

Factors Influencing the Settlement of Illegal Immigrants within the United States

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This paper identifies the important factors that determine the location of illegal immigrants within the United States. I estimate the effect of socioeconomic, agricultural, political, and enforcement variables on the number of illegal immigrants in U.S. using panel data from 1997 to 2010. Results show that illegal immigrants settle in states with network effects, where the size of the agricultural and construction sector, and enforcement is higher. Similarly, illegal immigrants are less likely to be in states with a higher unemployment rates. A logit model was used to examine personal, demographic and socioeconomic characteristics on the illegal immigrants. I find that illegal immigrants compared to legal immigrants are more likely to be males, with low education levels, working in the construction sector compared to legal immigrants.

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1. Introduction

The term “Illegal” refers to those unauthorized to reside and work in the United States. This paper identifies the important variables that affect the settlement patterns of illegal immigrants in the United States. In this paper I focus on the important characteristics that affect the causal relationship of illegal immigrants to reside in the particular states of the U.S due to various reasons. First, according to the Department of Homeland Security (DHS), the budgetary allocations on border security stand at USD 43 million. While so much has been spent on border security, the movement of illegal immigrants within the country received little attention in all forms of literature. The U.S. is the largest destination for immigrants in the world (Center, Pew Hispanic, 2013). The total immigrant population in the U.S. is around 40.4 million in 2011. The annual estimate of illegal immigration to the United States stands at approximately 500,000 and according to the Pew estimates, 11.7 million illegal immigrants reside in the U.S as of March 2012. This number is up from 11.5 million in 2011.

Secondly, surveys carried out by the Mexican Migration Project indicate that illegal immigrants tend to concentrate in cities with established networks of such immigrants. Further, anecdotal evidence suggests that such networks are highly responsive to enforcement activities by immigration authorities. This was evident in 2007, when a substantial amount of illegal immigrants moved out of Phoenix, Arizona with the enactment of the sanctions (Nowrasteh, 2012). However, the impacts of such laws vary considerably across different cities in the long run. In this paper, I quantitatively estimate the veracity of this claim.

In this paper I look at the characteristics that impact the decisions of illegal immigrants to locate in any particular U.S. state. I investigate the various reasons why illegal immigrants decide to settle in different states including socioeconomic, network, agricultural, construction, political and enforcement effects. Existing literature focused on the economic outcomes of immigration from Mexico to the United States using the data

from the Mexican Migration Project (MMP). A significant amount of research in the field of immigration has been focused on the factors influencing legal immigration because of the availability of data, whereas this paper contributes to the body of literature by examining the state level factors that influence illegal immigrants' decision to settle in the particular state of the United States using macro-level data. Panel data also allows me to look at the temporal factors that influence these migration decisions of illegal immigrants. Some papers focused on the impact of NAFTA on illegal immigration (Markusen and Zahniser, 1997; Luckstead, Devadoss, and Rodriguez, 2012).

Finally, in spite of serious anti-immigration efforts, a large population of unauthorized aliens still manages to avoid detection by enforcement officials. Anecdotal evidence (Woodland and Yosidha, 2006) suggests that as enforcement intensifies, such immigrants move from one location to another to avoid detection. According to the Immigration and Naturalization Services in 1990, ninety percent of the unauthorized population was confined to six states namely California, Florida, Illinois, New York, New Jersey and Texas¹. About 66 percent of legal resided in these six states. However, in 2004 Pew estimates showed a significant increase of unauthorized population in Arizona, Georgia, North Carolina and Tennessee. This seems to hint that unauthorized immigrants tend to move across state boundaries to avoid detection so that the number of illegals in each state is actually both new immigrants and old immigrants changing location within the United States.

Unlike the existing literature on immigration that uses apprehension as proxy for illegal immigrants, I use the direct number of illegal immigrants calculated by Warren, R., & Warren, J. R. (2013). This study focuses on various socio economic, demographic, enforcement, and political factors that can have an impact on the state location decision of illegal immigrants by using macro level data from 1997 to 2010. I examine factors that

¹ <http://www.cbo.gov/ftpdocs/87xx/doc8711/12-6-Immigration.pdf>

are likely to influence an illegal immigrants' choice to reside in a particular state. Furthermore, this paper also differs from the existing literature by identifying and considering the addition of new factors such as Mexican restaurants and political variables.

This paper contributes to the literature by estimating the determinants of causal variables accounting for the state location decision of illegal immigrants and models the decision of an illegal immigrant who is already in the U.S.

This paper attempts to answer the following research questions.

- 1) Does the number of illegal immigrant's increases in states with more diversified populations?
- 2) Does increased law enforcement in the state decrease the number of illegal immigrants?
- 3) Do the number of illegal immigrant's increase in the states with more service facilities?
- 4) Do the states with more agricultural production have more illegal immigrants compared to the states with non-agricultural production?

The results from this study show that network effects and agricultural factors are the most important determinants of location choice, while the unemployment variable is negatively associated with illegal immigrants.

I first analyze illegal immigration at the state level and also compare that with legal immigrants. I also examine the personal characteristics of illegal immigrants entering into the U.S. from Mexico. As an extension of this paper I estimate the probability of illegal immigration on various personal characteristics, both demographic and socio economic, using the logit model. I look at the characteristics of illegal immigrants in all states and in the individual states of California, Texas, Illinois and Arizona using the MMP survey data. I find that illegal immigrants are more likely to be males, have low education levels, and work in the construction sector compared to legal immigrants. These results show that illegal immigrants are likely to choose Illinois to work in the agriculture sector and the odds of an illegal immigrant to work in the agricultural sector are 2.09 times more than the odds of working in a non-agricultural sector. The odds of an illegal

immigrant working in the manufacturing sector are 1.2 times the odds of working in a non-manufacturing sector in California. Welfare programs did not have any significant impact on illegal immigrants. Network effects were found only in Texas and the odds of an illegal immigrant migrating to Texas where they have a Latino relative goes up by 1.4 times.

2. Literature

The Enhanced Border Security and Visa Reform Act of 2002 stipulated foreign nationals to carry identification documents with biometric technology. Moreover, the REAL ID Act of 2005 established national standards on issuing IDs. Most of these laws were only successful in preventing one form of illegal immigration: overstaying visas. However, such laws were not effective in preventing the alien influx from the U.S Mexico border. This triggered a series of state level enforcement activities especially in the bordering states and the states that were harboring a large number of illegals. Anecdotal evidence suggests that stringent state enforcements can force illegal immigrants to move from one state to another (Kobach, 2007). Espenshade (1994) and Gathmann (2008) did not find any effect of border enforcement on illegal immigration. Whereas Davila et al. (2002) find little effect of border enforcement on the number of illegal immigrants. Most of the studies use line watch hours per mile (person hours spent patrolling the border) to see the effect of border patrol intensity on the number of illegal immigrants (Hanson and A. Spilimbergo, 1999). In this study I am interested to see how illegal immigrants respond to border patrol agents deployed by various states.

