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# **Returns To Education For Mexican Immigrants To The United States**

Supervisor: Inga Persson

Martin Nordin

Meri Aghajanyan

Tolga Erbasol

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## **Abstract**

This thesis is about returns to schooling for Mexican immigrants to the United States. The United States became the home of many immigrants. There is an evidence that large amount of immigrants in USA are from Mexico. They are among both oldest and newest inhabitants of the nation. Mexican immigrants and their descendants now make-up a significant portion of the US population and have become one of the most influential social and cultural groups in the country. But many studies found that immigrants from Mexico show lower levels of educational attainment, which leads to lower earnings. Our aim is to focus on returns to schooling for Mexican immigrants to the United States using the Mincer's earnings function. Using Current Population Survey (CPS) data, we analyzed the differences in returns to schooling between native Americans and Mexican immigrants. And also we investigated whether there are Sheepskin effects or not. We found that there are positive Sheepskin effects for both Mexican immigrants and native Americans. But still there is a difference in rate of return to schooling for natives and Mexican immigrants, namely the rate of returns to schooling for Mexican immigrants is lower than for natives.

*Key words:* Mexico, immigration, human capital, returns to schooling, USA

## **1. Introduction**

The United States became the home of many immigrants. There is an evidence that large amount of immigrants in USA are from Mexico. They are among both the oldest and newest inhabitants of the nation. Mexican immigrants and their descendants now make-up a significant portion of the US population and have become one of the most influential social and cultural groups in the US. But many studies found that immigrants from Mexico show lower levels of educational attainment, which leads to the lower earnings comparing with native Americans. Another important fact why earnings are lower for Mexican immigrants is that English language is not their first language and it is well known that proficiency in English may exert much influence on how successfully they fare in living new lives in the United States. English deficiency is likely to make it difficult to transfer skills obtained in Mexico to the United States' labour market. Mexican immigrants in US labour market may have limited employment and training opportunities. And also lack in English proficiency face discrimination in the US labour market. In addition, long-term structural changes in the US economy have increased the importance of education, making high-school completion a minimum requirement for any individual to compete successfully in the labour market. (Chiswick and Miller, 2002; Ibarra and Labotsky, 2005).

### **1.1. Aim**

The aim of this paper is to focus on returns to schooling for Mexican immigrants in the United States in comparison with the native Americans, namely estimating so-called Mincer earnings function. Furthermore, we investigate whether there are so called Sheepskin effects, i.e. whether having a degree or not affects earnings.

## **1.2 Methodology**

The econometric models estimated in the thesis are based upon research by J. Mincer (1974). In our labour market approach we will employ the panel regression model to investigate the relationship between the dependent variable, which is the wage rate and the five explanatory variables: years of schooling, the potential labour market experience and its square, years since migration and its square. We will compare the Mexican immigrants performance in the United States labour market with that of the natives. We have performed the regressions in the statistical software SPSS.

To perform the econometric estimations, the study is based upon the methodology of ordinary least squares (OLS). This method adjusts a line to the real observations by minimizing the residual sum of squares. This estimation technique has certain assumptions<sup>1</sup> that need to be investigated in order to avoid misleading inference.

## **1.3. Data**

The data to estimate the above model is taken from the Integrated Public Use Microdata Series-Current Population Survey (IPUMS-CPS) over the period 2000-2007. IPUMS-CPS is an integrated set of data from the Current Population Survey. The CPS is a monthly U.S. household survey conducted jointly by the U.S. Census Bureau and Bureau of Labour Statistics.

## **1.4 Outline**

The structure of the thesis is the following.

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<sup>1</sup>There are assumptions in the Econometrics area, called Gauss-Markov assumptions, which state that the expected value of the error term is zero, which means that the regression line should be correct. The next, second, assumption states that error terms have the same variances, which is referred to as homoskedasticity, while the third assumption imposes zero correlation between different error terms. This is excluded any form of autocorrelation.(Verbeek, 2005)

Section 2 presents a theoretical framework connected to the theory of human capital and migration, particularly the evolution of the earnings function. The third section presents the characteristics of Mexican immigrants to the USA (their geographical origin, language skills, education), earlier studies that have been done within this area, and the impact of Mexican immigrants on the US economy and labour market. The fourth section presents the econometric model specification used in the study and description of the data. This section is followed by a description of the empirical analysis and a discussion of the results concerning the returns to education for natives and Mexican immigrants. The final section contains the conclusions from our study. The table with the definition of the variables is included in the appendix.

## **2. Theoretical Framework**

*In this section we will present the theoretical framework of our study, namely the human capital theory and economics of migration. Furthermore, we will see how these theories can be empirically implemented via the Mincer's earnings equation.*

### **2.1 Rate of return to schooling**

Human capital is the notion that individuals acquire skills and knowledge to increase their value in labour markets. Experience, training and education are the three main mechanisms for acquiring human capital, with education being primary for most individuals. The amount of education acquired by workers has an important impact on their labour market outcomes. The most direct way that education affects the labour market outcome of workers is by increasing their productivity, thus increasing their earnings. The more education individuals acquire, the better they are able to absorb new information, acquire new skills and familiarize themselves with new technologies. By increasing their human capital, workers enhance the productivity of their labour and the other capital they use at work. If higher levels of productivity reflect higher levels of human capital, which are in turn primarily a result of increased education, then a positive relationship should exist between educational attainment and earnings. Individuals provide the majority of the resources for human capital

investment through their own financial resources and the time spent acquiring additional education. A high school graduate, when considering college, will factor in the costs of education as well as the benefits. The cost of education borne by the student consists not only of tuition and other direct costs but also of forgone earnings. The costs and benefits associated with declining to acquire a bachelors degree are represented in the diagram below. This diagram illustrates two possible earnings streams facing a high school graduate. The costs associated with college attendance includes both indirect and direct costs of college. And also gross benefits show the increase in earnings that a college graduate would be expected to receive over the rest of his or her worklife. Deciding whether to invest requires comparison of the present value of future benefits with direct and indirect costs. Benefits consist of the difference between the two earnings profiles,  $\Delta Y$ . The present value of these benefits discounted at rate  $i$  will be approximately.

