

Illegal Immigration

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Introduction

In October of 1996 the Immigration and Naturalization Service (INS) estimated that there were 2.7 million undocumented Mexican immigrants who had established residence in the United States. They also estimate that undocumented Mexican immigrants constitute about 54 percent of the total undocumented population. Adding about 150,000 illegal immigrants each year to the U.S.. (Statistical Yearbook, 1996)

Through the years we have seen attempts by Congress to control the flow of illegal immigrants, directly and indirectly. Direct attempts to control the flow can be seen in the passage in legislation like the Immigration Reform and Control Act of 1986. The act raised sanctions on U.S. employers that hire illegal immigrants. Indirectly with the passage of NAFTA, the North American Free Trade Agreement. While NAFTA had a larger purpose and function related to trade barriers and tariffs, it was hoped that NAFTA would improve the economic situation in Mexico, eventually raising the standard of living and thus provide less of an incentive for Mexicans to immigrate legally and illegally to the United States. We also see the Government's attempts to close off the U.S.-Mexico border. Since the late 1980's Congress has doubled the number of personnel assigned to enforce the U.S.-Mexico border along with substantially increasing the budget of the INS. Operation "Hold the Line" and the construction of large walls and fences along the border also exhibit attempts to stem the tide of illegal immigration. While we did see a drop in the number of apprehensions of Mexican immigrants by the

Border Patrol, beginning in 1992, Mexicans continue to add substantially to the population of the United States.

With what some would consider the failure of the Government's attempts to control illegal immigration it becomes important to understand the factors enticing Mexicans to illegally cross the border. This paper examines illegal immigration from Mexico to the United States. It looks at the determinants of illegal migration based on neo-classical theory. The annual data was collected for the period 1978-1996.

The first section of this paper examines the theory of illegal international migration, section two discusses the model, section three presents the empirical results on the estimation of the model and section four provides some concluding remarks.

I. International Migration Theory

Neo-classical theory states that international immigration (legal and illegal) is a cost benefit decision undertaken by an individual in order to maximize expected income. Expected income is defined as the probability of employment times the mean income. For undocumented workers, expected income needs to be further multiplied by the probability of successfully entering the destination country. The net gain from movement is defined as the difference between expected income in the home and destination countries, summed and discounted for a time horizon and added to the negative cost of relocation. Individuals will be prompted to migrate when the net gain is positive. Thus the main determinant for explaining international migration is the wage differentials that exist between home and destination countries. (Massey, et al, 701)

The new economics of migration states that international migration occurs from “failures in other markets that threaten the material well-being of households and create barriers to their economic advancement.” This theory allows for markets to have imperfections. Which recognizes that in developing countries markets are not fully matured or well functioning. “In order to self-insure against risks to income, production, and property, or to gain access to scarce investment capital, households send one or more workers to foreign labor markets.” (Massey, et al, 711)

The migration literature also produces the segmented labor market theory. This theory states that immigration is driven by demand built into the economic structure of the well-developed industrial societies. In the well developed markets we see a labor market which on one hand offers jobs with high pay, benefits, good working conditions, while on the other hand we see a secondary job market characterized by low pay, few to no benefits, hazardous or unpleasant working conditions and instability. Typically, within the developed society, natives are not willing to take these jobs in the secondary market where there is little to no return to education, experience, or skill. Thus the shortage of laborers encourages immigration.

Another theory we see in the literature is the world systems theory. This theory states that migration is a natural course following from the globalization of the market economy. “The processes of economic globalization create a pool of mobile workers in developing countries and simultaneously connect them to labor markets in particular cities where their services are demanded” (Massey, et al, 723).

The last theory to be discussed here is the network theory. The interpersonal ties that connect migrants, former migrants, and nonimmigrant in origin and destination countries through relations of friendship, kinship, and through shared community origin increases the likelihood of immigration. These

networks reduce the costs, raise the benefits, and lessen the risks of international movement. Empirical evidence seems to suggest that networks play a significant role in shaping individual and household migration decisions, and in promoting and guiding flows of immigrants.

II. The Model

The challenge faced in any attempt to examine illegal immigration is the lack of information on the number of illegal immigrants. Researchers are forced to rely on government apprehension and deportation information and statistics. However, problems also exist with this data as discussed by Massey, “These data are simply totals of the number of Mexicans caught trying to enter the country illegally and subsequently deported by the Immigration and Naturalization Service. They tally enforcement actions and not people; the same person may be caught once, twice, several times, or not at all” Despite this drawback the data seems to be fairly accurate in capturing flows. The empirical results obtained from INS data is basically the same as results which use data other than INS data to estimate illegal immigration in to the United States. The INS data for this study was collected from the INS Statistical Yearbooks for various years. It is annual data from 1978-1996 which reports the number of deportations of Mexican citizens.