There is evidence suggesting that illegal immigrants tend to aggregate in isolated pockets. This is referred to as “*Network Effects*” in many studies (Bauer, Epstein and Gang, 2002; McKenzie and Rapoport, 2004) where the illegal immigrant mitigates the probability of apprehension by mingling around the existing alien population. Such aggregation behaviors have affected housing markets in certain neighborhoods by reducing prices. However, network effects are crucial for the survival of an illegal immigrant. According to the Pew Hispanic Center, 24% of illegal immigrants are employed in the farming sector, 17% in cleaning, 14% in construction and 12% in food preparation industries.

Carrington, Detragiache and Vishwanath (1996) found that migration costs decreased with an increase in social networks of the destination. Social networks reduce

the intangible cost of migration by providing the migrant social capital, such as knowledge about crossing methods or employment opportunities in the United States (Singer and Massey, 1998; Munshi, 2003).

Regarding the location choice, Buckley (1996) found a positive relationship between legal immigration and state welfare payouts using INS data from 1985 to 1991. Kaushal (2005) used state level policy variation to see if new immigrants make location decision based on benefit eligibility and generosity. Using the mean tested federal benefit programs Kaushal concludes that these programs have minimal effects on locational decisions.

A great deal of literature focused on economic outcomes of Mexican immigrants in the United States using the Current Population Survey (CPS) and census data. This paper contributes to the literature in three ways: first by estimating the factors influencing illegal immigrants to settle in a particular location of the United States using the macro level data, secondly by comparing the factors that influence the settlement pattern of legal and illegal immigrants, and finally by estimating the probability of illegal immigration through various personal, demographic and socio economic characteristics using MMP data.

3. The economics of Illegal Immigration:

In this section I summarize the predictions affecting the settlement of illegal immigrants in a particular state before discussing the empirical results.

Proposition 1: *States with diversified populations are likely to house a higher proportion of overall illegal immigrants.*

States with the highest shares of Hispanic population can attract illegal immigrants in two ways: first, the chances of being detected as an illegal immigrant is low in a diversified environment; and second, in a diversified environment, networks for illegal immigrants' survival are well established. The share of Hispanics in the overall population will serve as a proxy for the cultural and linguistic networks available in the state. This variable shows that immigrants migrate to the states where they have greater social networks.

Proposition 2: *Increased border patrol agents (enforcement variable) at the state level would reduce the number of illegal immigrants.*

The number of border patrol agents deployed by the state is expected to have a direct impact on illegal immigration. Border patrol agents enforce all applicable state laws at the state level, inducing the illegal immigrant to reassess his/her existence in that state. Increased border patrol agents in the state decreases the probability of illegal immigrants to settle in that particular state.

Proposition 3: *States with increased community facilities are likely to have a higher proportion of illegal immigrants.*

Access to medical and other social service institutions are largely limited to illegal immigrants. However, small community facility centers such as community hospitals still provide some amount of services to such immigrants. Therefore, increased numbers of illegal immigrants can be observed in states with increased community services.

Proposition 4: *Illegal immigrants are more likely to locate in states with large farming, construction, manufacturing, and restaurant sectors.*

States with large farming, construction, manufacturing and restaurant sectors are likely to attract more illegal immigrants. Such immigrants are highly unlikely to be detected in the above industries where they often get paid in cash. Illegal immigrants are more likely to have low education and are more willing to work in lower paid and low-skilled jobs. This makes them likely to be highly represented in the above sectors.

4. Data:

For this study, I have compiled a state level data set that contains variables for the years 1997 through 2010. This includes observations for 50 states annually, forming a sample of 700 observations.

The data has been organized into socioeconomic, enforcement, political, and control variables. The data was collected from a variety of sources including the U.S. Census Bureau, the Bureau of Economic Analysis, the Federal Reserve archives for economics research, the Year Book of Immigration Statistics, the Pew Hispanic Centre Archives, and U.S Statistical Abstracts. The complete list of data sources is given in Appendix A.

Variables:

Number of Illegal immigrants (Dependent Variable)

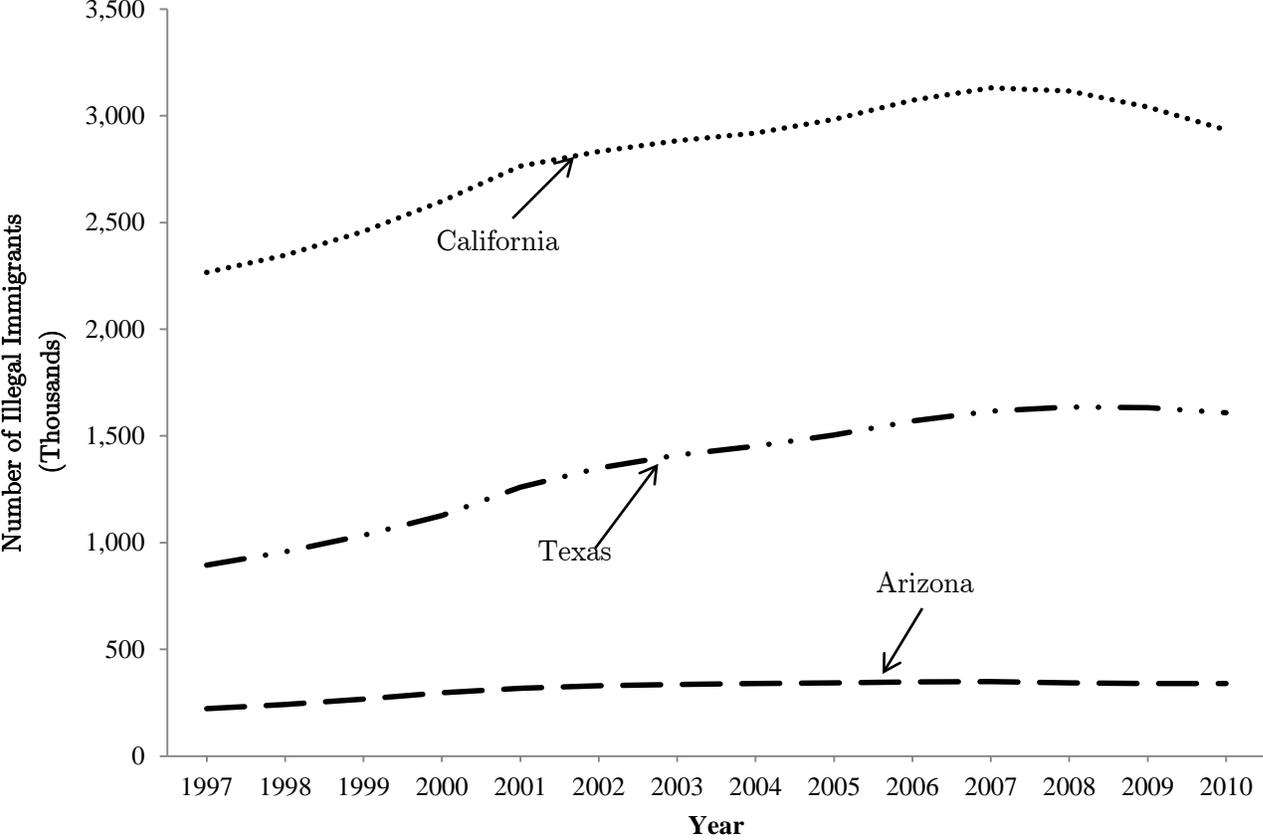
The main problem in the literature is the unavailability of direct data on numbers of illegal immigrants. This causes researchers to depend on estimates from the existing literature or use apprehension as a proxy for the number of illegal immigrants. In this paper I use the number of illegal immigrant's data from the estimates calculated by Warren, R., & Warren, J. R. (2013).