$$\mathbf{PV(i) \approx \Delta Y/i}$$

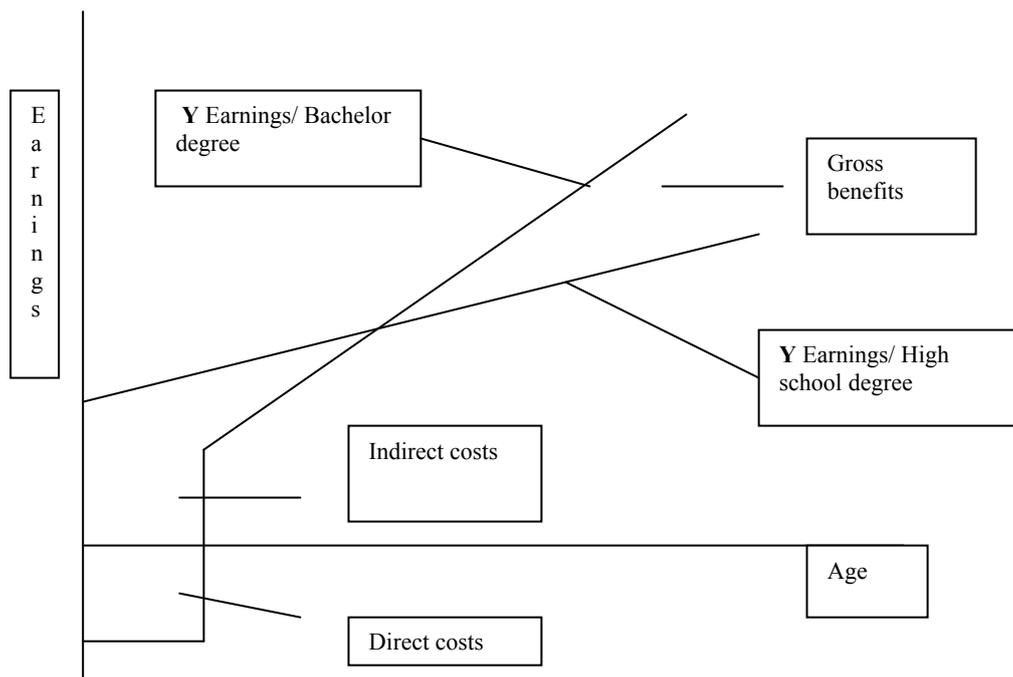
It is expected that an individual would attend college if the present value of the costs is less than the present value of the benefits.

The investment criterion is usually stated in terms of the internal rate of return (IRR), which was defined as that interest rate which just equated the costs and benefits. Thus, the interest rate that equates the present value of the returns to the present value of the cost is the internal rate of return.

$$\mathbf{PV(IRR) = \Delta Y/IRR=Cost}$$

On this criterion, the highest IRR would be considered the best.(Polachek, 1993)

**Diagram 1.**



**Source:** S.W Polachek and W.S. Siebert, 1993.

## 2.2 The Mincer's earnings function

The Mincer's (1974) earnings function is the prime analytical tool when it comes to empirically implement the human capital theory. It is the framework used to estimate returns to schooling, returns to schooling quality and to measure the impact of differences in work experience on e.g male-female wage gaps. This equation has become the cornerstone of empirical researches on earnings determinations. In the most widely used version of Mincer's human capital earnings function log earnings are modelled as the sum of a linear function of years of education and a quadratic function of years of potential experience:

$$\ln Y = \beta_0 + \beta_1 S + \beta_2 T + \beta_3 T^2 + u$$

Where S indicates the number of years of schooling, T gives the number of years of labour market experience,  $T^2$  is a quadratic on experience and Y is the wage rate.

$\beta_0$  is related to initial earnings capacity,  $\beta_1$  is the rate of return to education,  $\beta_2$  and  $\beta_3$  are related to both the amount and the financial return to on-job-training,  $u$  is the error term.

Mincer's earnings function yields at least three important empirical implications. The first is that earnings levels are related to human capital investments. This means that the more human capital investments an individual makes the higher his or her earnings. Second, the earnings function is concave<sup>2</sup>. It implies that earnings rise more quickly for the young, then earnings growth decreases gradually in the middle ages. The third is related to the social return which highlights any spillover effects and includes transfers and taxes.

