans living in Mexico with high school or less. Let $\hat{\sigma}_i^2$ and $\hat{\sigma}_0^2$ the corresponding variances. Then the correct variances for the differences are $\hat{\sigma}^2_{\hat{\mu}_i - \hat{\mu}_0} = \frac{\hat{\sigma}^2_{\hat{\mu}_i}}{n_i} + \frac{\hat{\sigma}^2_{\hat{\mu}_0}}{n_0}$. The independence between the observations in each group guarantees that the above formula gives correct estimates for the moment variances. Within each group the covariances are also calculated in order to obtain the full covariance matrix that is used to obtain the standard errors for the estimated parameters. The covariances across groups are all zero, as implied by the independence of each group.

Once I have all the moments I need to be certain that the model is identified. It is easy to show that once the joint ability distribution is completely characterized and all the means by generation of the two abilities, conditional and unconditional on education, are known, all the

power of earnings, in different locations. The geographical dummies are for states in Mexico and metropolitan status in the US. The reference groups are large cities for the US and the district of Mexico City for Mexico.

parameters are identified by the moments on earnings, on the share of college educated and by the differences between these moments. The earnings of each education/generation group identify the skill prices and the share of college educated identify the educational costs. The migration rate clearly depends on all parameters in the model. However, assuming that the earnings differences and the school choices identify all the parameters except for the average cost of migration, then μ_z is identified by the migration rate. The harder part is to show that it is possible to identify the ability averages by generations, conditional and unconditional on education, together with all the model parameters.

Appendix B shows that the difference between the earnings of high school educated immigrants and the earnings of high school educated Mexican residents identifies the parameter indicating the loss of human capital z_e. This implies that at the same time the difference between the manual average ability among immigrants and the manual average ability among Mexican residents conditional on high school education is identified. By knowing the ex-ante (before migration) ability distribution and knowing the share of high school educated immigrants it is possible to derive the unconditional manual average ability among immigrants and among Mexican residents. The knowledge of z_e can be used to identify the difference between the intellectual ability mean among immigrants and the intellectual ability mean among Mexican residents conditional on college education. Therefore, the unconditional means of the intellectual ability can also be identified in the same way as the manual ability.

Finally, by knowing the intergenerational transmission mechanism and the values of its parameters, it is possible to infer the unconditional averages for the second and third generation Mexicans except for the loss of capacity to transmit human capital x. The differences between earnings and educational attainment between generations of Mexicans in the US identify this parameter as well as provide overidentifying restrictions.

5 Estimation Results

Table 5 reports the estimates from Mayer (2005) that are used as first stage estimates. The table shows significant and sizable parameters related to the intergenerational transmission of

abilities. The intellectual ability is shown to be more persistent ($b_H = .55$) than the manual ability ($b_H = .209$).

Table 5: First Stage Parameter Estimates

Parameters	Point Estimate	s.e.
b_L	0.209	0.071
b_H	0.550	0.050
ρ	0.246	0.093
σ_L	0.387	0.015
σ_H	0.533	0.029

Mayer (2005), Table 2, pag. 32.

The standard deviation of the shocks associated with the transmission of the intellectual ability is larger than the standard deviation of the shock of the manual ability. Together with the persistence parameters, this implies that the variance of the higher ability in a cross section of individuals is higher than the variance of the manual ability[14].

Proposition 2 in Mayer's paper proves that this is a sufficient condition for the probability of children's college attendance to be a positive function of the parents' wage when parents are also college educated. The probability of having college educated children is also increasing in parents' earnings when parents are not college educated, provided that the two abilities are positively and strongly correlated. Through simulations of his model, Mayer shows that he obtains the same result although the estimated value of ρ in Table 5 is lower than it needs to be to satisfy the sufficient condition, as stated by Proposition 2. That is, given the values of the other parameters of the ability distribution, the correlation coefficient is large enough to generate the result predicted. As clarified later, this point has important consequences for the migration model presented here.

Table 6 presents the estimated parameters and the standard errors[15] obtained by the second stage of the 2SSMM procedure. Model 1 in the table refers to the model discussed above and for which I derived the sufficient conditions for identification. Model 2 is a generalization of

[14]The variance in a cross section is given by: $\bar{\sigma}_k^2 = \sigma_k^2/(1 - b_k^2)$.

[15]Standard errors in Table 6 are obtained using equation (24). To evaluate equation (24), I needed to numerically calculate the derivatives of the moment functions with respect to both sets of parameters. I also needed the covariance matrix of the data moments, and the covariance matrix of the estimates from the first stage. The last bit of information was kindly provided by Mayer.

Model 1 in which I let the parameters related to the loss of human capital (z_e and x) be different for the two educational levels.

Concentrating on Model 1, the first two rows of the table show the price set faced by Mexicans remaining in Mexico. As stated previously the skill price for the lower educational level is normalized to zero ($\pi_{mx,L} = 0$). Therefore, all the skill prices are relative to it and should be interpreted as the difference from the lowest skill price. The table shows that the skill price for college educated in Mexico ($\pi_{mx,H}$) is about .51 log points greater than the skill price for the high school educated. The parameter estimate is also significant at the 5% level. This difference also indicates the actual returns to college in Mexico for a randomly selected person to attend college, that is, net of self selection. The cost of college education for a Mexican remaining in Mexico (τ_{mx}) is about 1.1. This figure must be compared to the skill price difference in Mexico, which is given by $\pi_{mx,H}$=0.51. As such, it can be said that the cost of attending a college in Mexico is about double the returns that the college guarantees.

Table 6: Parameter Estimates

	Model 1			Model 2	
Parameter	Point Estimate	s.e.		Point Estimate	s.e.
$\pi_{mx,H}$	0.509	0.103		0.533	0.099
τ_{mx}	1.101	0.145		1.117	0.123
$\pi_{us,L}$	1.335	0.050		1.273	0.023
$\pi_{us,H}$	1.378	0.066		1.350	0.012
τ_m	0.641	0.115		0.406	0.094
z_e	0.248	0.051	z_{eL}	0.152	0.018
			z_{eH}	0.461	0.080
x	0.061	0.132	x_L	0.006	0.332
			x_H	0.015	0.418
μ_z	2.315	0.031		2.313	0.011
$\eta(\hat{\theta}, \hat{\gamma})$		387.79			46.18

Rows 3 and 4 show the skill prices for Mexicans working in the US. The skill price for high school educated Mexicans working in the US ($\pi_{us,L}$) is 1.335, while for college educated Mexicans in the US ($\pi_{us,H}$) it is 1.378. They are also significant at the 5% level. As before they must be interpreted as differences from the lowest skill price, *i.e.* high school educated in Mexico. The difference between the college and the high school skill price for Mexicans in the US can also be interpreted as the return to college net of self selection, which in this case

is 0.043.[16]. Row 5 in the table shows the cost of college attendance for Mexican immigrants (τ_m), which is estimated at 0.641. Recalling that the cost of college attendance is assumed to be 0.2 in the US, I find that the cost of college attendance for immigrants is a between the cost in the US and the cost in Mexico. To understand why the cost is so much higher than the cost in the US it is useful to recall equation (11) in Section 3,

$$\pi_{us,H} - \pi_{us,L} - \tau_{m,H} > s_{L,g} - s_{H,g}.$$

Rewriting the equation as follows

$$Prob(s_{L,g} - s_{H,g} < \pi_{us,H} - \pi_{us,L} - \tau_{m,H}), \tag{25}$$

it is possible to interpret the probability that a randomly selected immigrant has a college education as the share of college educated immigrants. The share of college educated among immigrants is much lower than the share of college educated among the second and third generation Mexicans in the US. However, the returns to education are the same for all three generations. The only difference is the cost of education, which for second and third generations is $\tau_{us,H}$. Moreover, as will be clear later, the difference between the manual and the intellectual average abilities is lower for immigrants than for second and third generation Mexicans, because it is expected to increase from the second to the third generation. Therefore, the high educational cost it is estimated as a result of the low educational attainment among immigrants.

Rows 6 to 9 present the estimates of the loss of human capital. Row 6 shows the direct loss faced by immigrants (z_e) while row 8 shows their loss of capacity to transmit human capital to their children (x). The value estimated by Model 1 for the direct loss of human capital is 0.248, which is sizable and significant at the 5% level, while the value of x is 0.061 and is not significant. Finally the mean of the utility cost distribution is significant at the 5% level and takes a value of around 2.3.

[16]Although it is not reported here, Mayer also estimates this difference for Americans and reports a value of 0.126. Therefore, the return to college for Mexicans living in the US is lower than for Americans This may explain the lower college attendance rate for Mexicans in the US.

The last row in the table shows the inverse of the goodness of fit values of the model. The function is calculated as a weighted sum of squares of the deviations between the simulated and data moments, where the weights are obtained using the optimal weighting matrix given by:

$$W_{opt} = [\Omega_g + \Omega_g^s + G_\gamma \Omega_\gamma G_\gamma']^{-1}. \tag{26}$$

A formal overidentifying restriction test rejects the model. The values are distributed as a χ^2 with $m - k$= 4 degrees of freedom. The null hypothesis, that the value is equal to zero, is rejected. A possible reason for the poor fit of the model is that it is not flexible enough to capture the differences between the two types of occupations, especially among immigrants.