Lancaster and Scheuren (1977) were among the first to estimate the number of unauthorized immigrants residing in the U.S. using the residual method. They estimated the number of illegal immigrants using the size of the total civilian non-institutionalized adult population based on the Current Population Survey (CPS), and subtracted from

that an estimate of the size of the legal civilian non-institutionalized adult population based on adjusted 1970 Census data. Using similar residual methods, Warren and Passel (1987) estimated the number of undocumented aliens based on U.S. Census data. However the estimates based on the residual method have methodological limitations and do not provide disaggregated estimates. Similarly the Pew Hispanic Center also estimates the number of unauthorized immigrants based on data from DHS and other government agencies. But these estimates are not very useful for states with small populations. However Warren, R., & Warren, J. R. (2013) overcome the above limitations and provide estimates that are very useful for academic purposes.

The pattern of apprehension of illegal immigrants from 1997 to 2010 for Arizona, California and Texas is represented in Figure 1. We can see a general increase in the number of illegal immigrants for California and Texas. The highest number of illegal immigrants is in California followed by Texas and Arizona. In general the number of illegal immigrants appears to be increasing until 2008 and decreasing from 2009 to 2010.

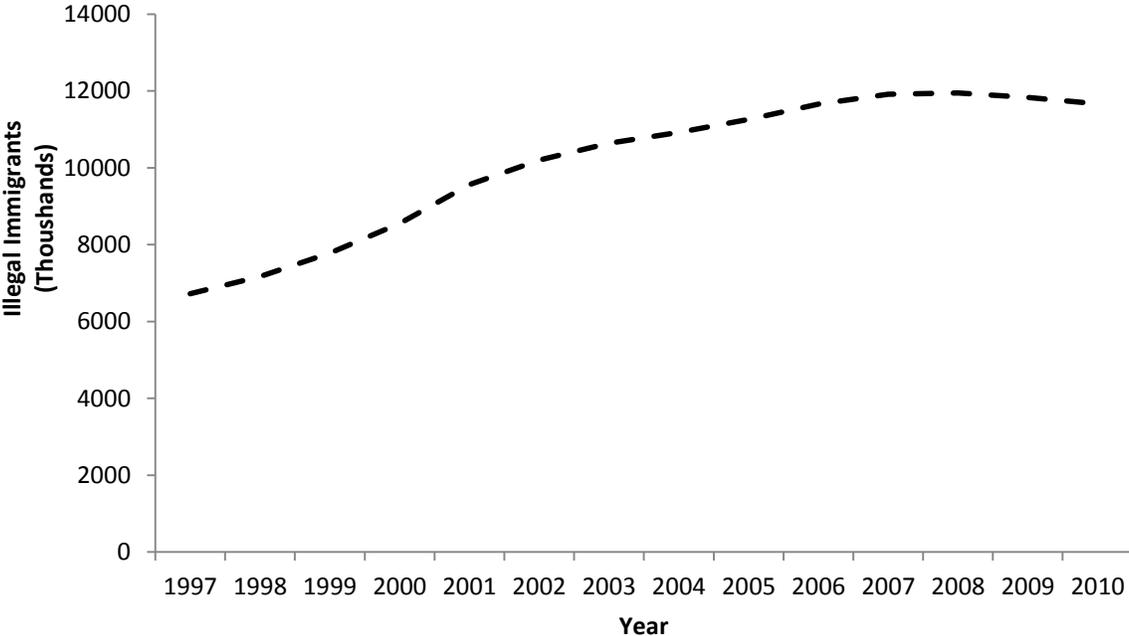
Figure 1: Comparison of Illegal Immigrant Numbers across Arizona, California and Texas



Source: Year Book of Immigration Statistics

Figure 2 shows the number of illegal immigrants over the period from 1997 to 2010 for all the 50 states used in the data. In general we can see the rise of illegal immigrants during the sample period. The series shows large increases in 2001, 2000, and 1999. A decrease in the number of illegal immigrants is seen in 2009 and 2010. We can see a rise of 12 percent of illegal immigrants in 2001 compared to 2000 and an increase of 10 percent in 2000 compared to 1999.

Figure 2: Total Illegal Immigrants trend for all 50 States



Socioeconomic Variables

I use several variables to measure the effects of socioeconomic factors on illegal immigrant choice of location. Statewide data on per capita GDP (PCGDP), Agricultural sector GDP (AGGDP) and Construction sector GDP (CGDP) were collected from the Bureau of Economic Analysis. These GDP figures were measured in real terms with year 2005 as the base year. Per capita GDP is a measure of wealth in each state and I expect this variable to be positively correlated with the number of aliens present in a state. I hypothesize that in

wealthier states, illegal immigrants face less competition for low end jobs and the monetary payoff is slightly higher.

Similarly, I expect AGGDP and CGDP to be positively correlated with an alien population in a state, because these industries are the main sources of employment for such individuals. Moreover, in these industries, wages are paid on a daily basis such that there is no binding commitment. Therefore, these industries offer flexibility for illegal aliens to work in these sectors. Since agriculture is one of the leading sectors of employment for temporary migrants, changes in the agricultural seasons increases the demand for illegal migrants and thus encourages settling in the states with larger agricultural sectors. Similarly, to capture the size of the construction sector I collected the number of housing units approved by each state annually.