According to the general approach of earnings function described above, we can present separate human capital earnings functions both for natives and immigrants and look at differences in returns to schooling for each group.

$$\ln Y_N = \beta_{0N} + \beta_{1N}C_N + u_N \quad (1)$$

$$\ln Y_I = \beta_{0I} + \beta_{1I}C_I + u_I \quad (2)$$

Where, for simplicity, number of years of schooling, number of labour market experience, quadratic on experience, years since migration and quadratic on years since migration are summarized by  $C$ , and  $Y_N$  and  $Y_I$  represent the wages for natives and immigrants respectively, subscripts  $N$  and  $I$  are for natives and immigrants respectively,  $u_N$  and  $u_I$  are the error terms. If we add the term  $\beta_{1N}(C_N - C_I)$  to both equations (1) and (2) and subtracting eq. (2) from eq. (1) we will obtain the following:

$$\ln Y_N - \ln Y_I = (\beta_{0N} - \beta_{0I}) + \beta_{1N}(C_N - C_I) + C_I(\beta_{1N} - \beta_{1I}) + (u_N - u_I) \quad (3)$$

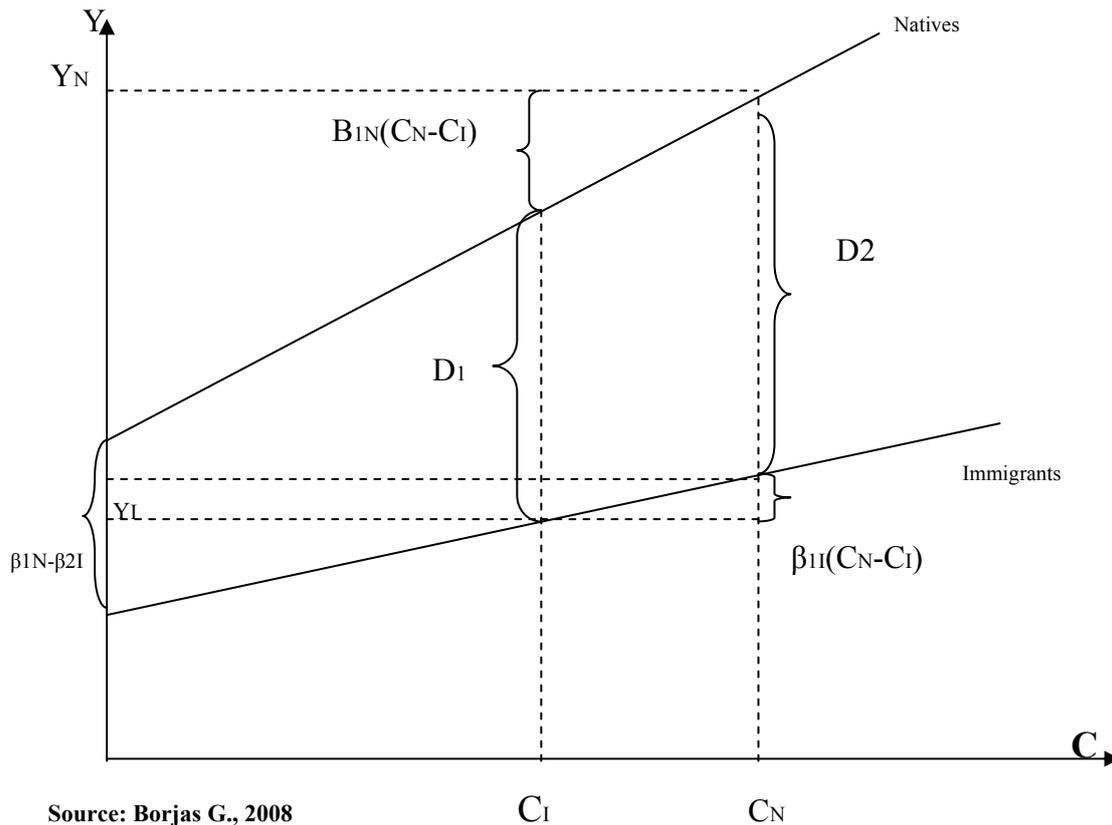
The terms in equation (3) can be represented in diagram 2 below and be interpreted as follows: first, the term  $\beta_{1N}(C_N - C_I)$  in eq. (3) measures the differences in the mean values of all the variables in  $C$  when these are valued at natives' prices ( $\beta_{1N}$ ). Second, the term  $C_I(\beta_{1N} - \beta_{1I})$  measures the higher prices ( $\beta_{1N} - \beta_{1I}$ ) that natives receive, which illuminates possible discrimination. Finally, the term  $(\beta_{0N} - \beta_{0I})$ , which is the intercept, it is the unexplained part of the difference in earnings which also might reflect discrimination.

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<sup>2</sup> The earnings function concavity resulting from the negative  $\beta_3$  coefficient found when estimating equation. This result is the same across countries and years, i.e  $T^2$  coefficient is almost always negative. This means that earnings rise at a decreasing rate throughout one's life.

Then, discrimination,  $D$ , (in the diagram 2 below) measured at native's prices will be  $D_1 = (\beta_{0N} - \beta_{0I}) + C_1(\beta_{1N} - \beta_{1I})$ . We can equally add  $\beta_{1I}(C_N - C_I)$  to both eq. (1) and eq. (2) which would have showed the prices received by immigrants. Then discrimination would be measured as  $D_2 = (\beta_{0N} - \beta_{0I}) + C_N(\beta_{1N} - \beta_{1I})$ . As we can see from the diagram below  $D_1$  would be lower and  $D_2$  would be greater. (Borjas, 2008)

**Diagram 2.**



## 2.3 Modifications of Mincer/Becker in the case of migration

### 2.3.1 Transferability

Chiswick (1978) was the first to argue that, for the same number of years of schooling, the ability to convert schooling into earnings might differ between the

foreign-born and the native-born. This argument implied that immigrants would be unable to transfer completely the human capital accumulated in their home country to the labour market of the destination country. To analyze this aspect of immigration, Chiswick developed the phrase international transferability of skills. International transferability of skills can be viewed as a function of similarities in the labour markets of the home country and the host country, taking into account schooling and language which are two important indicators. Schooling has an origin-specific component and an internationally transferable component. These two components differ by the level and the type of education attained by the immigrants. The more skills acquired through schooling in the origin, the greater the transferability to the destination. Becker (1967) developed a model of optimal schooling. The model explains the following: the individuals face a demand and supply schedules. The demand schedule reflects the marginal rate of return on investments in schooling and a supply schedule reflects the marginal interest cost of obtaining funds to finance the investment in schooling. Optimal investment occurs when the marginal rate of return on investment equals the marginal interest cost of funds. Chiswick (1999) interpreted Becker's model in the case of racial and ethnic groups. Chiswick argued that group differences in investment in schooling might arise from either differences in demand conditions or differences in supply conditions or from their combination. He further maintained that group differences in demand conditions vary more than group differences in supply conditions, which in turn implies a positive relationship between levels of schooling and rates of return from schooling.