Table 7 shows the data moments and their simulated counterparts, in particular rows 6 and 10 in the table show the earnings of high school educated (row 6) and college educated (row 10) immigrants. Looking at the table, it can be seen that in Model 1 the simulated earnings of high school educated immigrants, are lower while the earnings of college educated are higher, than their data counterpart. This may suggest that the direct loss of human capital faced by college educated is higher than the direct loss faced by high school or lower educated immigrants.

This hypothesis is examined in Model 2 where I let the parameters related to the loss of human capital for each educational level differ. Table 6 shows that the skill prices estimated under Model 2 are not very different from those estimated under Model 1. Also, the cost of college attendance in Mexico and the mean value of the utility cost distribution are very similar in both models. The parameters related to the intergenerational loss of human capital x's are also similar in both models and are always close to zero and not significant. Rather, the parameters that take different values are the cost of college attendance for Mexican immigrants and the direct loss of human capital. The cost of college is 0.406 under Model 2 rather than 0.641. Therefore, it has been reduced by one third of its original value. The estimates for the direct loss of human capital are 0.152 for the high school or lower educated (z_{eL}) and 0.461 for college educated (z_{eH}). As in Model 1, all the parameters in Model 2 are significant at the 5% level, with the exception of the x's.

Model 1 can be interpreted as a restricted model with respect to the more general Model

Table 7: Data Moments for the SMM Estimation: Males only

Moment	Data	Sim. Model 1	Sim. Model 2
Migration Rate	0.267	0.265	0.270
College Mex. in Mex.	0.157	0.150	0.155
College 1st Gen. in US	0.136	0.150	0.131
College 2st Gen. in US	0.436	0.391	0.420
College 3st Gen. in US	0.418	0.393	0.421
Earnings HS 1st Gen. in US	1.135	1.090	1.120
Earnings HS 2st Gen. in US	1.394	1.369	1.329
Earnings HS 3st Gen. in US	1.383	1.371	1.328
Earnings C. Mex. in Mex.	1.084	1.081	1.100
Earnings C. 1st Gen. in US	1.500	1.721	1.501
Earnings C. 2st Gen. in US	1.727	1.776	1.744
Earnings C. 3st Gen. in US	1.744	1.776	1.748

The data for Mexican residents in Mexico is from Mexican census, while for Mexicans residents in the US from CPS. College refers to the share of college educated out of the total population of the generation. Earnings are averages net of experience for each category minus the average earnings of Mexicans residents in Mexico with high school or less. The migration rate refers to the share of Mexican born individuals residents in the US. All data are for males, working full time and reporting positive earnings.

2 where the restrictions are $z_{eH} = z_{eL}$ and $x_H = x_L$. In this case the difference between the inverse of the goodness of fit values for Model 1 and Model 2 can be used to test if the restrictions are rejected by the data. The test is given by

$$\eta_R(\hat{\theta}, \hat{\gamma}) - \eta_U(\hat{\theta}, \hat{\gamma}) = 387.79 - 46.18 = 341.33. \tag{27}$$

The test is distributed as a χ^2 with degrees of freedom equal to the number of constraints (in this case two) and clearly rejects the null hypothesis that the constraints do not significantly worsen the fit of the model[17]. Overall Model 2 improves substantially the fit of the data, and for this reason I focus only on Model 2 in the analysis that follows.

The estimated parameters of the model suggest that the returns to college in Mexico are much higher than in the US. Abstracting from self selection, a college educated person in

[17]It should be stated that the overidentified restrictions test on Model 2 also rejects the model. However, as is clear by looking at the comparison between the simulated and data moments, the model performs very well in approximating the data moments. The relative good precision of the data moment estimates requires that the model reproduces them with higher precision in order to be statistically validated. In particular the college shares of second and third generation Mexicans are not fitted as well as required by their relative weight in the covariance matrix.

Mexico can expect to earn about 70% (0.53 log points) more than a high school or less educated Mexican resident in Mexico. A Mexican resident in the US can expect a return of only about 8% (0.077 log points). Often quoted as a reason for the high return to a college education is the relative scarcity of college educated people compared to high school or lower educated Mexicans residents. A related point that could be raised is, given the higher returns, why is the share of college educated in Mexico so low? To match this particular moment the model estimates a very high cost of education if compared with Mexican earnings. The estimated value of τ_{mx} is 1.117, which is about double the estimated returns to college. Therefore, assuming a high school or less educated immigrant can earn about 50,000[18] US dollars, the return to college is about 35,000 US dollars which would imply a cost of attending college of about 70,000 dollars. This figure is impressive if compared to actual Mexican earnings. Perhaps factors like proximity to colleges, the fact that some of the direct costs associated to attending a college are priced in US dollars contribute to explaining the relative high costs. However, the high cost of college education in Mexico could also be explained by the inefficient financial sector that in Mexico implies much higher costs for borrowing to finance the period of study. That is, Mexicans students may face borrowing constraints that Americans do not face. For the same reasons immigrants face higher educational costs than Americans. Their forgone earnings are closer to the forgone earnings of Americans since they have the option to migrate earlier and work in the US without a college education or wait until they are college educated and migrate later. However, the fact that they need to acquire their education in Mexico implies that they face the same difficulties that non-migrants face.

The model also suggests that the direct loss of human capital faced by immigrants is larger for college educated than for high school or lower educated[19]. As seen before the larger difference between the losses of human capital for the two educational levels helps the model

[18]The figure is obtained using the information from Table A.1 in Appendix A. Lifetime earnings are calculated assuming a high school or lower educated Mexican resident works for 40 years and each year her earnings increase due to accumulated experience. The lifetime earnings is a present value measure obtained by discounting using yearly interest rate equal to 4%. The figure is also adjusted to reproduce a value in US dollars non PPP adjusted.

[19]Recalling footnote 8 and the fact that the direct loss of human capital is mainly identified by the earnings difference between Mexican immigrants and second generation Mexicans for each educational group, it is possible to conclude that the this parameter might be upward biased. In fact, if Mexican immigrants with high school education or lower had the same average years of schooling than their second generation counterpart, their earnings gap would have been lower predicting a direct loss of human capital for this group of immigrants lower than the one estimated.

to better fit the earnings of college educated immigrants that in Model 1 were simulated to be much higher than was actually found in the data. At the same time the increased loss of human capital for the college educated implies a lower return to college education for immigrants. As such, this reduces the number of college educated immigrants in row 3 of Table 7 from 15% in Model 1 to 13.1% in Model 2. This is a much better fit to the data value of 13.6%. The shares of college educated second and third generation Mexicans in the US (rows 4 and 5) increase from about 39 to 42%; again this is closer to the data values of 43.6% for the second generation and 41.8% of the third generation. Because of the higher loss for immigrants, this is obtained by increasing the returns to college. In Model 2, this can be achieved without implying a higher share of college educated immigrants. However, the increase in the returns to college in Model 2 is obtained by lowering the skill price for high school or lower educated in the US. This, in turn, implies a worse downward fit of the earnings of second and third generations without college (rows 7-8). In contrast, the fit of immigrants with the same educational level in row 6 is improved by the lower estimated loss of human capital for this category.

These results imply of two facts: 1) the loss of human capital for college educated immigrants is higher than that for high school educated or less and 2) the values of the parameters indicating the loss of human capital transferred to children (x's) are always close to zero. This indicates that while the first generation incurs a significant and sizable loss of human capital, their children are not affected by this loss and can expect to inherit the same amount of abilities whether or not the parents migrate. This result is also consistent with Caponi (2006) that demonstrates that the loss of human capital is a positive function of education. The second result explains why there is a jump in the earnings from the first to the second generation of Mexicans in the US, a jump that is not present from the second to the third generation. This explanation does not require negative self selection as postulated by Borjas (1993).

6 Model Evaluation

Given the parameter estimates it is now useful to evaluate the model in terms of how it works and how it reproduces the data. A question that has important policy implications and that motivates a large part of the migration literature is how "good" are the immigrants entering the

host country; where good refers to how skilled they are, and how likely they are to successfully integrate. For Mexican immigrants in the US the data suggest that among immigrants there is a lower fraction of college educated workers as compared to those Mexicans that remain in their country. Therefore, in terms of observable characteristics immigrants should be worse than non-migrants, or negatively selected. However, the model presented here is capable of looking for a more complex answer. It can evaluate the Mexican immigrants in terms of unobservable as well as observable characteristics, and as such evaluate the possibility that immigrants can assimilate within one or more generations.

The loss of human capital for college educated immigrants is greater than for high school educated immigrants, a fact that largely explains their relative earnings. Also, the higher loss of human capital is such that most potential immigrants may feel there is no advantage in attending college before migrating. For example, a Mexican that is hit by a very low disutility shock and is therefore very likely to migrate regardless of her abilities[20] may find it optimal to choose not to attend college so as to avoid facing the higher loss of human capital. Another Mexican with exactly the same ability endowments but a much higher disutility cost would avoid migration and perhaps would choose to go to college since the returns are higher. Conditional on migrating, the incentive to acquire college education is lower. In part this explains the low share of college educated immigrants.