Unemployment (UNEMP) data is gathered from the Bureau of Labor Statistics. This variable captures unemployment as a percentage in June of each year. Annual employment rates serve as indicators of general labor market conditions in various states at given times. A higher unemployment rate in a state should dissuade illegal immigrants to migrate into that state. I expect this variable to be negatively correlated with immigrant populations. This was clearly evident during the recession in 2008, when large numbers of illegal immigrants left the U.S. due to a lack of jobs (Passel and Cohn, 2009). Finally, to capture the impact of housing prices on illegal immigrant movements, I have collected state-wide data on the percentage of rental housing units priced below \$300.

The number of Mexican restaurants and hotels was included to capture network effects. According to Pew, 59 percent of illegal immigrants are from Mexico. 33 percent of undocumented migrants work in the service industry (National Public Radio). I expect this variable to be positively correlated with the immigrant population.

Distance is the variable included in the model to capture the border between the states and Mexico border. Distance is in miles measured from center of each state to center of Mexico measured in miles. The source of the data is wolfram alpha.

Enforcement Variables

In order to capture the enforcement effects, I have gathered the data on number of border patrol agent staffing at the state level. This data was made available by the U.S. Customs and Border Protection (CBP). CBP officers and agents enforce all applicable U.S. laws to control illegal immigration. I expect this variable as a proxy for enforcement to have a direct impact on illegal immigration.

The enforcement (ENFORCE) variable, i.e. the number of border patrol agents, is a continuous variable. This variable is normalized by dividing with area of each state in square miles.

Political variables

Political variables are included to capture the impact of political influence on illegal immigration. It is reasonable to assume the political preference of Republicans, who are generally stricter in enforcing immigration laws compared to Democrats, to have a significant effect. To explore whether states having more representation of republicans or democrats would encourage illegal immigration, I include the percentage of republicans in the House of Representatives. This will help us to see the correlation between illegal immigration and the political environment. This information was obtained from United States House of Representatives.

Table 1. Variable Names and Summary Statistics

Variable Name	Definition	Mean	Std. Dev.	Min	Max
Dependent variable					
ILLEGAL IMMIGRANTS	Number of Illegal Immigrants in State	203279.80	449948.00	196.00	3131311.00
Independent Variables					
PER CAPITA GDP	State wise per capita GDP (Millions of chained 2005 dollars)	39453.05	7492.35	25224.00	64900.00
AG GDP	State wise Ag sector GDP (Millions of chained 2005 dollars)	2295.02	3159.19	62.00	26516.00
CONST GDP	State wise Construction sector GDP (Millions of chained 2005 dollars)	28907.88	32588.96	922.00	220769.00
AFRICAN	Percentage of African population in the state	10.32	9.47	0.31	37.17
ASIAN	Percentage of Asian population in the state	3.35	6.48	0.49	63.62
HISPANIC	Percentage of Hispanic population in the state	8.64	9.31	0.55	46.30
DISTANCE	Distance between the State and Mexico border	1611.59	568.65	607.40	3655.00
UNEMPLOYMENT	Percentage of persons unemployed in the state	5.22	1.92	1.60	13.80
COMMUNITY HOSP	Number of Community hospitals in the state	98.32	78.52	6.00	417.00
PERCENT REPUBLICAN	Percentage of Republicans in the House of Representatives	52.99	31.02	0.00	100.00
ENFORCE	Number of Border Patrol Agents	266.16	994.16	0.00	9373.00
MEXICAN REST	Number of Mexican restaurants in the state	1395.12	2313.08	45.00	13515.00
BUILD AUTH	Number of new housing units authorized	29803.20	38598.21	494.00	287250.00
RENTAL POPULATION DENSITY	Percentage of rental housing units for less than \$300 Population per square mile	9.58	4.55	1.50	22.90
		169.17	223.45	1.03	1129.60

N=700

Table 1 provides descriptive statistics of variables used for the empirical analysis. From the data we can see that the average number of illegal immigrants is 203,279 for the 50 states during the period of 1997 to 2010. The average Hispanic share of total population is 8.64 percent in 50 states from 1997 to 2010. California has the highest Hispanic share percentage with 34.31, followed by Texas with 33.94 percent and Arizona with 27.26 percent.

5. Model:

The relationship between illegal immigrants and various state characteristics is estimated in this section. In order to explain the relationships between illegal immigration and observable variables, I use random effects panel data that spans the 50 states over the 14-year period from 1997-2010. I estimate the number of illegal immigrants as a function of socio economic, network, political, and enforcement related factors.

$$y_{it} = \alpha_i + X_{itk}\beta + u_{it} \tag{1}$$

$$i = 1, \dots, 50$$

$$t = 1997, \dots, 2010$$

$$k = 1, 2, \dots, k$$

y_{it} is the variable representing the number of illegal immigrants in state i at time t . X_i is a matrix of independent variables with a constant α_i , β is a column vector of unknown coefficients, and k is the number of explanatory variables. The final model was selected after checking for multicollinearity problems.

I estimate illegal immigrants as a function of independent variables which is one of the most common forms. Ideally the data has to be treated as a panel data set with fixed effects for individual states. However, the inclusion of fixed effects leads to perfect prediction in panels where the variables are moving slowly (Beck and Katz 2004, Clark and Linzer 2012). To overcome this issue I use a random effects model with Maximum Likelihood estimation. Clark and Linzer (2012) demonstrate that the Hausman test is neither a sufficient nor necessary statistic to use fixed or random effects. In these models regressors do not vary much within each unit relative to the variations in the response

variable. In this situation the fixed effect estimates will be far away from true parameters and lead to less robust estimates with high variance. Hence, random effects models give more stable estimates with low variance.

6. Results and Analysis

Table 2. Results
Dependent Variable: Illegal Immigrants

Variables	Estimates
PER CAPITA GDP	-2.37*** (2.83)
CONST GDP	3.80*** (14.80)
AFRICAN	1490.98 (0.87)
ASIAN	522.64 (0.50)
HISPANIC	14968.60*** (9.57)
UNEMPLOYMENT	-6.57 (0.01)
COMMUNITY`HOSP	-528.28 (1.29)
PERCENT REPUBLICAN	286.00** (2.51)
AG GDP	19.59*** (7.27)
ENFORCE	24.71*** (4.60)
MEXICAN`REST	90.65*** (6.50)
DISTANCE	98.88*** (2.98)
BUILD AUTHORIZATION	0.34*** (3.23)
POPULATION DENSITY	264.45*** (3.79)
CONSTANT	-315246*** (4.44)
R-squared	0.89
N	700

***indicates significance at 1% level ** at 5% level and * at 10%level

Absolute z-values reported in parentheses

Analysis:

Analysis is based on the best available estimates on number of illegal immigrants. Table 2 presents the estimation results with z-values reported in parenthesis. R-square of the above models ranges from 0.89. F-statistic is significant at 1 percent level in the model indicating the overall strength of the model. UNEMPLOYMENT turns out to be negative but not significant in the model. This may suggest that illegal immigrants tend to move out of states with high rates of unemployment. This variable indicates that illegal immigrants will be able to find jobs in the state with lower unemployment upon moving from the state with higher unemployment rate. This may also imply that during recession the sectors in which illegal immigrants were working tend to suffer with heavy job losses that make them to leave the states. Unemployment rate which serves as an indicator for general labor market conditions shows that states with higher unemployment rate dissuades illegal immigrants. However the variable is not significant in the model.