Previous studies show that the composition and characteristics of the illegal migrants from Mexico tend to be young Mexican males with few skills and low levels of education attainment. Unfortunately I was unable to find data for all the relevant years on the Mexican male population between the ages of 16-30. I use instead the data number of Mexican males in the labor force, for the years 1978-1995. This data was collected from the World Bank country report *Mexico Enhancing Factor Productivity Growth*.

To capture the idea of wage differentials I use the Mexican real hourly manufacturing wage rate. The nominal hourly rate is reported by the IMF in their annual International Financial Statistics Yearbook. The nominal wage rate then was adjusted by the Mexican CPI. The use of the wage is based on the observation reported by Borjas in the study by Hanson and Spilimbergo,

Borjas (1994) reports that in 1990 the average educational attainment of Mexican born men residing in the United States was 7.6 years; in 1990 average educational attainment among men employed in Mexican manufacturing was 8.1 years. Further, a large fraction of Mexican-born workers in the United States are employed in manufacturing.” (Hanson and Spilimbergo, 10)

Use of this wage captures the possible expectations of Mexican immigrants about the wage they will earn upon arriving in the United States.

For the United States I use the real minimum wage pertaining to each year. This data was collected from the IMF and the Census Bureau. In most industries the minimum wage would be the least that an immigrant would earn for work done. This measure may not capture the wages in agriculture where migrants may be paid by the barrel or pound of agricultural product harvested. It may also underestimate the wages earned in cities with a relatively high cost of living where minimum hourly wage rate for the area may be higher than the federally established minimum wage rate. Despite this I feel the minimum wage is a good starting point in capturing wage differentials.

I have also included the U.S. unemployment rate as a variable determining illegal migration. This variable will capture the effect if any of illegal migrants’ responsiveness to employment conditions in the United States. If the U.S. is experiencing a period of high unemployment do migrants take this into consideration and will this increase the cost of illegal migration, in that the migrant may have a more difficult time finding work, so as to deter migration.

The specification of the migration model is,

$$\ln A_i = \alpha_1 + \ln \beta_2 \text{MPOP}_i^M + \ln \beta_3 \text{Mfg}_i^M + \ln \beta_4 \text{MW}_i^{\text{US}} + \ln \beta_5 \text{Ploy}_i^{\text{US}} + \ln \beta_6 \text{INS} + T + e_i$$

where US refers to data for the United States; M refers to data for Mexico and i refers to data from year i . A = deportations of Mexican citizens back to Mexico by the INS; MPOP=data for the number of Mexican males in the labor force; INS= the capital expenditures adjusted by the CPI of the Immigration and Naturalization Service; W refers to the real minimum wage; Mfg=the real hourly manufacturing wage; Ploy = the unemployment rate; T=time trend; and e is the error term. All variables are in log levels. I predict that the coefficient associated with β_2 , and β_4 will be positive, and that the coefficients on β_3 , and β_5 will be negative. The prediction of the sign of the coefficient related to the INS budget could be positive or negative depending on which view you take. An increase in the budget, thus an increase in INS activity, would deter illegal immigration and we would expect to find a negative sign. However, increased INS activity should also lead to an expansion of the capacity of the Border Patrol to intercept and locate illegal aliens, in which case the sign would be positive (McPheters, Schlagenhauf, 4). Summary statistics of the variables are available in Appendix I.

III. Estimation Results

Results of the OLS regression for the specified model can be seen below in Table 1. From this table we can see that only two coefficients are of the expected sign, Mfg. and MW. While Mpop, Ploy, have the opposite sign of what was predicted. INS is negative, meaning that increases in the budget of the INS seem to deter illegal immigration. Mfg. is the only variable with a statistically significant t value, however, the F statistic (which allows us to test the overall significance of the model) is statistically

significant. This fact, that only one variable is statistically significant while the F-statistic is statistically significant, points to the possible problem of multicollinearity.

Dependent Variable: LNAPP
Method: Least Squares

Sample(adjusted): 1978 1995
Included observations: 18 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	30.66125	429.3840	0.071408	0.9444
MPOP	-0.385831	26.07170	-0.014799	0.9885
Mfg.	-6.775864	1.763074	-3.843211	0.0027
MW	2.224462	4.175686	0.532718	0.6048
Ploy	0.085319	0.128059	0.666246	0.5190
INS	-0.356886	0.505723	-0.705695	0.4951
TME	-0.044264	0.842343	-0.052549	0.9590
R-squared	0.831656	Mean dependent var		11.90056
Adjusted R-squared	0.739833	S.D. dependent var		1.063864
S.E. of regression	0.542641	Akaike info criterion		-0.937314
Sum squared resid	3.239049	Schwarz criterion		-0.591058
Log likelihood	-10.10507	F-statistic		9.057087
Durbin-Watson stat	2.437432	Prob(F-statistic)		0.000995

Table 1

To test for first order serial correlation, I used the Durbin-Watson statistic and the significance points of $d_l=0.603$ and $d_u=2.257$. If the Durbin-Watson statistic is less than 0.603 there is evidence of first order serial correlation, if it is greater than 2.257 then there is no evidence of first order serial correlation, and if the statistic lies between the values of 0.603 and 2.257 we cannot conclude whether first order serial correlation is present or absent in the model. The calculated Durbin-Watson statistic for this model is 2.44 which is greater than 2.257. Thus we can conclude that there is no evidence of first order serial correlation.