This leads to another query. Keeping the disutility cost of migrating constant, is the probability of migration increasing (decreasing) with each of the abilities? This question is answered by Figure B.1 in Appendix B, which demonstrates the migration policy as a function of abilities. On the xy plane are measured the ability endowments, while on the z axis the function takes a value of 1 for migration and 0 otherwise. The figure shows that migration is a positive function of intellectual ability and a negative function of manual ability.

On the one hand, an immigrant with the same ability endowments of a non-migrant is less likely to acquire college education because of the lower returns. This implies less college educated immigrants. On the other hand, a Mexican is more likely to migrate if the higher ability is higher. This would imply more college educated immigrants. As it turns out, the

[20] Recall that even including the human capital loss the earnings possibilities in the US are always higher than in Mexico, hence with low disutility one would always migrate.

first effect prevails and a lower share of college educated immigrants results. However, this mechanism has another implication: among college educated immigrants the intellectual ability must, on average, be higher than among non-migrants. The same is also true among high school educated immigrants. Also, the manual ability should be lower among immigrants than among non-migrants for both college and high school educated. Table 8 reports the average abilities for Mexican immigrants and non-migrants in Mexico unconditional and conditional on the educational choice. Rows 3 to 6 of the table shows exactly what was predicted above.

Table 8: Average Abilities and Self Selection

Decision	Lower Ability (L)	Higher Ability (H)
Migrant	0.005	-0.001
Non-migrant	-0.002	-0.004
Migrant with High School	0.047	-0.101
Migrant with College	-0.274	0.659
Non-migrant with High school	0.048	-0.117
Non-migrant with College	-0.270	0.615

The first two rows of the table show that unconditional[21]on the educational choice the averages of both abilities are higher for immigrants than for non-migrants. This result can be explained by the fact that the correlation coefficient between the two abilities is positive and that the intellectual ability drives the selection in migration.

Looking at the numbers in the table it is also possible to decompose the earnings relative to the lowest earnings group[22] of immigrants and non-migrants by the contribution of the price skill and the contribution of the self selection into the educational levels. For example, taking high school educated immigrants, their earnings compared to the earnings of Mexican residents without college are given by

$$E[w|G_1 = 1, D = 0] - E[w|G_0 = 1, D = 0] = \quad \pi_{usL} - \pi_{mxL} + \bar{s}^m_{L,g} - \bar{s}^s_{L,g} - z_{eL}$$

[21]Notice that the unconditional value of the intellectual ability is negative in both cases. This is because the average intellectual ability in Mexico is affected by the positive selection of immigrants, or negative selection of non-migrants. Therefore new generations of Mexicans have on average less intellectual ability than they would if there was not migration, *i.e. zero*.

[22]Recall that all the earnings moments are expressed as differences from the earnings of Mexican residents without college.

$$1.12 = \quad 1.273 - 0 + .047 - .048 - .152, \tag{28}$$

where $E[w|G_1 = 1, D = 0]$, represents the earnings conditional on belonging to generation $G_i = 1$, with $i = 0, 1$ for non-migrants and immigrants respectively, and schooling level $D = 0$ for high school. $\bar{s}^m_{L,g}$ and $\bar{s}^s_{L,g}$ are the averages of the manual ability of migrants and non-migrants respectively. The earnings of college educated relative to less than college educated non-migrants are

$$\begin{aligned} E[w|G_0 = 1, D = 1] - E[w|G_0 = 1, D = 0] = & \quad \pi_{mx,H} - \pi_{mx,L} + \bar{s}^s_{H,g} - \bar{s}^s_{L,g} \\ 1.10 = & \quad .533 - 0 + .615 - .048. \end{aligned} \tag{29}$$

The last equation shows that about 54% of the difference in earnings between college educated and less than college educated Mexican residents is due to self selection rather than to actual returns to education. The high cost of college education implies that the ability threshold above which a Mexican resident chooses to attend college is high as well. This, in turn, implies a higher conditional average. Lowering the cost of college education in Mexico would therefore lower the earnings inequality not just by readjusting the skill prices, but also by changing the ability distributions and decreasing the average ability of self selected college educated.

As shown in Figure B.1, Mexican immigrants are positively selected with respect to the intellectual ability and negatively with respect to the manual ability. An explanation for this result can be provided based on intergenerational altruism. Given the lower cost of education in the US and the better opportunities for college educated immigrants' children not bearing the human capital loss faced by their parents, altruistic parents tend to prefer to migrate when they possess more of the higher ability even when they choose to be high school educated.

This hypothesis can be verified by simulating a counterfactual scenario. Table 9 reproduces the simulated moments of the model under different parameterizations. I first lower the altruism parameter β by 50%, setting it equal to .158 and then by 100% setting it equal to zero.

Table 9: Counterfactual Experiment

Moment	Benchmark	Counterf. 1 ($\beta = .158$)	Counterf. 2 ($\beta = 0$)
Migration Rate	0.270	0.168	0.113
College Mex. in Mex.	0.155	0.156	0.157
College 1st Gen. in US	0.131	0.129	0.126
College 2st Gen. in US	0.420	0.417	0.411
College 3st Gen. in US	0.421	0.417	0.417
Earnings HS 1st Gen. in US	1.120	1.120	1.119
Earnings HS 2st Gen. in US	1.329	1.326	1.323
Earnings HS 3st Gen. in US	1.328	1.326	1.328
Earnings C. Mex. in Mex.	1.100	1.103	1.104
Earnings C. 1st Gen. in US	1.501	1.491	1.487
Earnings C. 2st Gen. in US	1.744	1.744	1.744
Earnings C. 3st Gen. in US	1.748	1.749	1.744

The first evident and large effect noticeable in Table 9 is the sharp reduction in the migration rate due to the lower altruism. The model predicts that a selfish parent is less than half as likely as an altruistic parent to bear the psychological and human capital cost of migrating. Caring about the future of their children motivates parents to migrate. Although not as large, the other effect is the decrease in the share of college educated first generation immigrants as well as second and third generation Mexicans. Overall there is a worsening of the educational distribution of Mexicans in the US. From Table 10 it is possible to hypothesize the cause of this decline. The ability average of the higher skill is greatly reduced when altruism is lower. There is still a positive self selection of immigrants with respect to the intellectual ability. However, the selection is lower when conditioning on the immigrants being college educated and almost disappears when conditioning on having high school or less.

Table 10: Average Abilities and Self Selection

	Counterfactual 1 ($\beta = .158$)		Counterfactual 2($\beta = 0$)	
Decision	Ability (L)	Ability (H)	Ability (L)	Ability (H)
Migrant	0.006	-0.007	0.007	-0.015
Non-migrant	-0.001	0.000	-0.000	0.002
Migrant with High School	0.047	-0.105	0.048	-0.111
Migrant with College	-0.276	0.651	-0.278	0.647
Non-migrant with High school	0.049	-0.115	0.049	-0.113
Non-migrant with College	-0.267	0.619	-0.267	0.620

Finally, a look at the choices of children conditional on the education of parents in Table 11

makes it possible to assess that the worsening in the educational distribution is driven primarily by more intergenerational persistence in the lower educational category and consequently a lower advancement in the educational attainment from one generation to the next.

Table 11: Children Education Conditional on Parents Education

Parent/Child	Benchmark	Counterfactual 1 ($\beta = .158$)	Counterfactual 2 ($\beta = 0$)
HS/HS	0.619	0.622	0.627
$HS/Coll.$	0.381	0.378	0.373
$Coll./HS$	0.320	0.318	0.323
$Coll./Coll.$	0.680	0.682	0.677

As stated above, Mayer (2005) proves in his paper that the positive correlation between the two abilities creates a positive correlation between parents' earnings and the probability that children attend college. In this paper, I find that this result is reinforced for immigrants when they care about their children. In the case of immigrants, parents with larger amounts of higher ability tend to migrate more and, tend to choose to remain high school educated. However, they migrate with the expectation of their children becoming college educated. This has important policy implications. First it suggests that immigrants bring more human capital than is shown by their earnings. Second, they bring more of the intellectual ability that reaches full utilization when it is transmitted entirely to their children.

It should be clear that the model presented here does not explain why third generation Mexicans face lower earnings. The model relies on the assumption that this is the effect of exogenous forces, *e.g.* discrimination, that are unrelated to the ability of Mexicans. The skill prices faced by the three generations of Mexicans working in the US presented here are not interpretable as the skill prices in the US faced by everyone. In other words, it is possible to write the skill prices faced by the generations of Mexicans as the product of the general US skill prices and a discrimination factor faced specifically by Mexicans such that $\pi_{us,L} = \pi_{usG,L} - \lambda_L$ and $\pi_{us,H} = \pi_{usG,H} - \lambda_H$. Where π_{usG} is the skill price in the US and λ_k is a discrimination factor specific for Mexicans that may be different for each educational group. Estimation of the λ's is beyond the scope of this work. However, it can be said that by comparing Mayer's estimates of the return to college and the estimates obtained here for second and third generation Mexicans, the model suggests that λ_H is larger than λ_L. That is, well educated

Mexicans face more discrimination than lower educated ones.

7 Policy Evaluation: Loss of Human Capital

Although the model presented in this paper is a partial equilibrium model, it is possible to use it to evaluate policies that can be implemented to affect the migration flow into the US and its composition. The migration flow and composition may also have an effect on the skill prices that the partial equilibrium specification is unable to capture. However, as long as the effects on migration are not too large, it is reasonable to expect that the effects on the US skill composition are also small. As such the skill price should not be importantly affected by such policies.