The important variable of the study, ENFORCEMENT, is positive and significant at 1 % level. This indicates that as the number of border patrol agent's increases illegal immigrant's decision to reside in that state increases. These border agent's variable which serves as proxy for enforcement, surprisingly have positive impact on the illegal immigrant to reside in the particular states of the United States. From policy perspective, it indicates that funds spent on enforcement activities are not helpful to curb the flow of illegal immigrants. This result is consistent with the findings of Hanson and Spilimbergo (1999).

AGRICULTURAL GDP variable is positive and significant at 1% level. More the agricultural GDP in the state, higher is the number of illegal immigrants. This finding is consistent with hypothesis that illegal immigrants have a preference to stay in areas with more agricultural production compared to non-agricultural production. According to the Bureau of Labor Statistics number of people employed in agriculture is declining gradually because of various reasons such as seasonal employment and low wages. This lack of domestic workers willing to work on farms has created significant demand for undocumented

workers to work in farming. Moreover, the illegal immigrants generally are more willing to work for lower wages compared to U.S. workers. Thus, the agricultural sector eventually relies on illegal immigrants especially during harvest season. So we see that illegal immigrants prefer to work in higher agricultural employment states.

The estimates for percentage Hispanics and percentage Asian population yield a positive sign. This variable approximates the cultural and language network available in a particular state and serves as a good proxy for illegal immigrant's network in the states of U.S. This positive estimate suggests that the illegal immigrants aggregate in states where network effects are most profound. Hispanic variable is positive and significant at 1% level. This result suggests that illegal immigrants' locational choice is highly influenced by the highest percentage of Hispanic population effect which supports the strong network effect. African American variable is insignificant in the model. The network effect is further supported by the number of Mexican restaurants. This variable is positive and significant at 1% level. PER CAPITA GDP is negative and significant in the model and shows that the settlement pattern of illegal immigrants is low in the states with high per capita GDP.

CONSTRUCTION`GDP variable has a positive and significant effect on number of illegal immigrants. This indicates that they are willing to choose to work in the states with more construction units. They prefer to work in the areas where they have connections and prevent the apprehension from the authorities. Illegal immigrants generally prefer to work in low-skilled jobs, where domestic workers are not willing to work. This creates more demand in industries such as agriculture and construction sectors. The evidence of CONSTRUCTION`GDP variable is further supported by BUILD AUTHORIZATION variable which shows that illegal immigrants prefer to settle in the states having more number of building units authorized in the state. RENTAL variable shows the impact of housing prices in the state on the settlement pattern of illegal

immigrants. This variable is positive and significant implying that illegal immigrants prefer to settle in the states where the housing prices are lower.

MEXICAN REST variable is positive and significant at 1% level in the model. This indicates that illegal immigrants are more likely to stay in states with more restaurants compared to states with few restaurants. Illegal immigrants generally prefer to work in least preferred low skilled jobs where they do face competition from domestic workers. This increases the demand for illegal workers in service industry.

Surprisingly, PERCENT REPUBLICAN variable is positive and significant in model at 5% level. This variable is included to test the political influence on illegal immigration. This positive sign indicates that illegal immigrants prefer to stay in states that have more Republican representation compared to Democratic states.

DISTANCE variable is positive and significant indicating that illegal immigrants prefer to settle in the states that are farther away from the Mexico border. This shows that illegal immigrants who enter into the U.S. from Mexico border move away from the bordered states to states farther from border. This variable do not have expected sign due to various other reasons such as agricultural, construction sector, unemployment and enforcement factors.

Overall, these results show us the important factors that influence the illegal immigrants to settle in the particular states of the United States.

How Legal Immigrants Differ from Illegal immigrants:

In this section we try to see how legal immigrants differ from illegal immigrants at the macro level. Other studies which focused on legal immigration do not capture the total effect of immigrants, as illegal immigrants constitute the significant share of total immigrants. Illegal immigrants also differ from legal immigrants in terms of costs related to border “coyotes” price that they pay to smugglers to cross the borders. However in case of legal migration, they do not observe these costs. Other factors such as income, unemployment level, agricultural GDP, Construction GDP, labor market conditions and other factors will affect locational choice of both legal and illegal immigrants.

I follow the same model used for illegal immigrants. The dependent variable used in here is the total number of illegal immigrants in each state. Data for Legal immigrants is obtained from year book of Immigration statistics. The general flow of legal immigrants for all the 50 states from 1997 to 2010 can be seen from figure 3. We do not see a particular trend of flow of legal immigrants in to the U.S. We observe there is a general increase and decrease in the number of legal immigrants over the period. The highest flow of immigrants can be seen in 2004 over 2003 with about 28 percent. Similarly we can see an increase of 27 percent of legal immigrants in 1999 compared to 1998. The highest decrease can be observed in 2003 with 28 percent over 2002.

