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ABSTRACT:

In this paper, I hope to analyze the possible effect that illegal immigration from Mexico to the United States will have on the unemployment rate in those border states. Economic theory is conclusive on the possible effects of immigration on the labor force, including unemployment. However, it has not been empirically demonstrated if illegal immigration has a specific separate effect on the unemployment rate independent of the legal migrant effect. We therefore consider the possibility that illegal immigration may have its own independent effects on the unemployment rate, using basic theory of immigration, but controlling specifically for illegal immigrants. We therefore control for the illegal immigration status using a proxy variable of those illegals arrested in a border state.

INTRODUCTION:

The United States has been faced with a rapidly rising unemployment problem. In the past few years alone, unemployment has skyrocketed, raising from 4.6% in 2007 to 9.3% in 2009. It continues to trend upward, based on information gathered from the Bureau of Labor Statistics (BLS 2010). Immigration is one of the driving forces in labor supply. It allows employers access to a larger base of possible employees, and causes stronger competition for jobs, usually lowering the mean wage rate and increasing the unemployment rate. This becomes more and more important as more immigrants enter the United States.

In 1980, only 6.4% of the U.S. Workforce was not born in America. By 1994, that number had jumped to 9.7%, an increase of over 50%. (Borjas 1996). However, every major empirical study done to this point has been focused on the effect of immigration as a whole on different facets of the labor market. The area of illegal immigration has been vastly underinvestigated, and only conjectured about in a theoretical framework. If illegal immigration is found to have little or no effect on the labor

market, then the policy implications in terms of border enforcement and deportation may have to be revamped. If, on the other hand, illegal immigration has a dramatic impact on the unemployment rate, then we can investigate reshaping policy to put this to our advantage.

We are addressing the hypothesis that illegal immigration has a distinct and significant impact on the unemployment rate in border states across the United States/Mexico border. Studies have been done in the past aggregating all illegal immigrants in the United States and comparing that to the national unemployment rate. However, in this research, we hope to refine that to a specific region to determine what local impacts this may have.

In order to test this hypothesis, we will be using data gathered from several different sources. GDP figures are gathered from the Bureau of Economic Analysis. Legal domestic immigrants are found from the Bureau of Labor Statistics. Data measuring illegal immigration, on the other hand, will be a bit more complex. We will be using the regional data for illegal immigrants apprehended by the Department of Homeland security as a proxy for the number of illegal immigrants entering the area. While this will not be the full number of immigrants, it is the closest proxy we can hope for to estimate the illegal immigrant population in America.

Throughout the rest of the paper, we will be examining the economic theory upon which this hypothesis is founded, and applying this theory econometrically. We should then be able to determine what, if any, is the effect that illegal immigration specifically has on the unemployment rate. However, before in order to understand the theory and methodology well, an understanding of previous writings and background information is necessary.

LITERATURE REVIEW:

The issue of immigration has been heavily researched and explicated in the past. It is a fundamental force that impacts our labor market, changing the entire supply side of the function for

local labor. The most famous economist to investigate the issue of immigration is George Borjas. He literally wrote the book on immigration and its economic effects.

Heaven's Door (Borjas 1999) is that book. In chapter 4, *The Labor Market Impact of Immigration*, he states that the impact of immigration on the local labor market is dependent on the immigrants entering the locality, but also dependent on the skills the immigrants have and how those skills compare to the skills of the local workers. Immigrant labor in Borjas's study showed an overall increase in available low-skilled labor. This is very important in the case of illegal immigrants, as other research has identified illegal immigrants as having a competitive advantage in short-term, low-skill jobs (Carter 1998).

Borjas (1996) attempts to examine the effect of immigration on labor-market outcomes in “Searching for the Effect of Immigration in the Labor Market”. He uses both the Area Approach as well as Factor-Proportions Analysis on the 1980 and 1990 Censuses of Population. His findings determine that the effect of immigration was to decrease overall wage rates. The impact was much stronger on the wage of individuals with lower levels of education. But as he expanded the scope of his dataset, from specific small groups to larger populations, his results became more diluted. He believed this to be due to diffusion of labor; as workers became unemployed, they moved to other locations, taking other jobs, displacing other workers and creating a ripple effect.