The policy considered in this section is aimed at integrating immigrants faster in the host country. It is plausible to think that it is possible to implement a policy that helps immigrants to adapt their skills more rapidly to the new country. There are countries that spend significant resources to implement public programs aimed at teaching the official languages to new immigrants. These programs are thought to be beneficial for immigrants in order to adapt their skills to the new labor market.

In this section I assume that these programs can be translated into lower losses of human capital. I also take into account two different scenarios, one in which the programs target highly educated immigrants, and therefore reduce the loss of human capital only for that group, and another in which the lower educated are targeted. I assume that these programs are capable of reducing the loss of human capital by 25%. This implies that when the lower educated group of immigrants is targeted their loss of human capital of 15.5% decreases to 11.42%, *i.e.* $z_{eL} = .1142$, while when the college educated immigrants are targeted their loss of 46.1% becomes 34.58% *i.e.* $z_{eH} = .3458$.

Table 12 shows the counterfactual simulations relative to the self selection mechanism. Counterfactual 1 refers to the case in which the program targets high school or less educated immigrants. Counterfactual 2 is the case in which the targeted group is the college educated. From the first two rows of Counterfactual 1 it is possible to see that the overall mean of

the manual ability distribution increases, while the mean of the intellectual ability decreases. Improving the adaptability of the manual ability improves the lower skill distribution among immigrants, while worsening the higher skill distribution. Immigrants are now overall positively selected with respect to the manual ability and negatively with respect to the intellectual ability. Looking at rows 3 and 5 it is possible to note that among immigrants with high school or lower education, the average of the lower skill is less than among non-migrants with the same level of education. Conditional on having a lower level of education, this implies that immigrants are negatively selected with respect to the manual ability. Rows 4 and 6 show that college educated immigrants are still positively selected conditional on their level of education.

Table 12: Average Abilities and Self Selection

	Counterfactual 1		Counterfactual 2	
	($z_{eL} = 0.1142$, $z_{eH} = 0.4610$)		($z_{eL} = 0.1523$, $z_{eH} = 0.3458$)	
Decision	Ability (L)	Ability (H)	Ability (L)	Ability (H)
Migrant	0.006	-0.004	-0.001	0.007
Non-migrant	-0.002	-0.000	0.001	-0.015
Migrant with High School	0.044	-0.092	0.058	-0.132
Migrant with College	-0.283	0.681	-0.251	0.596
Non-migrant with High school	0.048	-0.116	0.048	-0.123
Non-migrant with College	-0.270	0.616	-0.269	0.611

Table 13 makes it possible to understand why high school and lower educated immigrants are overall positively selected, but negatively selected when conditioning on their education. From row 3 in the table it is possible to note that the share of college educated immigrants decreases in counterfactual 1 with respect to the benchmark case. The selection mechanism conditional on schooling did not change with respect to the benchmark simulation and, since now there are more lower educated immigrants, the negative selection is more pronounced. However, because lower educated immigrants have more of the manual ability on average than higher educated ones, an increase in their share also implies an increase in the overall average of the manual ability. At the same time, lower educated immigrants also have on average less intellectual ability than college educated immigrants. This explains why overall the higher ability decreases.

Finally, from rows 6 to 12 of Table 13 it is possible to note that the earnings relative to the lowest earner group do not change significantly for any group except for immigrants with

low education (row 6). The reduction of z_{eL} has a direct effect on the earnings of this group. While z_{eL} decreased by .0408 log points, earnings only increased by .035 log points since the lower z_{eL} has the effect of decreasing the average ability of immigrants with high school or lower education.

Counterfactual 2 shows the effect of a reduction in the loss of human capital faced by college educated immigrants. Here the most striking effect to note is that such a change in policy can overturn the selection mechanism of college immigrants with respect to the intellectual ability. In fact, conditional on being college educated immigrants have on average more manual ability than non-migrants (rows 4 and 6 of Counterfactual 2, Table 12). Overall, immigrants on average have more of the intellectual ability than non-migrants (rows 1 and 2). Moreover, immigrants have more higher ability with respect to the benchmark case. However, as can be seen from row 3 in Table 13, this is due to the higher share of college educated immigrants that have more of the intellectual ability than high school or lower educated immigrants.

Table 13: Counterfactual Simulation: Policy Evaluation - Moments

Moment	Benchmark	Counterfactual 1 ($z_{eL} = 0.1142$, $z_{eH} = 0.4610$)	Counterfactual 2 ($z_{eL} = 0.1523$, $z_{eH} = 0.3458$)
Migration Rate	0.270	0.280	0.276
College Mex. in Mex.	0.155	0.158	0.147
College 1st Gen. in US	0.131	0.115	0.190
College 2st Gen. in US	0.420	0.418	0.422
College 3st Gen. in US	0.421	0.418	0.424
Earnings HS 1st Gen. in US	1.120	1.155	1.131
Earnings HS 2st Gen. in US	1.329	1.329	1.328
Earnings HS 3st Gen. in US	1.328	1.328	1.330
Earnings C. Mex. in Mex.	1.100	1.101	1.096
Earnings C. 1st Gen. in US	1.501	1.522	1.552
Earnings C. 2st Gen. in US	1.744	1.745	1.750
Earnings C. 3st Gen. in US	1.748	1.751	1.749

Looking at earnings in rows 6 to 12 in Table 13 there is little change for all categories except for immigrants with college education (row 10). With respect to the benchmark their earnings increase by .051 log points. Again the change is not as big as the change in z_{eH}, which is equal to about 0.11. This can be explained by the negative selection of college educated immigrants that causes them to have a lower average ability than in the benchmark case. Finally, in both scenarios the migration rate increases due to the lower migration cost. However, the change

is not very large, indicating that migration is not very sensitive to the direct cost in terms of the loss of human capital.

Overall the policy experiment suggests that policies aiming at rapidly integrating immigrants in the host country have a limited effect on the incentive to migrate. They do have the effect of increasing the earnings potential of immigrants. However, the benefit may appear to be lower due to the self selection mechanism that lowers the ability average of the targeted group. Moreover, the policy experiment suggests that policies that target a specific educational group can be effective in increasing the overall average of the ability used by that group.

8 Conclusion

Focusing on Mexican immigrants in the US, a significant gap is found between the first generation immigrants and non-Mexican Americans. This gap is reduced by the second generation, but stabilizes or increases after the second generation. In fact, conditioning on education, the data suggest that the second generation of Mexicans with high school or lower education, earn more than the third generation with the same level of education. However, no significant differences exist between the earnings of the second and the third generations of Mexicans with some college education. Moreover, the data suggest that there is a lower fraction of college educated among Mexican immigrants in the US as compared to those that remain in their own country.

This paper provides an explanation of the evidence that does not rely on negative self selection of immigrants. The explanation is based on three main concepts. The first concept is that immigrants have difficulties adapting their abilities in the host country. This includes language ability, social skills, and different cultural traits that represent the formidable challenge of adapting acquired skills from one's mother country to another country. This difficulty translates to a reduced capacity toward using one's abilities to produce earnings and, therefore, results in lower earnings. The second concept is that individuals are endowed with two abilities that can be used alternatively depending on the acquired level of education. A higher level of ability (*i.e.*, the intellectual or college ability) is used if some college education is acquired.

Alternatively, the lower level (*i.e.*, manual or high school ability) is used. The third concept is that there is a transfer of abilities from parents to their children. In this respect, immigrants' capacity to transfer their abilities to their children is not reduced. Therefore, while immigrants are observed to earn less because they find it difficult to adapt their skills to the host country, their children earn more because they can inherit all the abilities of their parents, including that part that could not be used for producing earnings.

A partial equilibrium intergenerational altruistic model that is capable of interpreting the main features of Mexican migration is built and estimated. By allowing agents to be endowed with two distinct abilities the model is capable of capturing the complexity of the selection mechanism. The estimation results highlight some important facts: 1) immigrants face an important loss of human capital upon migration; 2) the loss of human capital for college educated immigrants is higher than for immigrants with high school education or lower; 3) there is no loss of capacity to transfer human capital to children; 4) altruism is an important factor that motivates migration; and 5) immigrants are overall positively self selected with respect to their abilities.

The model presented here is an extension of Mayer's (2005) intergenerational self-selection model to the analysis of migration. Mayer (2005) proves in his paper that the positive correlation between the two abilities creates a positive correlation between parents' earnings and the probability that children attend college. In this paper, I find that this result is reinforced for immigrants when they care about their children. In the case of immigrants, parents with larger amounts of intellectual ability tend to migrate more and tend to choose to remain high school educated. However, they migrate with the expectation of their children becoming college educated. Therefore, measures that rely on the earnings performance and educational attainment of immigrants underestimate the amount of human capital they bring into the host country. In this sense, this paper reverses the pessimistic view implied by negative selection and intergenerational transmission of abilities theory proposed by Borjas (1993). A reason why new immigrant cohorts are observed to do worse in terms of earnings than the previous European based waves of immigrants may be given by a higher difficulty to adapt their skills to the new country. However, future generations of Mexican Americans should be observed to assimilate as fast as other previous ethnic groups did provided there are not other exogenous

obstacles that prevent this integration.