Based on the above discussion the theoretical demand for schooling equation for immigrants can be expressed as a function of both pre-immigration conditions and the post-migration experience of immigrants. Pre-immigration conditions and post-migration experience play important role in immigrants schooling investment decisions because they affect the level and the transferability of skills that immigrants bring with them. While pre-immigration condition includes age at immigration, country of origin and pre-immigration educational attainment, post-migration experience is associated with immigrant duration in the destination country. For the foreign-born total schooling has two components schooling acquired before and schooling acquired after migration. Post-migration experience is usually measured by duration in the destination country. If post-migration investments are made, they occur in the first few years after immigration and diminish thereafter. (Hashmi, 1987).

According to Chiswick (1999) the model of immigrant adjustment based on human capital theory suggests that the economic status of immigrants improves with their duration of stay, that is immigrant assimilation in the host country is positively related to length of stay.

### **2.3.2 Country –Specific Human Capital**

Among immigrants, educational attainment will differ by country of origin. Immigrants to the US from non-English speaking countries will exhibit a higher demand for investments specific to the US but will be handicapped by their lesser proficiency in English.

Language is an important component affecting transferability of skills since the lower the immigrant's fluency in the destination language, the lower the transferability of the origin country skills. Furthermore, the lower an immigrant's transferability of skills, the greater the incentive to invest in destination specific human capital because of the positive effect that destination country education has on increasing the transferability of origin country skills. (Trejo, 1997)

### **2.3.3 Discrimination**

Differences in returns to education may arise from discrimination in access to quality schooling and in the labour market. Discrimination in the access to quality schooling will lower the human capital stock and rates of return to number of years of schooling. Discrimination in the labour market will generally lower earnings and rates of return from schooling. Even if labour market discrimination is neutral with respect to skill, that is if it results in the same percentage fall in earnings for all levels of schooling, the rate of return is lowered<sup>3</sup>. Discrimination in the labour market is the usual explanation for the lower measured rates of return from schooling received by the immigrants. (Borjas, 2008; Smith and Welch, 1986)

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<sup>3</sup>This arises so long as the private direct costs of schooling do not decline with discrimination.

## 2.4 Signalling/Sheepskin Effects

Sheepskin effects, also known as credential effects, refer to an increase in labour market earnings associated with the completion of a diploma or degree, such as high school or university graduation. In the labour economics literature the relationship between earnings and education is one of the most important areas for empirical estimation. According to the human capital approach the positive correlation between education and earnings can be investigated with only the total number of years of education as an educational variable (observed skill). On the other hand, studies on screening theories of education argue that degrees, indeed have an independent implication for the returns to education. As mentioned above in the labour economics literature, the earnings function is used to investigate the determinants of earnings, more specifically the earnings-education relationship. According to that application of the Mincer equation, earnings are considered as a function of the years of education variable as a proxy of human capital variable (observed skill variable.). This means that the estimated return to education represents the return to human capital. On the one hand, the theory of human capital is concerned with the role of learning in determining the returns to education. It is assumed that years of education, used as observed skill variable, is the only relevant variable to determine earnings together with experience and demographic variables. Diploma or credentials should have no independent effect on the earnings of a worker. However, this human capital approach is criticized. If diplomas or credentials have no relevant implication on earnings, there would be no difference in earnings between those with a similar number of years of education who complete a program and those who do not. (Ferrer and Riddell, 2001). In contrast to that vision, screening (signalling) theory of education, shows another way in order to display what determines the earnings of a person. Other studies consider whether education might be used merely as a signal of worker quality rather than as a tool to enhance productivity. Employers are held to screen potential employees using educational qualification as a guide to potential productivity. Job seekers use their educational achievements to signal their productivity potential to employers. Screening theories of education, while allowing for learning, suggest that better-educated individuals earn more because education serves as a credential which signals higher productivity (Arrow, 1973). With the help of empirical studies the

question whether a diploma or credential has an independent impact on earnings, can be illuminated. One implication of the signalling model is the existence of sheepskin effects, i.e. returns to diploma over and beyond the additional year of education. (Melissa, 2006). This type of modelling does not deny the effect of years of education on the earnings of workers but they highlight that also diploma has an additional effect on earnings. The insight of this theory suggests that the main function of education is to serve as a signalling or elimination device to show which employees are more productive than the others. Nonetheless, an alternative sheepskin effect model also suggests that education has no effect on earnings. According to that view, it is proposed that if one does not finish and acquire an educational degree, the years of education has no effect on that worker's income. This view is counted as pure credentialist approach. Following this theory, it is predicted that only the acquisition of diplomas trigger an increase in the worker's earnings so that a sheepskin effect exists. (Melissa, 2006)

## **2.5 Summary**

As we mentioned earlier in our paper our purpose is to estimate the earnings function with additional high school and bachelor degree dummy variables and look at the effects. Further in our empirical results we will analyze the results based on the theoretical part discussed in section 2. Main focus will be on the questions such as:

- a) Differences in the rate of return to schooling, that is we will estimate our equations and will look at the differences between slopes  $\beta_{1N}$  and  $\beta_{1I}$  as described in section 2.
- b) Sheepskin effects, namely we will analyze whether sheepskin effects exist in the case of natives and Mexican immigrants according to our regression results.
- c) All these analyses will be done separately for men and women.