Figure 3: Comparison of Total Legal Immigrants trends for all 50 States

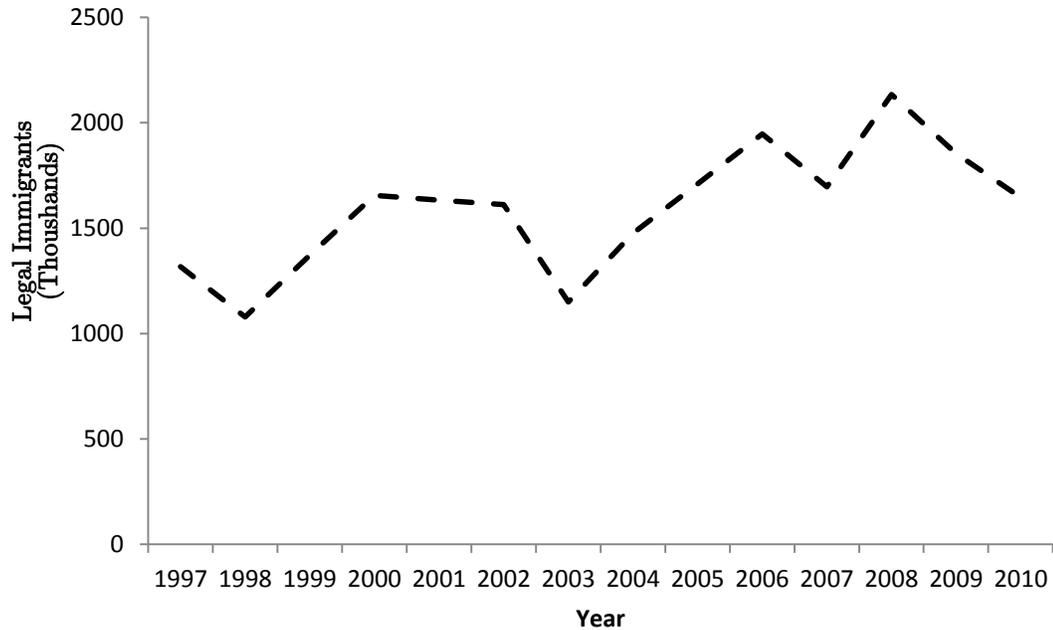


Table 3 presents the results with factors affecting the legal immigrants. I also compare factors affecting legal immigrants with illegal immigrants using the results from table 4. The results from table 3 and table 4 indicate that legal immigrants are similar to illegal immigrants in terms of unemployment, construction GDP and network effects. However legal immigrants differ from illegals with agricultural GDP. AGRICULTURAL GDP variable is negative which indicate that legal immigrants will not prefer to stay in states with higher agricultural GDP. However this variable is not significant in the model. The coefficient of determination (R-squared) indicates that the model for illegal immigrants explains about 72 percent of total variation, whereas for legal immigrants it explains 45 percent of total variation.

Table 3. Results
 Dependent Variable: Legal Immigrants

	Estimate
PER CAPITA GDP	-0.07 (0.27)
CONST GDP	0.44*** (5.48)
AFRICAN	711.22 (1.33)
ASIAN	422.51 (1.18)
HISPANIC	2806.91*** (6.38)
UNEMPLOYMENT	-725.82* (1.84)
PERCENT REPUBLICAN	20.05 (0.50)
AG GDP	-1.04 (1.16)
POPULATION DENSITY	48.21** (2.09)
CONSTANT	-14417.51 (1.22)
R-squared	0.45
N	700

*** indicates significance at 1% level ** at 5% level and * at 10% level

Absolute z-values reported in parentheses

Table 4. Results**Dependent Variable:**
Immigrants

	Illegal	Legal Immigrants
	Estimate	Estimate
PER CAPITA GDP	-4.76*** (5.80)	-0.07 (0.27)
CONST GDP	4.26*** (17.61)	0.44*** (5.48)
AFRICAN	-855.93 (0.38)	711.22 (1.33)
ASIAN	1112.90 (1.04)	422.51 (1.18)
HISPANIC	21992.52*** (14.64)	2806.91*** (6.38)
UNEMPLOYMENT	-4221.12*** (3.57)	-725.82* (1.84)
PERCENT REPUBLICAN	344.37*** (2.99)	20.05 (0.50)
AG GDP	18.81*** (5.80)	-1.04 (1.16)
POPULATION DENSITY	505.82*** (5.23)	48.21** (2.09)
CONSTANT	-41718.60 (1.01)	-14417.51 (1.22)
R-squared	0.72	0.45
N	700	700

*** indicates significance at 1% level ** at 5% level and * at 10% level

Absolute z-values reported in parentheses

7. Individual Characteristics of Illegal Immigrants

As an extension of this paper I used the MMP data to estimate the probability of illegal immigrants on various personal characteristics, demographic and socio economic characteristics. This survey data contains information on undocumented and documented migrants. I contribute to the existing literature by estimating the characteristics of illegal immigrants in all states together and various states individually. This will help to estimate the odds of a person immigrating to the U.S. states. In this section I use data

from four states: California, Texas, Illinois, and Arizona which have the highest number of illegal immigrants. I find that illegal immigrants are more likely to be males, low education level, and work in construction sector compared to legal immigrants.

Data and variables:

The source of data for this paper comes from MMP. MMP is mainly multidisciplinary research effort that mainly collects the data on social and economic characteristics on Mexican-U.S. migration. As of 2013, dataset comprised of 7347 observations from 1987 to 2013. Of the 7347 observations, 72 percent of them are illegal immigrants and 28 percent of them are legal immigrants. Table 5 presents the descriptive statistics of the variables that identifies the individual characteristics of illegal immigrants.

The details of the variables with descriptive statistics used in the model are given below:

Table 5. Descriptive Statistics of Individual Characteristics of Illegal Immigrants

Variable	Mean	Std Dev
Illegal_Immigrant	0.72	0.45
Sex	0.95	0.21
Age	45.88	15.05
Marital Status	0.86	0.35
Education Years	5.47	4.01
Agriculture	0.31	0.46
Manufacturing	0.32	0.47
Relations_relatives	0.42	0.49
Relations_Community	0.53	0.50
Relations_Latinos	0.91	0.28
Benefits_Schools	0.13	0.34
Benefits_foodstamps	0.05	0.21
Cost_Coyote	218.30	522.51

n=7347

Sex is a dummy variable and takes the value of 1 if male and 0 if female. Age is a continuous variable in years and the average age of illegal immigrants who migrated to U.S. from Mexico is 46 years. Marital Status takes the value of 1 if the illegal immigrant is married and 0 otherwise. Education_years is a continuous variable with total number of years of education completed. Relations with relatives, community members, and Latinos are the dummy variables used in the model to capture the network effect of illegal immigrants. Benefits_Schools and Benefits_food stamps are also the dummy variables used to capture the effect of welfare programs on illegal immigrants. Agriculture is a dummy variable and takes the value of 1 if the illegal immigrant works in agricultural sector and 0 otherwise. From the above table we see that 31 percent of illegal immigrants work in the agricultural sector. Similarly, manufacturing is a dummy variable and takes the value of 1 if the illegal immigrant who migrated to U.S. works in the manufacturing industry and takes the value of 0 otherwise. Cost_Coyote is a continuous variable in dollars paid by illegal immigrant to cross the border. The average cost to cross the border is \$ 218.

Econometric Model:

I used the logit method to measure the individual characteristics of illegal immigrants. This measure the relationship between the individual characteristics and the probability of illegal immigrant's compared to legal immigrants. Logit model is estimated by maximizing the likelihood function with respect to all the explanatory variables. Logit model is the best alternative for this hypothesis since we have information available whether the household members have information on personal and socio demographic factors. These estimates will indicate the probability of choosing a particular location of illegal immigrant over the other location. Dependent variable is the illegal immigrant in to the United States and I estimate the effect of network effects, occupation, education, age levels, marital status and public benefits on illegal immigrants using the following equation:

$$Y^* = \beta'X_i + u_i$$

Where $Y_i = 1$ if $Y_i^* > 0$

$Y_i = 0$ if $Y_i^* \leq 0$

Where $Y_i = 1$ if the household member have migrated illegally into the U.S.