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Appendix A

This section presents a few additional facts on returns to education of different generations of Mexican immigrants and non-migrants. Table A.1 reports log hourly wages regressed on dummy variables for educational attainment and generation, a quadratic function of experience and, although not reported for brevity, on dummy for survey years if the observations are from CPS data and geographical dummies. The parameters estimates in rows 1 to 8 indicate the average earnings for each category of individuals once experience and other geographical and time effects are netted out. This returns are used to derive the moments in Table 4.

Table A.1: Earnings Regression - Mexicans Only

Dependent Var.: Log Hourly Wage	Men	Women
Mexicans in MX HS	0.4019	0.2084
	(0.0129)	(0.0200)
1st Gen. Imm. HS	1.5365	1.5668
	(0.0206)	(0.0269)
2nd Gen. Mexicans HS	1.7962	1.7822
	(0.0222)	(0.0277)
3rd Gen. Mexicans HS	1.7849	1.7682
	(0.0215)	(0.0273)
Mexicans in MX Coll.	1.4861	1.1614
	(0.0133)	(0.0201)
1st Gen. Imm. Coll.	1.9015	1.9432
	(0.0221)	(0.0282)
2nd Gen. Mexicans Coll.	2.1288	2.1481
	(0.0228)	(0.0273)
3rd Gen. Mexicans Coll.	2.1459	2.1473
	(0.0217)	(0.0266)
Exp	0.0427	0.0268
	(0.0013)	(0.0016)
$Exp^2/100$	-0.0585	-0.0400
	(0.0021)	(0.0027)
N.OBS.	111358	51591
R^2	0.8744	0.8798

Standard errors in parenthesis.

Table A.2 provides a descriptive overview of earnings and educational attainment for different generations of Mexicans working in the US. The table presents average yearly and weekly

earnings, as well as educational attainment[A.1] from CPS data. The data are pooled from repeated cross section data sets of the CPS March supplement from 1994 to 2005, 1994 being the first available year in which the CPS data contain a variable that indicates the place of birth of respondents' parents.

First, averages for the pooled data are shown and then for each year of the 12 year period. Figures are corrected for inflation with base year 2000. The data were also corrected to take into account top-coded values[A.2].

[A.1] Educational attainment is measured here as the share of the referenced population with some college education.

[A.2] To build a measure of log hourly wage I use observations on yearly income from the CPS. These observations are top-coded at different levels depending on the survey year. In 1994 and 1995 incomes over 100,000 dollars were top-coded. From 1996 to 2002 the level was 150,000, and then increased to 200,000 since 2003. From 1996 the CPS does not set all the top-coded observations equal to the top-code level. Instead the averages incomes of six categories of individuals conditional on being top-coded are calculated. These categories are Hispanics, blacks and whites divided by men and women. Then each top-coded observation is replaced with the conditional mean corresponding to the group of the individual with top-coded income. To correct for top-coding I first re-assign the top-coding threshold value to each top-coded observation, then I build a measure of log hourly earnings for all top-coded and non top-coded observations. Once I have this measure I calculate the expected mean value of the top-coded observations by estimating a Tobit model, assuming that log-hourly wages are normally distributed. Once I have the mean value I adjust each top-coded observation by the difference between the expected mean from the Tobit estimation and the top-coded value.

Table A.2: Descriptive Statistics

		Men				Women			
Survey Year	Variable	$1^{st}Gen$	$2^{nd}Gen$	$3^{rd}Gen$	US nat.	$1^{st}Gen$	$2^{nd}Gen$	$3^{rd}Gen$	US nat.
1994 - 2005	Yearly Earnings	20993	29208	30334	42108	13727	20662	20773	25064
		(129.61)	(447.76)	(274.03)	(79.81)	(122.97)	(308.72)	(188.63)	(47.16)
	Hourly Earnings	10.96	15.15	15.53	20.38	9.18	12.32	12.33	14.95
		(0.074)	(0.241)	(0.140)	(0.039)	(0.096)	(0.185)	(0.112)	(0.029)
	"Some College" Share	0.13	0.40	0.39	0.54	0.14	0.38	0.39	0.54
		(0.002)	(0.007)	(0.005)	(0.001)	(0.002)	(0.006)	(0.004)	(0.001)
	N. obs	24782	5093	11871	359017	12586	4663	11143	339153
1994	Yearly Earnings	18393	28702	27348	39034	12119	18746	19097	22197
		(472.23)	(2906.66)	(921.33)	(269.31)	(515.77)	(1048.85)	(588.38)	(144.84)
	Hourly Earnings	10.10	15.72	15.09	19.31	8.82	12.06	11.78	13.87
		(0.231)	(1.688)	(0.583)	(0.129)	(0.364)	(0.738)	(0.345)	(0.094)
	"Some College" Share	0.12	0.38	0.37	0.51	0.14	0.33	0.33	0.49
		(0.009)	(0.025)	(0.018)	(0.003)	(0.010)	(0.023)	(0.016)	(0.003)
	N. obs	1372	384	864	28302	673	317	731	26342
1995	Yearly Earnings	19014	28295	27770	38381	12432	18089	18043	22017
		(575.70)	(1495.42)	(852.55)	(254.61)	(461.35)	(842.17)	(620.75)	(157.09)
	Hourly Earnings	10.34	15.01	14.74	18.78	9.12	11.07	11.05	13.61
		(0.348)	(0.934)	(0.552)	(0.125)	(0.405)	(0.409)	(0.360)	(0.098)
	"Some College" Share	0.12	0.36	0.39	0.52	0.14	0.30	0.36	0.50
		(0.009)	(0.024)	(0.019)	(0.003)	(0.010)	(0.021)	(0.016)	(0.003)
	N. obs	1506	376	800	28168	764	327	728	26069
1996	Yearly Earnings	18304	27517	26063	38924	12186	17173	17831	22375
		(474.98)	(1406.41)	(1069.02)	(282.38)	(560.52)	(1028.16)	(569.78)	(150.56)
	Hourly Earnings	10.22	14.68	13.98	19.01	8.72	11.30	11.07	13.86
		(0.269)	(0.770)	(0.508)	(0.139)	(0.565)	(0.721)	(0.353)	(0.104)
	"Some College" Share	0.12	0.39	0.37	0.52	0.14	0.35	0.34	0.51
		(0.009)	(0.027)	(0.019)	(0.003)	(0.009)	(0.022)	(0.016)	(0.003)
	N. obs	1484	345	758	24674	783	319	720	22772
1997	Yearly Earnings	19170	27470	27390	39932	12612	19808	19067	23467
		(452.73)	(1176.27)	(1129.83)	(279.40)	(448.26)	(1022.09)	(669.19)	(165.55)
	Hourly Earnings	10.03	14.85	14.02	19.29	8.45	12.26	11.88	14.17
		(0.240)	(0.910)	(0.557)	(0.132)	(0.270)	(0.626)	(0.436)	(0.106)
	"Some College" Share	0.15	0.42	0.40	0.52	0.13	0.35	0.37	0.51
		(0.009)	(0.026)	(0.019)	(0.003)	(0.009)	(0.022)	(0.016)	(0.003)
	N. obs	1633	382	805	24762	786	342	758	23055
1998	Yearly Earnings	20163	28119	30592	41308	13004	20814	20883	24289
		(482.55)	(1267.13)	(1051.01)	(278.78)	(404.48)	(1158.60)	(739.01)	(163.37)
	Hourly Earnings	10.55	14.00	15.43	19.92	9.03	13.14	12.01	14.48
		(0.258)	(0.607)	(0.523)	(0.135)	(0.355)	(0.722)	(0.367)	(0.101)
	"Some College" Share	0.13	0.39	0.35	0.53	0.14	0.37	0.40	0.52
		(0.009)	(0.025)	(0.017)	(0.003)	(0.009)	(0.023)	(0.016)	(0.003)
	N. obs	1681	370	864	24548	869	313	795	22932
1999	Yearly Earnings	20602	29931	31523	42394	13273	19157	19621	25111
		(432.64)	(1456.15)	(1004.32)	(284.86)	(453.24)	(842.88)	(567.73)	(164.32)
	Hourly Earnings	10.69	15.11	15.52	20.20	8.59	12.11	11.99	14.85
		(0.260)	(0.642)	(0.458)	(0.135)	(0.275)	(0.721)	(0.392)	(0.099)
	"Some College" Share	0.13	0.39	0.39	0.54	0.14	0.35	0.39	0.53
		(0.008)	(0.024)	(0.017)	(0.003)	(0.009)	(0.023)	(0.015)	(0.003)
	N. obs	1785	394	916	24709	893	335	891	23193
2000	Yearly Earnings	20791	28511	30668	42832	14033	19573	20984	25477
		(366.00)	(1379.66)	(737.79)	(274.61)	(581.03)	(845.16)	(821.28)	(170.83)
	Hourly Earnings	10.74	14.63	15.36	20.29	8.71	11.02	12.18	15.04
		(0.198)	(0.639)	(0.368)	(0.129)	(0.266)	(0.382)	(0.379)	(0.106)
	"Some College" Share	0.13	0.35	0.40	0.55	0.14	0.38	0.40	0.54
		(0.008)	(0.024)	(0.016)	(0.003)	(0.009)	(0.023)	(0.015)	(0.003)
	N. obs	2047	412	981	24820	1041	365	951	23399
2001	Yearly Earnings	22315	29099	32202	44097	13535	22478	21172	26275
		(417.22)	(1691.97)	(1007.75)	(310.39)	(351.62)	(889.21)	(593.83)	(176.49)
	Hourly Earnings	11.24	15.05	16.36	21.12	8.90	13.31	12.39	15.35
		(0.211)	(0.850)	(0.476)	(0.151)	(0.290)	(0.624)	(0.311)	(0.106)
	"Some College" Share	0.13	0.39	0.39	0.55	0.15	0.43	0.39	0.56
		(0.008)	(0.025)	(0.017)	(0.003)	(0.009)	(0.023)	(0.015)	(0.003)
	N. obs	2052	397	915	23777	1064	380	934	22317
2002	Yearly Earnings	22409	29848	32451	44926	14818	21790	22508	27305
		(433.76)	(1235.66)	(874.84)	(259.42)	(362.61)	(957.53)	(577.41)	(161.36)
	Hourly Earnings	11.93	14.69	16.24	21.81	9.50	11.95	13.06	15.99
		(0.315)	(0.482)	(0.455)	(0.130)	(0.227)	(0.405)	(0.396)	(0.096)
	"Some College" Share	0.14	0.40	0.41	0.56	0.14	0.40	0.40	0.57
		(0.007)	(0.023)	(0.016)	(0.003)	(0.008)	(0.020)	(0.014)	(0.003)
	N. obs	2717	488	1134	39918	1429	470	1136	38134
2003	Yearly Earnings	23475	30300	31950	45067	14662	21567	23071	27255
		(501.02)	(1138.24)	(948.16)	(277.09)	(341.43)	(847.09)	(604.78)	(164.23)
	Hourly Earnings	11.89	15.36	16.68	21.87	10.01	12.08	13.28	16.06
		(0.271)	(0.559)	(0.510)	(0.137)	(0.343)	(0.428)	(0.407)	(0.096)
	"Some College" Share	0.14	0.41	0.40	0.56	0.14	0.41	0.42	0.57
		(0.007)	(0.022)	(0.015)	(0.003)	(0.007)	(0.020)	(0.014)	(0.003)
	N. obs	2735	526	1306	39295	1430	492	1155	37510
2004	Yearly Earnings	21620	30906	30271	44248	14371	22494	21808	27501
		(339.89)	(1653.96)	(726.81)	(265.80)	(346.81)	(1166.41)	(591.84)	(167.55)
	Hourly Earnings	11.11	16.77	15.49	21.67	9.60	12.29	13.11	16.18
		(0.179)	(0.975)	(0.348)	(0.132)	(0.359)	(0.432)	(0.358)	(0.098)
	"Some College" Share	0.14	0.42	0.43	0.57	0.15	0.46	0.42	0.58
		(0.007)	(0.022)	(0.015)	(0.003)	(0.008)	(0.021)	(0.014)	(0.003)
	N. obs	2861	498	1289	38311	1442	494	1160	36968
2005	Yearly Earnings	22074	30487	33062	43782	15059	23193	22387	26865
		(398.94)	(1277.99)	(954.77)	(269.59)	(366.89)	(1465.81)	(703.59)	(159.13)
	Hourly Earnings	11.23	15.46	16.36	21.11	9.60	14.39	12.95	15.64
		(0.216)	(0.630)	(0.499)	(0.130)	(0.271)	(0.991)	(0.425)	(0.088)
	"Some College" Share	0.14	0.43	0.41	0.56	0.15	0.43	0.43	0.59
		(0.007)	(0.022)	(0.015)	(0.003)	(0.008)	(0.020)	(0.013)	(0.003)
	N. obs	2909	521	1239	37733	1412	509	1184	36462