To test for heteroscedasticity I used White's test. White's test first runs an OLS regression on the original model and saves the residuals. Then the residuals are squared and are then regressed on the original explanatory variables, the squared values of the explanatory variables, and any cross products. The $H_0: \beta_1=\beta_2=\beta_3=\beta_4=\dots=\beta_k=0$. The test statistic used is $(n)(R^2)$, where n equals the number of observations, which is distributed as a χ^2 with the degrees of freedom equal to the number of regressors minus the constant. For my model the test statistic equaled 13.63 and with 12 degrees of freedom. At the 5% level we fail to reject the null hypothesis and can conclude that there is no evidence of heteroscedasticity.

To test for multicollinearity I calculated the variance inflation factor for the 5 auxiliary regressions. The variance inflation factor (VIF) is a measure of the extent to which the variance in each explanatory variable can be explained by the remaining explanatory variables in the model. I first ran auxiliary regressions in which one explanatory variable is defined as the dependent variable and then regressed on the remaining right hand side variables. The VIF equals $1/(1-R^2)$. A low VIF indicates no multicollinearity and a high VIF indicates multicollinearity. The cutoff number is set at 10. The results of which are shown in Table 2.

<u>Dependent Variable</u>	<u>Explanatory Variables</u>	<u>VIF</u>
MPOP	Mfg., MW, Ploy, INS, TME	100
Mfg.	MPOP, MW, Ploy, INS, TME	4.54
Ploy	MPOP, Mfg., MW, INS, TME	1.47
MW	MPOP, Mfg., Ploy, INS, TME	14.28
INS	MPOP, Mfg., Ploy, INS, TME	14.28

Table 2

As we can see from Table 2, we have a high degree of collinearity with the MPOP variable and collinearity present with the MW and INS variables.

As a result of this collinearity (1) small changes in the observed values of the explanatory variables may result in large changes in the estimated coefficients (2) we see large variances and standard error of the OLS estimators which makes it difficult to estimate the true value of the estimator(s) and which gives us larger confidence intervals (4) with the increase in the standard errors the t-statistics tend to be smaller than they would be without collinearity and thus we conclude that many of our variables are statistically insignificant (5) we may also see coefficients with the wrong signs than what theory would predict, while this is may not be due to multicollinearity it cannot be ruled out as a possible explanation (6) we also have difficult in determining the effect of the individual explanatory variables on the dependent variable. With all these consequences, however, the OLS estimates of the coefficients are unbiased and efficient.

It is important to remember that multicollinearity is not necessarily a problem with the model but a problem with the data. The fact that it is present in my model again attests to the difficulty in obtaining data on illegal immigration and certain economic and demographic variables for Mexico.

In this paper I have attempted to ascertain the determinants of illegal migration based on the theory of wage differentials between Mexico and the United States. While the model did not exhibit evidence of first order correlation or heteroscedasticity I believe that the severity of multicollinearity makes it difficult to interpret the results of the individual estimated coefficients. However, I can say, based on the significance of the F statistic that the model as a whole is good. The $R^2 = 83\%$, which says that the variability in the explanatory variables explain 83% of the variability in the dependent variable, deportations of Mexicans by the INS.

IV. Concluding Remarks

As can be seen from Table 1, the Mexican wage (MFG) appears to have the greatest impact, possibly the only variable impacting flows, on the flow of illegal Mexican migrants to the United States. This being the case, money spent by the INS enforcing the border does not have the desired deterrent result. Using this double log model we can see that a 1% decrease in the Mexican manufacturing wage increases illegal immigration by almost 7%. This 7% increase can be substantial, especially for border towns on both sides of the border (El Paso, Nogales, Juarez, etc.).

These results suggest that money would be better spent by the United States in unilateral efforts with Mexico to raise Mexican wages through economic development and investment. The United States Government would be better served in its efforts to stem the tide of illegal migration by taking steps to cure the problem instead of dumping large sums of money into border enforcement programs.

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Appendix I-Summary Statistics

Variable	Observations	Mean	Median	Maximum	Minimum	Standard Deviation
LNAPP	19	11.82	12.2	13.74	10.15	1.08
MPOP	18	16.78	16.79	17.15	16.49	0.18
Mfg.	19	1.36	1.33	1.62	1.15	0.16
MW	19	1.61	1.57	1.85	1.44	0.12
Ploy	19	6.63	6.7	9.5	5.2	1.25
INS	19	18.94	19.12	20.47	17.03	1.09