### **3. Mexican immigration to the United States**

*In this section we will give a brief history of Mexican immigration to the USA by means of a survey of earlier studies that have been done within this area. We will also give a brief outline of the characteristics of Mexican immigrants in the United States in terms of their geographical location, language skills and educational attainment. Finally, we will describe the impact of Mexican immigrants on the United States labour market and economy.*

#### **3.1 Survey of earlier studies**

Legal and illegal migration to the United States and within the region will continue to rise. Despite declining population growth and strong economic prospects in Mexico, persistent poverty and large wage differentials will further fuel large-scale emigration to the United States. By far the most important source for immigration to the United States is Mexico. By 2003, 10.2 million Mexicans or almost 9% of the Mexican population had migrated to the United States. They are also among the most economically disadvantaged workers in the nation. In 1989 Mexican-origin households earned on average, 27% less than non-Hispanic white households, 37% less than Asian households and 3% more than black households. (U.S. Census, 1990) Chavez (1991) argues that the large inflows of recent immigrants from Mexico create a deceptively pessimistic picture of Mexican-origin workers in the US labour market. In her view, US born, English-speaking Mexican Americans have enjoyed rapid progress over the last couple of decades and are approaching the labour market status of non-Hispanic whites. In contrast to this, Chapa (1990) sees little evidence that Mexican Americans are making steady progress toward economic parity with Anglos and he worries about the emergence of a Chicano underclass with many of the same problems faced by inner-city blacks. Borjas and Katz (2005) use the US census data to provide a sweeping account of the evolution of the Mexican born workforce in the United States. The empirical analysis of Borjas and Katz yields a number of interesting findings. They find that the large differences in educational attainment between native-born workers and Mexican-born immigrants accounts for nearly 75%

of the very large wage disadvantage suffered by Mexican immigrants in the US workforce. Borjas and Katz also estimate a structural model of labour demand and show that Mexican immigration has affected the earnings of less-educated native workers in recent decades. In fact, they find that practically all of the predicted reduction in the real wage of high school can be traced to the depressing wage effects caused by the increase in the supply of low skill workers attributable to Mexican immigration. Blau and Kahn (2000) provide a study of the assimilation of Mexican immigrants in the US labour market. They examine the relationship between gender and assimilation in labour supply and wages both within and across generations. Blau and Kahn (2000) find that there is a much more traditional gender division of labour in the family in Mexico than among Mexican immigrants in the United States. Women in US of Mexican origin have considerably lower labour force participation and higher fertility than their ethnic counterparts in the United States. Another interesting finding has been made by Ibarra and Labotsky (2005). Their main goal is to assess empirically if Mexican migrants are, in fact, positively or negatively selected. Using data from the 2000 Mexican and US Censuses, they examine how the educational attainment of Mexican migrants to the United States compares with the educational attainment of the Mexican workforce who choose to remain in Mexico. Their main finding is that low-skill Mexicans are more likely to migrate to the United States than high-skill Mexicans. They also show that the degree of negative selection among emigrants is larger in Mexican counties where workers typically face higher returns to education. Borjas (1996) in his paper uses the 1970, 1980 and 1990 Public Use Samples of the US Census to document how Mexican immigrants perform in the US labour market and finds that there has been a decline in the relative wage of Mexican immigrants in the past 30 years. He shows that even after adjusting for changes in the wage structure between 1970 and 1990, the entry wage of Mexican immigrant cohorts declined by about 9% in the 1970s and by about 7% in the 1980s. In fact, Borjas finds that there is little convergence between the wages of Mexican immigrants and the wages of native workers. And also, much of the wage gap between Mexican immigrants and natives Borjas explained by the very low educational attainment of the Mexican immigrant population

## **3.2 Characteristics of Mexican immigrants to USA**

### **3.2.1 Geographical location**

Mexican immigration into the United States has ranged as high as one million a year. By 1950, nearly 39.1 % of Mexican immigrants lived in Texas and 40.3% in California. By 1980, almost 60% of Mexican immigrants lived in California and the fraction of those living in Texas had further declined to 21.2%. By 2000 the fraction of Mexican immigrants living in California had declined to 42.1% and nearly 14.8 of the California workforce and 10.9 of the Texas workforce are Mexican-born. Also almost 3% of the Mexican immigrants was located in North Carolina and Georgia by 2000. Similarly, less than 1% of workers in Colorado were Mexican born in 1980. By 2000, almost 5% of Colorado's workforce was Mexican-born. The growth of Mexican immigrants is dramatic especially in California. In 1970, only 2.4% of California's workforce was Mexican-born. By 2000, this statistic had increased sixfold, to 14.8%. (Borjas and Katz, 2005)

### **3.2.2 Language skills**

Since 1965 the US has seen increasingly large numbers of immigrants crossing its borders. The 1990s saw more immigrants enter the US than any previous decade. (INS, 1999). A disturbing corollary to the recent explosion in immigration is the corresponding decline of immigrant wages relative to the wages of natives. As a prime example, Mexican immigrants now outnumber any other national group while having one of the biggest relative wage gaps, with Mexican immigrant males earning on average 50% less than native males. (Trejo, 1997). This wage differential is a problem. Mexican immigrants tend to be segregated from the rest of US society, some 42% of Hispanics lived in predominantly Hispanic neighborhoods in 1990 (Chiswick and Miller, 1999). This is because immigrants feel most comfortable living with those who speak their language and share their culture. In fact, the language deficiency is an important determinant of the wage gap between Mexican immigrants and US natives. There is an evidence that Mexican immigrants who do not speak English at all earn only about half of what Mexican immigrants who speak very well earn (Trejo, 1997).