Standard errors in parenthesis.

Table A.3 reports average log hourly wages for each generation with and without college education for each CPS survey year. The averages are obtained regressing log hourly wages on interaction dummies for education and generation as well as a quadratic function for experience and geographical dummies. Table A.4 reports the returns to college obtained using the estimated difference between the college and the high school estimated averages in Table A.3.

Since wages are expressed in constant 2000 dollars, these regressions clearly show that between 1994 and 2005 there has been an increment, although not very large, of the real value of wages for both high school and college educated individuals. Moreover, this seems to be the case for each generation of Mexican immigrants as well as for Americans. However, as clearly shown by Table A.4, the returns to college education has not seen a substantial change in these twelve years considered. This is shown well by the returns to college for Americans in the first column of the table, while in the other three column the picture is not as clear given the higher noise in the estimates for the three generations of Mexican immigrants. The higher standard errors associated to the parameters estimates for Mexican generations of immigrants is due to the smaller sample size. This being the main reason justifying the use of the pooled data set in the rest of the paper.

Table A.3: Earnings Regressions - Year by Year

Dependent Var.: Log Hourly Wage											
Year	Estimate	Americans		1st Gen. Imm.		2nd Gen. Imm.		3rd Gen. Imm.			
		HS	Coll.	HS	Coll.	HS	Coll.	HS	Coll.	N. Obs.	R^2
1994	Parameter	1.4961	1.8772	1.1104	1.5198	1.4022	1.7622	1.3853	1.7076	24938	0.9516
	s.e.	(0.0269)	(0.0269)	(0.0325)	(0.0604)	(0.0487)	(0.0847)	(0.0419)	(0.0506)		
1995	Parameter	1.4851	1.8666	1.1271	1.5279	1.3445	1.7157	1.3714	1.7918	25276	0.9488
	s.e.	(0.0264)	(0.0263)	(0.0321)	(0.0671)	(0.0554)	(0.0731)	(0.0434)	(0.0478)		
1996	Parameter	1.5327	1.9003	1.1854	1.5160	1.4078	1.8523	1.4021	1.7443	21945	0.9508
	s.e.	(0.0280)	(0.0278)	(0.0331)	(0.0549)	(0.0540)	(0.0658)	(0.0417)	(0.0568)		
1997	Parameter	1.6229	1.9871	1.1918	1.5828	1.5120	1.8304	1.4033	1.7508	22344	0.9526
	s.e.	(0.0274)	(0.0271)	(0.0323)	(0.0534)	(0.0522)	(0.0612)	(0.0427)	(0.0569)		
1998	Parameter	1.6771	2.0509	1.2791	1.6594	1.5433	1.8151	1.5217	1.9725	22379	0.9542
	s.e.	(0.0277)	(0.0271)	(0.0311)	(0.0558)	(0.0546)	(0.0555)	(0.0395)	(0.0451)		
1999	Parameter	1.6575	2.0447	1.2565	1.6527	1.5666	1.8835	1.5250	1.9282	22732	0.9549
	s.e.	(0.0285)	(0.0280)	(0.0312)	(0.0556)	(0.0521)	(0.0579)	(0.0392)	(0.0448)		
2000	Parameter	1.7261	2.1012	1.3432	1.6976	1.5759	2.0065	1.6070	1.9469	23389	0.9545
	s.e.	(0.0280)	(0.0276)	(0.0302)	(0.0474)	(0.0473)	(0.0629)	(0.0397)	(0.0389)		
2001	Parameter	1.7701	2.1449	1.3968	1.7678	1.6799	1.8972	1.6103	2.0768	22357	0.9532
	s.e.	(0.0293)	(0.0288)	(0.0315)	(0.0473)	(0.0542)	(0.0637)	(0.0400)	(0.0423)		
2002	Parameter	1.7445	2.1592	1.4239	1.7917	1.6438	1.9740	1.6382	2.0157	36058	0.9531
	s.e.	(0.0254)	(0.0253)	(0.0278)	(0.0447)	(0.0476)	(0.0539)	(0.0377)	(0.0412)		
2003	Parameter	1.7199	2.1463	1.3916	1.8213	1.6784	2.0144	1.6972	1.9471	35456	0.9523
	s.e.	(0.0258)	(0.0252)	(0.0283)	(0.0539)	(0.0432)	(0.0492)	(0.0369)	(0.0386)		
2004	Parameter	1.6999	2.0958	1.3414	1.7043	1.6805	2.0057	1.5565	1.9376	35017	0.9524
	s.e.	(0.0258)	(0.0258)	(0.0275)	(0.0492)	(0.0442)	(0.0625)	(0.0351)	(0.0389)		
2005	Parameter	1.6278	2.0405	1.2890	1.6363	1.5815	1.9079	1.5596	1.8944	34537	0.9519
	s.e.	(0.0259)	(0.0259)	(0.0281)	(0.0454)	(0.0519)	(0.0407)	(0.0370)	(0.0395)		

Standard errors in parenthesis.