And $Y_i = 0$ if the household member have migrated legally into the U.S.

$$\text{Prob}(Y_i = 1) = F(\beta'X_i)$$

$$\text{Prob}(Y_i = 0) = 1 - F(\beta'X_i)$$

The Likelihood function for the model is given by:

$$\ln L = \sum_{i=1}^N y_i \ln F(x_i\beta) + (1-y_i) \ln F(1-x_i\beta)$$

Where F is the logistic distribution.

The results of the logit model are given in the below tables:

Table 6. Logit Model Results - **All States**

Variable	Estimate	Std. Error	Odds Ratio
Intercept	4.272***	0.237	
Sex	0.343**	0.157	1.409
Age	-0.068***	0.003	0.933
Marital Status	0.029	0.102	1.029
Education years	-0.124***	0.009	0.883
Agriculture	-0.060	0.074	0.941
Manufacturing	0.149**	0.078	1.161
Relations_relatives	0.086	0.063	1.089
Relations_Community	0.053	0.060	1.054
Relations_Latinos	0.036	0.106	1.037
Benefits_Schools	-0.139	0.088	0.870
Benefits_foodstamps	-0.117	0.141	0.890
Cost_Coyote	0.002***	0.000	1.002

*** Significant at 1% ** Significant at 5% * Significant at 10%

Likelihood Ratio 1687.21

n=7347

Table 7. Logit Model Results - **California**

Variable	Estimate	Std. Error	Odds Ratio
Intercept	4.635***	0.334	
Sex	0.319*	0.209	1.376
Age	-0.071***	0.004	0.931
Marital Status	0.022	0.143	1.023
Education years	-0.135***	0.012	0.873
Agriculture	-0.034	0.105	0.966
Manufacturing	0.231**	0.109	1.260
Relations_relatives	-0.022	0.087	0.978
Relations_Community	0.069	0.085	1.071
Relations_Latinos	-0.090	0.159	0.914
Benefits_Schools	-0.160	0.112	0.853
Benefits_foodstamps	-0.074	0.180	0.929
Cost_Coyote	0.003	0.000	1.003

*** Significant at 1% ** Significant at 5% * Significant at 10%

Likelihood Ratio 894.18

n=3837

Table 8. Logit Model Results - Texas

Variable	Estimate	Std. Error	Odds Ratio
Intercept	4.197***	0.571	
Sex	0.020	0.384	1.021
Age	-0.066***	0.006	0.936
Marital Status	0.297	0.236	1.345
Education years	-0.124***	0.021	0.883
Agriculture	-0.117	0.175	0.890
Manufacturing	-0.054	0.179	0.948
Relations_relatives	0.029	0.150	1.030
Relations_Community	0.103	0.140	1.108
Relations_Latinos	0.357*	0.236	1.429
Benefits_Schools	-0.343	0.243	0.710
Benefits_foodstamps	0.572	0.400	1.772
Cost_Coyote	0.001***	0.000	1.001
*** Significant at 1% ** Significant at 5% * Significant at 10%			
Likelihood Ratio	202.96		
n=1237			

Table 9. Logit Model Results - Illinois

Variable	Estimate	Std. Error	Odds Ratio
Intercept	3.076***	0.955	
Sex	0.685	0.556	1.984
Age	-0.049***	0.010	0.952
Marital Status	0.187	0.383	1.206
Education years	-0.163***	0.031	0.849
Agriculture	0.740**	0.350	2.097
Manufacturing	-0.165	0.268	0.848
Relations_relatives	0.111	0.243	1.117
Relations_Community	0.341	0.238	1.406
Relations_Latinos	0.314	0.474	1.369
Benefits_Schools	-0.232	0.307	0.793
Benefits_foodstamps	-0.593	0.479	0.553
Cost_Coyote	0.002***	0.000	1.002
*** Significant at 1% ** Significant at 5% * Significant at 10%			
Likelihood Ratio	116.76		
n=571			

times. This result tells that a less educated immigrant is more likely to be an illegal immigrant. Surprisingly I did not find any network effect in all the states combined, California, Illinois, and Arizona. I found a significant network effect only in Texas. This shows that illegal immigrants prefer to choose to stay in Texas with more network effects compared to other states. The odds of illegal immigrant migrating to Texas having Latino relative goes up by 1.4 times. I did not find any significant effect of public benefits such as children in public schools and food stamps on the illegal immigrants. Surprisingly, I found positive significant effect with cost paid to coyote, which suggests that the odds of illegal immigrants increases as the cost of crossing the border goes up. This variable indicates that illegal immigrants are willing to pay more to the experienced coyotes so that they can safely cross the border with our getting caught by the border security officials.

The occupation variable “agriculture” is positive and significant in Illinois only. This suggests that illegal immigrants likely to choose Illinois over other states to work in the agriculture sector. This indicates that odds of an illegal immigrant to work in the agricultural sector are 2.09 times the odd of working in non-agricultural sector. Similarly “manufacturing” variable is positive and significant in the model with full states and in California state and not significant in other states. This informs that people who migrate illegally into the U.S. prefer to work in the manufacturing sector compared to the other sectors. The odds of illegal immigrant working in the manufacturing sector are 1.2 times the odds of working in non-manufacturing sector in the California state. This shows that people who migrate illegally into the California prefer to work in the manufacturing sector compared to the non-manufacturing sector.

8. Conclusions

This paper uses data on illegal immigrants to examine the factors influencing the movements of illegal immigrants across major states within the United States using statewide panel data from 1997 to 2010. This paper contributes to the literature by estimating the determinants of causal variables accounting for the state location decision of illegal immigrants. State level variables on socioeconomic, political and enforcement related factors are determined for the analysis. The term *favorable conditions* include economic benefits and avoiding detection from law enforcement authorities. This study provides a model to identify states with favorable conditions for illegal immigrant survival and provides insights on the settlement pattern of illegal immigrants.

The framework presented in this study suggests per capita GDP and unemployment as deterrent factors towards illegal immigrant influx. Further, the size of Hispanic population, size of agricultural sector, construction sector, and enforcement variables are positively related with immigrant influx.

As an extension of this paper I used the MMP data to estimate the probability of illegal immigrants on various personal characteristics, demographic and socio economic characteristics. Results indicate that illegal immigrants are more likely to be males, have low education level, and work in construction sector compared to legal immigrants. Welfare programs did not have any significant impact on the illegal immigrants. Network effect was found only in Texas and the odds of illegal immigrant migrating to Texas having Latino relative goes up by 1.4 times.