Language deficiency prevents Mexican immigrants from being rewarded for their human capital investments. English language deficiency prevents immigrants from making use of their acquired human capital in the US labour market. This could be because poor English skills force Mexican immigrants into ethnic neighbourhoods where labour demand might be low or it could be simply because a college degree means little to an employer if the potential employee cannot speak English. And the English language is an important enough determinant of income to explain a very large portion of the immigrant-native wage gap. (Trejo, 1997)

### **3.2.3 Educational attainment**

Mexicans are less likely to participate in any postsecondary education and have some of the highest poverty levels of all immigrant groups. According to the 1999 US Census, Mexicans had the lowest proportion of high school diplomas of all groups, at 50%. In 1990, of the Mexican immigrants aged 15-17, only 25% were in school, nearly 20% fewer than that of any other immigrant group, and 17% lower than natives of Mexican origin. Only 7% of the Mexican American population has bachelor degrees, as compared to about 26% of the foreign and native born..(Gray, et. al, 1996). In fact, Mexicans in the US are the largest and poorest immigrant group. They participate and succeed in higher education at lower levels than other immigrants and natives of the US.

## **3.3 The impact of Mexican immigrants on the U.S. economic growth and labour market**

The impact of Mexican immigration on the United States has been a major focus of policymakers and the public for well over a decade now. During the 1990s the number of Mexican immigrants living in the US rose by more than 5 million. By the 2000 Census, Mexican immigrants made up more than 4% of the working age population. The growing importance of Mexican immigrants in the labour force has

catalyzed a research and policy debate regarding their impact on wages and employment outcomes of US born workers. American employers in a wide variety of industries, however, clearly recognize the value of Mexican immigrant workers. US industry has hired and continues to seek to hire large numbers of Mexican workers due to significant worker shortages in America, fueling a dramatically increased role for Mexican immigrants in the national economy. For American employers, Mexican immigration plays a critical role in efforts to maintain a sufficiently large pool of workers in part because of the close match between the needs of employers and the job readiness of Mexican immigrant workers. In fact, by 2010 some 24.7 million jobs will open up for persons with minimal education levels and these jobs will represent nearly 43% of all projected openings. As citizens of a developing nation, many Mexican immigrants may have relatively low levels of formal education, but they have the necessary skills that are compatible with numerous jobs being created in the US. Furthermore, Mexicans experience pressures to emigration in search of jobs because of high unemployment in their home country. Under this, Mexican immigrants are an obvious source of recruits for American employers. (US Census Bureau, 2001).

The impact of immigrants on labour market outcomes for natives depends on the substitutability between natives and immigrants. If immigrants and natives are perfect substitutes, an increase in the supply of immigrants will lower wages for natives. On the other hand, if immigrants and native workers are not gross substitutes for each other, but rather, are complements in production, then an increase in immigrants' inflow into the labour market could raise the wages of native workers, if the latter reallocate into occupations with higher wages. Convention suggests that low-skilled immigrants and natives are potentially greater substitutes for one another. This is because low-skilled occupations tend to have lower training costs and require less institutional knowledge. (Friedberg, 2000). Julian Betts and Magnus Lofstrom (1998) use data drawn from the decennial censuses to study the trends in educational attainment and subsequent earnings of immigrants relative to those of natives. An important lesson of the empirical evidence is the importance of differences in educational attainment between immigrants and natives, as well as among immigrant groups, in determining wage differences among the various populations. Betts and Lofstrom document the familiar result that the gap in educational attainment between immigrants and natives widened between 1970 and 1990, with immigrants

experiencing an ever larger disadvantage. More important, they show that much of this widening in the gap is driven by changes in the bottom half of the education distribution with a larger number of immigrants arriving in the United States with relatively little schooling. The analysis concludes that differences in educational attainment can explain more than half of the observed wage gap between immigrants and natives. Depending on the methodological approach, some studies found a negative impact of immigrants on natives. Others found no significant impact on natives. Card and Lewis (2005) found that inflows of Mexican immigrants into the new metropolitan areas have had no effect on the relative wages of the very low skilled. Rather, Mexican workers do affect relative wages for high school graduates. They suggest that this may be due to two possibilities. First, Mexican workers may be closer substitutes to natives with high school diploma. Second, firms may be absorbing new inflows of low-skilled Mexican workers in local labour markets by adjusting for skill requirements in the workplace.

#### **4. Data and Method**

The empirical analysis discussed in this paper are based on data from Current Population Survey (CPS) over the period 2000-2007. The Current Population Survey is a monthly US household Survey conducted by the US Census Bureau and Bureau of Labour Statistics. The CPS provides information on employment, unemployment, earnings, hours of work and other labour force indicators on all household members more than 16 years old. Such data are available by a variety of demographic characteristics including age, sex, race, marital status and educational attainment.

##### **4.1 The sample**

The total sample size of the 2000-2007 CPS is 186,841 individuals, that is 87,010 native men and 91,375 native women and 4,508 immigrant men and 3,948 immigrant women. Because the purpose of this paper is to study the relationship between schooling and earnings, we also exclude from the sample individuals who do not have

data on income and education, reducing sample size to 137,694 individuals. The study of educational attainment was conducted for all adults between 25 and 64 years.