Table A.4: Returns to College by Generation - Year by Year

Dependent Var.: Log Hourly Wage

Year	Estimate	Americans	1st Gen. Imm.	2nd Gen. Imm.	3rd Gen. Imm.
1994	Parameter	0.3724	0.3025	0.4174	0.3513
	s.e.	(0.0094)	(0.0669)	(0.0754)	(0.0460)
1995	Parameter	0.3739	0.4087	0.3289	0.4078
	s.e.	(0.0097)	(0.0688)	(0.0666)	(0.0501)
1996	Parameter	0.3913	0.4615	0.3751	0.3347
	s.e.	(0.0099)	(0.0597)	(0.0822)	(0.0519)
1997	Parameter	0.3714	0.4303	0.2470	0.3825
	s.e.	(0.0099)	(0.0653)	(0.0705)	(0.0483)
1998	Parameter	0.3826	0.3885	0.4046	0.4583
	s.e.	(0.0097)	(0.0654)	(0.0766)	(0.0467)
1999	Parameter	0.3948	0.3783	0.4038	0.3870
	s.e.	(0.0097)	(0.0642)	(0.0724)	(0.0443)
2000	Parameter	0.4019	0.4085	0.3510	0.3766
	s.e.	(0.0097)	(0.0551)	(0.0664)	(0.0430)
2001	Parameter	0.4021	0.3408	0.3222	0.3793
	s.e.	(0.0101)	(0.0476)	(0.0658)	(0.0423)
2002	Parameter	0.3941	0.3454	0.4108	0.3700
	s.e.	(0.0085)	(0.0486)	(0.0607)	(0.0444)
2003	Parameter	0.3887	0.3401	0.3516	0.3810
	s.e.	(0.0085)	(0.0505)	(0.0634)	(0.0395)
2004	Parameter	0.3820	0.3990	0.4304	0.4006
	s.e.	(0.0087)	(0.0545)	(0.0577)	(0.0427)
2005	Parameter	0.3945	0.4428	0.4575	0.4197
	s.e.	(0.0087)	(0.0501)	(0.0690)	(0.0414)

Standard errors in parenthesis.

Table A.5 reports the regression of log hourly earnings on dummies for generations of immigrants or for Mexicans remained in Mexico, on years of schooling interacted with the previous dummies a quadratic function of experience and dummies for time and geography. The data set used is obtained combining the pooled CPS data with the data from the 2000 Mexican Census. The table clearly show that the returns to an extra year of schooling is higher for Mexican non-migrants than is for first generation immigrants. The returns to years of schooling for the other two groups are similar, showing a slightly flatter profile for the second compared to the third generation. The lower returns to years of schooling faced by first generation immigrants compared to all other Mexican generations rules out the possibility that the lower earnings of high school or lower educated firs generation immigrants as compared to second ad third generations are entirely due to lower educational attainment, in terms of completed years of education, within this group. In fact, even if the average years of schooling within the high school educated group was the same, given the lower returns to years of education we would observe a significant gp between first and second generation immigrants.

Table A.5: Returns to Years of Schooling by Generation - Mexican Only

Dependent Var.: Log Hourly Wage				
	Non-Migrants	1st Gen. Imm.	2nd Gen. Imm.	3rd Gen. Imm.
Intercept	-0.7425	1.1588	0.7371	0.6260
	(0.0168)	(0.0278)	(0.0635)	(0.0497)
Years of Schooling	0.1101	0.0429	0.0952	0.1030
	(0.0005)	(0.0012)	(0.0049)	(0.0035)
Experience		0.0425		
		(0.0016)		
Experience^2		-0.0525		
		(0.0028)		
N. Obs.		187914		
R^2		0.8445		

Standard errors in parenthesis.

Appendix B: A Simplified Model

In this section I build a simplified model that, while conserving all the main characteristics of the general model presented in the paper, is analytically tractable. To build this model, I simplify the general model with three assumptions. First, I assume that for each dynasty there are only two generations. That is, the first generation has children, but the second does not. In this case the problem becomes analytically tractable. The second assumption is that the autoregressive parameter b that governs the transmission of abilities from one generation to the other is the same for both abilities. The third assumption is that the cost of education is the same for immigrants and non-migrants ($\tau_m = \tau_{mx}$).

These assumptions clearly would alter the original model in such a way that would be impossible to derive precise answers to the questions of interest. However they do not change the main features of the original model. In particular, they maintain the fact that the decisions of an agent concerning schooling and migration are made taking into account both their current, and their children's future welfare.

B.1 The value of Migrating

I start with the problem faced by the Mexican resident who has to decide to migrate or not and his educational level,

$$\max\{v_1(s_{L,g}, s_{H,g}), v_0(s_{L,g}, s_{H,g})\}, \tag{B.1}$$

where

$$v_1(s_{L,g}, s_{H,g}) = \max_k\{w_k + \beta v_{11}(s_{L,g+1}, s_{H,g+1}), \} \tag{B.2}$$

with

$$w_k = \pi_{us,k} + s_{k,g} - z_e - \tau_{mx,k},$$

and

$$Ev_{11}(s_{L,g+1}, s_{H,g+1}) = \max_k\{\pi_{us,k} + bs_k - x + u_k - \tau_{us,k}). \tag{B.3}$$

Equation (B.3) takes into account the intergenerational transfer of ability given by the following law of motion

$$s_{k,g+1} = bs_{k,g} + u_k.$$

The second generation immigrant only has to choose between high school and college as being in the US for a US born person is always better than migrating to Mexico. The value of being born in the US from an immigrant father is therefore

$$\begin{aligned} Ev_{11}(s_{L,g+1}, s_{H,g+1}) = & \int_{-\infty}^{\infty} \int_{-\infty}^{A+u_H} (\pi_{us,H} + bs_H - x + u_H - \tau_{us,H}) f(u_L, u_H) du_L du_H + \\ & \int_{-\infty}^{\infty} \int_{A+u_H}^{\infty} (\pi_{us,L} + bs_L - x + u_L - \tau_{us,L}) f(u_L, u_H) du_L du_H, \end{aligned} \quad \text{(B.4)}$$

where

$$A = \pi_{us,H} - \pi_{us,L} + b(s_H - s_L) - (\tau_{us,H} - \tau_{us,L}),$$

and $f(u_L, u_H)$ is the bivariate density function of the errors. Equation (B.4) can be rearranged to obtain

$$Ev_{11}(\cdot) = \int_{-\infty}^{A} (A - u) f_u(u) du + \int_{-\infty}^{\infty} (\pi_{us,L} + bs_L - \tau_{us,L} + u_L) f_L(u_L) du_L - x, \quad \text{(B.5)}$$

or simply

$$Ev_{11}(\cdot) = \pi_{us,L} + bs_L - x - \tau_{us,L} + \int_{-\infty}^{A} (A - u) f_u(u) du, \quad \text{(B.6)}$$

where $u = u_L - u_H$. Now, equation (B.2) can be written

$$v_1(s_{L,g}, s_{H,g}) = \max\{\pi_{us,L} + s_L, \pi_{us,H} + s_H - \tau_{mx,H}\} - z + \beta Ev_{11}(s_{L,g+1}, s_{H,g+1}), \quad \text{(B.7)}$$

where it is assumed $\tau_{mx,L} = 0$.

B.2 The Value of Staying

Given the greater number of options the second generation have, to calculate the value of staying is a little more complicated. I start by writing

$$v_0(s_{L,g}, s_{H,g}) = \max\{\pi_{mx,L} + s_L, \pi_{mx,H} + s_H - \tau_{mx,H}\} + \beta E v_0(s_{L,g+1}, s_{H,g+1}). \tag{B.8}$$

To calculate the expected value of the second generation in this case I need to take into account the four available possibilities: migrating or not and the level of education to take. Second generations solve the following problem

$$\max_{k,I}\{\pi_{mx,L}+bs_L+u_L, \pi_{mx,H}+bs_H+u_H-\tau_{mx,H}, \pi_{us,L}+bs_L-z-\tau_{mx,L}, \pi_{us,H}+bs_H-z-\tau_{mx,H}\}. \tag{B.9}$$

The second generation, conditional on the first generation choosing to stay, choose to migrate unconditionally if and only if

$$\pi_{mx,L} + bs_L + u_L < \pi_{us,L} + bs_L - z + u_L \tag{B.10}$$

$$\pi_{mx,H} + bs_H + u_H < \pi_{us,H} + bs_L - z + u_L, \tag{B.11}$$

or

$$\pi_{us,L} - \pi_{mx,L} > z \tag{B.12}$$

$$\pi_{us,H} - \pi_{mx,H} > z. \tag{B.13}$$

However, note that if I assume that $\pi_{us,H} - \pi_{us,L} > \pi_{mx,H} - \pi_{mx,L}$ then equation (B.12) implies equation (B.13). I now can write the expected value for a second generation Mexican of a non-migrant

$$Ev_{01}(s_{L,g+1}, s_{H,g+1}) = \int_{-\infty}^{\pi_{us,L}-\pi_{mx,L}} \left[E \max_k\{\pi_{us,k} + bs_k + u_k - \tau_{mx,k}\} - z\right] f_z(z)dz +$$

$$\int_{\pi_{us,L}-\pi_{mx,L}}^{\pi_{us,H}-\pi_{mx,H}} \left[E\max\{\pi_{us,L}+bs_L-z+u_L,\pi_{mx,H}+bs_H+u_H-\tau_{mx,H}\}\right] f_z(z)dz + \int_{\pi_{us,H}-\pi_{mx,H}}^{\infty} \left[E\max_k\{\pi_{mx,k}+bs_k+u_k-\tau_{mx,k}\}\right] f_z(z)dz, \quad \text{(B.14)}$$

setting

$$A_1 = \pi_{us,H} - \pi_{us,L} + b(s_H - s_L) - \tau_{mx,H},$$

$$A_z = \pi_{mx,H} - \pi_{us,L} + b(s_H - s_L) + z - \tau_{mx,H},$$

and,

$$A_2 = \pi_{mx,H} - \pi_{mx,L} + b(s_H - s_L) - \tau_{mx,H}.$$

After some algebra

$$Ev_{01}(\cdot) = \pi_{us,L} + bs_L + F_z(\Delta\pi_L)\left[\int_{-\infty}^{A_1}(A_1-u)f_u(u)du\right] - \int_{-\infty}^{\Delta\pi_H} zf_z(z)dz + \int_{\Delta\pi_L}^{\Delta\pi_H}\left[\int_{-\infty}^{A_z}(A_z-u)f_u(u)du\right]f_z(z)dz + [1-F_z(\Delta\pi_H)]\left[\int_{-\infty}^{A_2}(A_2-u)f_u(u)du\right],$$

where $\Delta\pi_H = \pi_{us,H} - \pi_{mx,H}$ and $\Delta\pi_L = \pi_{us,L} - \pi_{mx,L}$. The value of not migrating for the father is

$$v_0(\cdot) = \max_k\{\pi_{mx,k} + s_k - \tau_{mx,k}\} + \beta Ev_{01}(\cdot). \quad \text{(B.15)}$$