References:

- Bauer, T. K., Epstein, G. S., & Gang, I. N. (2002). Herd effects or migration networks? The location choice of Mexican immigrants in the US (No. 551). IZA Discussion paper series.
- Borjas, G. J., Freeman, R. B., & Lang, K. (1991). Undocumented Mexican-born workers in the United States: how many, how permanent?. In *Immigration, Trade and the Labor Market* (pp. 77-100). University of Chicago Press.
- Buckley, F. H. (1996). The political economy of immigration policies. *International Review of Law and Economics*, 16(1), 81-99.
- Caponi, Vincenzo, Plesca, Miana (2013). Empirical characteristics of legal and illegal immigrants in the U.S., IZA Discussion papers 7304, Institute for the study of labor (IZA).
- Center, Pew Hispanic (2013). *A nation of immigrants: A portrait of the 40 million, including 11 million unauthorized*. Washington, DC: Author.
- Clark, T.S. and Linzer, D.A., 2012, Should I Use Fixed or Random Effects?, Working paper, available at <http://polmeth.wustl.edu/mediaDetail.php?docId=1315>, The Society for Political Methodology.
- Dávila, A., Pagán, J. A., & Soydemir, G. (2002). The short-term and long-term deterrence effects of INS border and interior enforcement on undocumented immigration. *Journal of Economic Behavior & Organization*, 49(4), 459-472.
- Espenshade, Thomas J (1994). Does the threat of border apprehension deter undocumented US immigration. *Population and Development Review*, 20(4):195-216
- Espenshade, Thomas J (1995). Using INS Border Apprehension Data to Measure the Flow of Undocumented Migrants Crossing the U.S.-Mexico Frontier. *International Migration Review*, 29(2): 545-565.
- Francine J. Lipman. (2006). Taxing undocumented immigrants: Separate, unequal and without representation *Harvard Latino Law Review*.
- Gathmann, C. (2008). Effects of enforcement on illegal markets: Evidence from migrant smuggling along the southwestern border. *Journal of Public Economics*, 92(10), 1926-1941.
- Gordon H. Hanson. (2006). Illegal migration from Mexico to the United States. *Journal of Economic Literature*, 44(4), 869-924.
- Hanson, G.H., and A. Spilimbergo (1999): Illegal Immigration, Border Enforcement, and Relative Wages: Evidence from Apprehensions at the U.S.-Mexico Border, *The American Economic Review*, 89(5), 1337-1357.
- Kaushal, N. (2005). New immigrants' location choices: magnets without welfare. *Journal of Labor Economics*, 23(1), 59-80.
- Kobach, K. W. (2007). Attrition through Enforcement: A Rational Approach to Illegal Immigration. *Tul. J. Comp. & Int'l L.*, 15, 155.

- Lancaster, C., & Scheuren, F. J. (1977). Counting the uncountable illegals: some initial statistical speculations employing capture-recapture techniques.
- Luckstead, J., S. Devadoss, and A. Rodriguez (2012). The Effects of North American Free Trade Agreement and United States Farm Policies on Illegal Immigration and Agricultural Trade. *Journal of Agricultural and Applied Economics*, 44(1), 1–19.
- Markusen, James R. and Stephen Zahniser (1999). Liberalization and Incentives for Labor Migration: Theory with Applications to NAFTA. In *Trade and Factor Mobility*, ed. Jamie de Melo, Ricardo Faini, and Klaus F. Zimmerman, 263-294. London, Cambridge University Press.
- McKenzie, D. and H. Rapoport (2004): Network effects and the dynamics of migration and inequality: theory and evidence from Mexico, BREAD Working Paper No 63, Harvard University, April.
- Munshi, K. (2003). Networks in the modern economy: Mexican migrants in the US labor market. *The Quarterly Journal of Economics*, 118(2), 549-599.
- Nathaniel Beck, Jonathan N. Katz (2004). Random Coefficient models for time-series-cross-section data, working Papers 1205, California Institute of Technology, Division of the Humanities and Social Sciences.
- Nowrasteh, A. (2012). The Economic Case against Arizona’s Immigration Laws. Cato Institute.
- Passel, J. S., & D’Vera Cohn. (2009). Mexican immigrants: How many come? How many leave?. Washington, DC: Pew Hispanic Center.
- Singer, Audrey, and Douglas S. Massey (1998). The Social Process of Undocumented Border Crossing. *International Migration Review* 32 (3),561-592.
- Warren, Robert E. and Jeffrey S. Passel (1987). “A Count of the Uncountable: Estimates of Undocumented Aliens Counted in the 1980 United States Census.” *Demography* 24 (3), 375–393.
- Warren, R., & Warren, J.R. (2013). “Unauthorized Immigration to the United States: Annual Estimates and Components of Change, by State, 1990 to 2010.” *International Migration Review*.
- White, M.J., Bean, F.D., & Espenshade, T.J. (1990). The US 1986 immigration reform and control act and undocumented migration to the United States. *Population Research and Policy Review*, 9(2), 93-116.
- Woodland, A. D., & Yoshida, C. (2006). Risk preference, immigration policy and illegal immigration. *Journal of Development Economics*, 81(2), 500-513.

Appendix A:

Variable Name	Definition	Source
Dependent variable		
Illegal Immigrants	Number of illegal immigrants in each state	Warren, R., & Warren, J. R. (2013) Estimates
Independent Variables		
PER CAPITA GDP	State wise per capita GDP (Millions of chained 2005 dollars)	Bureau of Economic Analysis
AG GDP	State wise Ag sector GDP (Millions of chained 2005 dollars)	Bureau of Economic Analysis
CONST GDP	State wise Construction sector GDP (Millions of chained 2005 dollars)	Bureau of Economic Analysis
AFRICAN	Percentage of African population in the state	U.S. Census Bureau
ASIAN	Percentage of Asian population in the state	U.S. Census Bureau
HISPANIC	Percentage of Hispanic population in the state	U.S. Census Bureau
UNEMPLOYMENT	Percentage of persons unemployed in the state	Bureau of Labor Statistics
COMMUNITY HOSP	Number of Community hospitals in the state	American Hospital Association
PERCENT REPUBLICAN	Percentage of Republicans in the House of Representatives	U.S. House of Representatives
ENFORCE	Number of Border Patrol Agents	U.S. Customs and Border Protection
MEXICAN REST BUILD	Number of Mexican restaurants in the state	Yellow pages
AUTHORIZATION	Number of new housing units authorized	U.S. Census Bureau
RENTAL	Percentage of rental housing units for less than \$300	U.S. Census Bureau
DISTANCE	Distance between the State and Mexico border	Wolfram alpha
POPULATION DENSITY	Population per square mile	U.S. Census Bureau