### **Descriptive statistics for natives and immigrants**

<b>Men</b>	<b>Annual Income/1000\$</b>	<b>Average years of Schooling</b>	<b>N</b>
<b>United States (natives)</b>	<b>58</b>	<b>11.8</b>	<b>87010</b>
<b>Mexico (immigrants)</b>	<b>34</b>	<b>10.1</b>	<b>4508</b>
<b>Women</b>	<b>Annual Income/1000</b>	<b>Average years of Schooling</b>	<b>N</b>
<b>United States (natives)</b>	<b>35</b>	<b>11.9</b>	<b>91375</b>
<b>Mexico (immigrants)</b>	<b>22</b>	<b>10.6</b>	<b>3948</b>

Source: Current Population Survey (CPS) [2000-2007]

#### **4.2 The estimating equation**

The model for testing the returns to education for immigrants in USA builds on the basic structure of the wage equation established by Mincer(1974). Accordingly, the main factors explaining the earnings are education and experience. Additionally, other factors have proved to be important in the context of immigration<sup>4</sup>. The underlying econometric model of this study is therefore constructed by

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<sup>4</sup> For a list of variables and their definitions see Appendix

$$\ln w = \beta_0 + \beta_1 \text{schooling} + \beta_2 \text{potexp} + \beta_3 \text{potexp}^2 + \beta_4 \text{ysm} + \beta_5 \text{ysm}^2 + \beta_6 X + \beta_7 E + u$$

Where;

w- is the wage rate

potexp – are the years of potential labour market experience

potexp<sup>2</sup>– are the years of potential labour market experience squared

ysm- are the years since migration to the US

ysm<sup>2</sup>- are the years since migration squared

u- is the error term

Since there is likely to be diminishing returns to years of experience and years since migration, these variables are also included in quadratic form.

X includes a vector of dummies like marital status and sex and E represents a set of dummies for completed education (high school and bachelor degree). The latter variables are of special interest for testing the signalling and sheepskin hypothesis discussed in section 2. For this purpose the model is estimated for four different categories, one for native Americans with high school degree, the second for Mexican immigrants with high school degree, the third is for natives with both high school and bachelor degrees and the fourth is for Mexican immigrants both with high school and bachelor degrees. This way the model allows comparing these two groups that is Mexican immigrants returns to education with natives holding other factors constant.

To perform the econometric estimations, the study is based upon the methodology of ordinary least squares (OLS). This method adjusts a linear line to the real observations by minimizing the residual sum of squares. This estimation technique has certain assumptions that needs to be investigated in order to avoid misleading inference.

## 5. Regression Analysis

We now use our sample to estimate earnings regression as specified in Section 4. The dependent variable for the regression equation is the log of earnings. Three different specifications of the equation were considered. The primary explanatory variables

used in all three specifications are years of schooling, potential labour market experience and its square, years since migration and its square. The basic specification is a simple model which used the above mentioned set of explanatory variables:

$$\text{LnW} = \beta_0 + \beta_1 S + \beta_2 \text{Exp} + \beta_3 \text{Exp}^2 + \beta_4 \text{Ysm} + \beta_5 \text{YSM}^2 + u \quad (1)$$

Focusing on model (1) [Table 1. below] of the regression the positive sign of potential experience with the negative sign of potential experience squared shows an increase in earnings with the number of years of potential experience but at a decreasing rate for both native men and native women. The effect of an additional year since migration on the earnings of Mexican immigrants is given by the coefficients of variables years since migration and years since migration squared. The positive coefficients of years since migration indicate the earnings of Mexican immigrants increase with years since migration (as it is mentioned in section 2.), in other words, the earnings of Mexican immigrants depends on years since migration. We also used the ysm (years since migration) as a proxy variable for English language. With this variable we can explain the dynamics of the language adjustment process among Mexican immigrants in the US, that is Mexican immigrants will achieve the high level in English language along with an additional year since migration to the USA.

The remaining coefficients in the estimating equation are all highly significant. Native Americans women's return to schooling is 20.7% while for native men is 18.1%. Being a Mexican immigrant woman returns to schooling is 11.8% which is lower comparing with native women, while the rate of return for immigrant men is 17.5% which also is somewhat lower comparing with native men.

**Table 1. The relationship between earnings and schooling**

	Native Men <i>N= 87010</i>	Native Women <i>N=91375</i>	Immigrant Men <i>N=4508</i>	Immigrant Women <i>N=3948</i>
Intercept	6.994 (.038)	6.380 (.049)	7.578 (.086)	7.051 (.026)
Schooling	0.181 (.003)	0.207 (.003)	0.175 (.005)	0.118 (.008)
Experience	0.092 (.001)	0.068 (.002)	0.051 (.004)	0.026 (.004)
Experience <sup>2</sup>	-0.002 (.000)	-0.001 (.000)	-0.001 (.000)	0.000 (.000)
YSM	-	-	0.013 (.003)	0.019 (.004)
YSM <sup>2</sup>	-	-	0.000 (.000)	0.000 (.000)
R <sup>2</sup>	0.200	0.136	0.206	0.148

Note: Standard errors in parentheses, N is the number of observation.