B.3 The Selection Mechanism

In order to show that the model is identified by the available data, I need to show the relationship between the incentive to migrate and its cost together with the relationship between the incentive to migrate and the abilities. I need to verify that in all possible situations an increased cost of migrating decreases the incentive to migrate, and check in which direction

the selection goes in terms of abilities and how the selection process reacts to a change in the cost of migration.

First note that a person migrates if and only if

$$v_1(\cdot) - v_0(\cdot) > 0, \tag{B.16}$$

where the value of moving is given by

$$v_1(\cdot) = \max_k \{\pi_{us,k} + s_k - z - \tau_{mx,k}\} + \beta E v_{11}. \tag{B.17}$$

Also note that, since the cost of moving is a variable that is not correlated across generations, it does not affect the expected value of second generations. Therefore, a higher z implies a lower probability to migrate. This implies the obvious result that immigrants have a relatively lower z than non-migrants. Another important feature to study is how the incentive to migrate changes with both abilities. Taking the derivative of $v_1 - v_0$

$$\frac{\partial(v_1 - v_0)}{\partial s_L} = \frac{\partial(v_1 - v_0)}{\partial s_L} + \beta \frac{\partial(Ev_{11} - Ev_{01})}{\partial s_L}. \tag{B.18}$$

The first part of the derivative is either 0 or -1[B.1], I therefore concentrate on the second part. If the second part is always negative, as I will show is the case when sensible restrictions on the parameters are made, then the derivative is negative. For the current generation the incentive to migrate does not change with abilities except for the part that is related to the expected value of future generations. Therefore,

$$\frac{\partial(Ev_{11} - Ev_{01})}{\partial s_L} = b[1 - F_u(A)] - \frac{\partial Ev_{01}}{\partial s_L}, \tag{B.19}$$

where:

$$\frac{\partial Ev_{01}}{\partial s_L} = b\left\{1 - F_u(A_1)F_z(\Delta\pi_L) + \int_{\Delta\pi_L}^{\Delta\pi_H} F_u(A_z)f_z(z)dz - [1 - F_z(\Delta\pi_H)]F(A_2)\right\}. \tag{B.20}$$

[B.1] It is assumed that $\pi_{us,H} - \pi_{us,L} > \pi_{mx,H} - \pi_{mx,L}$ a Mexican that chooses L conditional on remaining in Mexico would also choose L conditional on migrating. However it is possible that conditional on staying a Mexican would choose H and L if migrating. The first case would give $1 - 1 = 0$ for the derivative of current generation's value with respect to s_L, the second case $0 - 1 = -1$.

Rearranging the terms it is possible to write

$$\frac{\partial(Ev_{11} - Ev_{01})}{\partial s_L} = b\Bigg\{[1 - F_z(\Delta\pi_H)][F(A_2) - F(A_1)] + \int_{\Delta\pi_L}^{\Delta\pi_H} [F_u(A_z) - F(A_1)]f_z(z)dz - [F(A) - F(A_1)]\Bigg\}. \tag{B.21}$$

The same can be done for the intellectual ability so that

$$\frac{\partial(Ev_{11} - Ev_{01})}{\partial s_H} = b\Bigg\{[F(A) - F(A_1)] - [1 - F_z(\Delta\pi_H)][F(A_2) - F(A_1)] - \int_{\Delta\pi_L}^{\Delta\pi_H} [F_u(A_z) - F(A_1)]f_z(z)dz\Bigg\}. \tag{B.22}$$

What is clear then is that the incentive to migrate increases in one ability and decreases with the other. Assuming that $\pi_{us,H} - \tau_{us,H} - (\pi_{us,L} - \tau_{us,L}) > \pi_{mx,H} - \tau_{mx,H} - \pi_{mx,L}$ it is possible to prove that the derivative with respect to the manual ability is always negative, while the intellectual ability increases the incentive to migrate. In fact, the derivative with respect to the manual ability s_L is

$$\frac{\partial(Ev_{11} - Ev_{01})}{\partial s_L} = b\Bigg\{[1 - F_z(\Delta\pi_L)][F(A_2) - F(A_1)] + \int_{\Delta\pi_H}^{\Delta\pi_L} [F_u(A_z) - F(A_1)]f_z(z)dz - [F(A) - F(A_1)]\Bigg\}. \tag{B.23}$$

First note that $z = \Delta\pi_H$ implies $A_z = A_1$. Therefore,

$$\int_{\Delta\pi_H}^{\Delta\pi_L} F(A_z)f_z(z)dz \leq [F_z(\Delta\pi_H) - F_z(\Delta\pi_L)]F(A_2), \tag{B.24}$$

and

$$\int_{\Delta\pi_H}^{\Delta\pi_L} [F_u(A_z) - F(A_1)]f_z(z)dz \leq 0. \tag{B.25}$$

Thus,

$$\frac{\partial(Ev_{11} - Ev_{01})}{\partial s_L} \leq b\left\{[1 - F_z(\Delta\pi_H)][F(A_2) - F(A_1)] - [F(A) - F(A_1)]\right\}. \quad \text{(B.26)}$$

The rhs of equation (B.26) is clearly negative if $A > A_2$. In other words, if the difference in the spread of earnings is lower than the difference in the spread of costs, increasing the lower ability makes the expected value of remaining in Mexico greater than going to the US. The results can be reversed by assuming that $\tau_{mx,H} < \tau_{us,H} - \tau_{us,L}$. In this case the derivative with respect to s_L is always positive and the one with respect to s_H is negative. Intuitively, if the first generation decides to migrate, the second generation pays the cost of education in the host country. As such, the value of being born in the US for the second generation is lower the greater is the intellectual ability and the lower is the manual ability. This arises because the cost for higher education is relatively lower compared to its gain than for lower levels of education. Because the derivatives do not change sign with changes in the z_e distribution, a theoretical moment of the model can be found that has a correspondent in the data, and that is monotonic in z_e. This moment is given by the difference between the earnings of of immigrants and the earnings of Mexican non-migrants with high school or lower education

$$E[v|G_1 = 1, D = 0] - E[v|G_0 = 1, D = 0] = \pi_{us,L} + \bar{s}^m_{L,g} - \bar{s}^s_{L,g} - z_e \quad \text{(B.27)}$$

Since the gain from migration is decreasing in s_L, a higher μ_z needs a lower s_L to satisfy $v_1 - v_0 > 0$. This means that the lower skill is negatively selected in migration, implying that the conditional expectation is decreasing with z_e monotonically.

Figure B.1 shows for different values of abilities the choice to migrate. In the figure the indicator I takes the value of 1 for migration and 0 otherwise. The figure is produced using the general model with the estimated parameters. The figure shows that the selection mechanism implied by the simplified model is in fact reproduced by the general model as well.
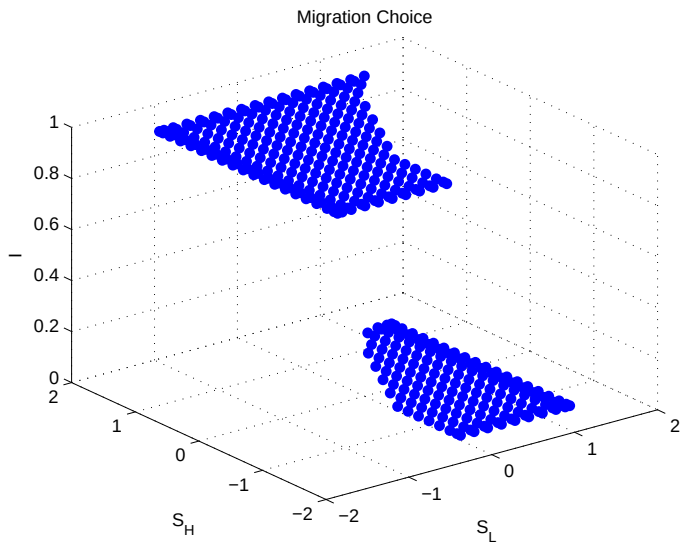
Figure B.1: Migration Choice Based on Abilities