The second specification added high school (HS) dummy variable to the set of explanatory variables. In this way we can see whether there are Sheepskin effects and whether the rate of returns change when including the degree variable.

$$\text{LnW} = \beta_0 + \beta_1S + \beta_2\text{Exp} + \beta_3\text{Exp}^2 + \beta_4\text{Ysm} + \beta_5\text{YSM}^2 + \beta_6\text{HS} + u \quad (2)$$

According to our results [Table 2. below] first we can see that there are (negative) Sheepskin effects for all four groups. Further, there are some changes in the rates of return. Adding high school dummy variable increases the returns to schooling for natives, that is it increases the returns to schooling for native men from 18.1% to 19.4% and for native women from 20.7% to 21.9%. In the case of Mexican male immigrants we have opposite effect, that is adding the high school degree dummy variable decreases returns to schooling for Mexican immigrant men from 17.5% to 15.5% while for immigrant women the rate of return increases from 11.8% to 16.0%. Thus, it shows that, when having a degree or not is taken into account, native Americans have higher returns to schooling than Mexican immigrants.

**Table 2. OLS Earnings Equation Estimates for Natives and Mexican Immigrants with additional High School dummy variable**

	Native Men <i>N= 87010</i>	Native Women <i>N=91375</i>	Immigrant Men <i>N=4508</i>	Immigrant Women <i>N=3948</i>
Intercept	7.012 (.038)	6.398 (.049)	7.598 (.087)	7.110 (.026)
Schooling	0.194 (.003)	0.219 (.003)	0.155 (.005)	0.160 (.008)
Experience	0.092 (.001)	0.068 (.002)	0.051 (.004)	0.027 (.004)
Experience <sup>2</sup>	-0.002 (.000)	-0.001 (.000)	-0.001(.000)	0.000 (.000)
YSM	-	-	0.013 (.003)	0.020 (.004)
YSM <sup>2</sup>	-	-	0.000 (.000)	0.000 (.000)
HS	-0.225 (.036)	-0.243 (.047)	-0.099 (.057)	-0.247 (.081)
R <sup>2</sup>	0.200	0.137	0.134	0.100

Note: Standard errors in parentheses, N is the number of observation

The last specification added Bachelor Degree (BchD) dummy variable to the set of explanatory variables.

$$\text{LnW} = \beta_0 + \beta_1S + \beta_2\text{Exp} + \beta_3\text{Exp}^2 + \beta_4\text{Ysm} + \beta_5\text{YSM}^2 + \beta_6\text{BchD} + u \quad (3)$$

As can be seen from our results [Table 3. below] there are Sheepskin effects for all four groups. Furthermore, the rates of return estimates are affected to some extent when adding the Bachelor degree dummy variable. If we compare with the results in Table 2. we can see that adding Bachelor degree dummy variable leaves the returns to schooling for both native men and women roughly unchanged. This is also the case for male Mexican immigrants. However, for female Mexican immigrants the rate of returns to an additional year of schooling increases from about 16.0% to about 19%. But the rates of return to schooling remain lower for immigrants than for natives.

**Table 3. OLS Earnings Equation Estimates for Natives and Mexican Immigrants with additional Bachelor Degree dummy variable**

	Native Men <i>N= 87010</i>	Native Women <i>N=91375</i>	Immigrant Men <i>N=4508</i>	Immigrant Women <i>N=3948</i>
Intercept	7.125 (.038)	6.508 (.050)	7.362 (.086)	7.605 (.027)
Schooling	0.195 (.003)	0.220 (.003)	0.156 (.005)	0.194 (.008)
Experience	0.092 (.001)	0.068 (.002)	0.051 (.004)	0.024 (.004)
Experience <sup>2</sup>	-0.002(.000)	-0.001(.000)	-0.001(.000)	0.000 (.000)
YSM	-	-	0.013 (.003)	0.019 (.004)
YSM <sup>2</sup>	-	-	0.000 (.000)	0.000 (.000)
BchD	0.219 (.011)	0.157(.012)	0.190 (.025)	0.170 (.031)
R <sup>2</sup>	0.208	0.140	0.137	0.104

Note: Standard errors in parentheses, N is the number of observation

## 6. Conclusion

Based on the regression estimates, this paper's major finding is that returns to schooling differ between native Americans and Mexican immigrants. We found significant differences in the rate of returns to schooling between Mexican immigrants and natives, that is Mexican immigrant women's return to schooling is 11.8% while for native women rate of return is 20.7%. For Mexican immigrant men and native men the differences in the rate of returns are not significant, that is 17.5% and 18.1% respectively. According to our results the coefficients for High school dummy variables are not significant for all four groups. In contrast to this, we found statistically significant coefficients for Bachelor Degree dummy variable for both

Mexican immigrants and natives which is the fact of the existence of positive Sheepskin effects for all four groups. But still there are differences in returns rate of schooling between Mexican immigrants and natives. These differences in rate of returns might be the differences in the quality of education which differ by country of origin. Lack of English language proficiency also might be the reason for differences between natives and Mexican immigrants. Mexican immigrants are from non-English speaking country and might exhibit a higher demand for investments specific to the US but will be handicapped by their lesser proficiency in English. The other reason that the differences in rates of return may arise might be the discrimination which will generally lead to the lower earnings and rates of return from schooling in the labour market.

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## Appendix

<b>Definition of Variables</b>		
<b>Variables</b>	<b>Code</b>	<b>Description</b>
Dependent Variable	LnW	The logarithmic annual income from work
<u>Explanatory Variables:</u>		
Schooling	Schooling	Number of Years of schooling
Potential Experience	PotExp	Age-Schooling-6
Potential Experience squared	PotExp <sup>2</sup>	[Age-Schooling-6] <sup>2</sup>
Years since migration	YSM	Number of years since a person born outside the United States came to the US to stay
Years since migration squared	YSM <sup>2</sup>	Years since migration squared
<u>Dummy Variables:</u>		
High School	HS	This variable is equal to 1 for indicated characteristic, and, 0 otherwise
Bachelor Degree	BchD	This variable is equal to 1 for indicated characteristic, and, 0 otherwise