Borjas (2004) expands on his previous research by using census data from 1960 to 2000 for the entire United States. His regression model approximates the effect of immigrants on wages controlling for education levels, work experience, etc. Variables include the fraction of the workforce in a skill group that is foreign-born, effects indicating the groups experience, and a factor of fixed effects indicating the time period of the observation. His findings for this study concurred with his previous research; as the number of immigrant workers in an area increased in a skill group, the overall earnings for the people of that group fell. This study demonstrated that immigration's effect is felt nationally, but

can be measured both locally and nationally.

However, Borjas focuses on immigration as a universal variable, never separating it into the categories of legal and illegal. Hanson (2006) focuses on ways to estimate the flow of illegal immigrants, a factor not discussed in Borjas's writing. He then determines a possible demand for illegal immigrants that is separate from the demand for immigrant labor overall. He does conjecture that laws are imperfectly enforced, leading to the possibility that the number of immigrants arrested for illegal entry may be used as a proxy for the total number of illegal immigrants. This research does not involve any econometric regression models. However, it does give theoretical framework from which to estimate illegal immigration and its effects.

In order to analyze the further effects of specifically illegal immigration, Bandyopadhyay (1998) looked at the supply side determinants of illegal immigration. She used a three sector model, sectors including Agriculture, manufacturing, and high-tech. Her results suggest that the wage rate paid to illegal workers is heavily dependent on the demand for illegal labor in the host country. The results find shifts in illegal immigration levels depending on either capital mobility, increased enforcement, agricultural liberalization, and other factors. The research is clear and distinct, but heavily numerical. It outlines no policy implications that could be useful in future work.

Finally, Carter (1998) writes that illegal immigrants may compete with workers, but they may also take what Carter refers to as the “bad jobs”; these are jobs that domestic labor does not want. He comes to the immediate conclusion that illegals and natives are not identical substitutes in the labor equation. His findings indicate that illegals are more mobile and hold jobs for shorter periods of time. They therefore have a competitive advantage in jobs in which long tenure is not important, such as low-wage secondary jobs. His results show that immigration policy depends on which illegals are focused on. With few illegals, primary jobs are held mostly by natives. Immigration raises the number of primary jobs. But at a certain point, the number of illegals is high enough that they begin to fill those

jobs.

THEORETICAL BACKGROUND:

Demand for labor generally follows a supply and demand model. What we are looking for in our econometric section is confirmation of the theory that as the supply side of the equation increases (specifically, the supply of illegal labor). If this is true, then we should see a movement down the demand curve, leading to a larger gap between the amount of labor demanded and the supply of labor at a given rate. This leads to an increase in unemployment, according to Ehrneberg and Smith (2006). However, this assumes that the inflow of illegal labor is positively correlated to the unemployment rate. As illegal immigration increases, unemployment would increase as well, indicating that illegal immigrant labor is a substitute for domestic labor. However, there is also the possibility that low skilled, illegal immigrants are a complement, rather than a substitute, for much of the possible employment found in the areas of interest.

According to APSnet, all of the states in the dataset are either a leading specialty crop state, have specialty crop value for about half of all crops, or both (Rutgers 2010). If it is true that illegal immigration is being used for work like crop harvesting, then the demand for other labor related to crop harvesting may increase. This would cause illegal immigrant labor to function as complementary labor rather than substitutes.

It is therefore possible for our variable of interest to have either a positive or negative effect on the unemployment rate. For this reason, we are testing the hypothesis that illegal immigration has a significant impact on the unemployment rate in border states. But we are not initially concerned about which direction that impact is.

Pischke and Velling (1997) indicate in their work that immigrants, particularly illegal ones, are usually less skilled, and can be treated as a separate input in production functions. In the standard

competitive model, increases in the supply of immigrant labor reduces the wage and employment of natives. Pischke and Velling indicate that while the competitive model indicates a negative relationship between immigrants and unemployment, we may see possible positive results. This may be due to the complementary behavior of both groups in production.

ECONOMETRIC MODELING:

Galloway (2008) attempted to measure the impact of immigration on unemployment in the the Netherlands using panel data from 1996 to 2003. Her dependent variable was the change in unemployment rates annually. She also examined the change in number of foreigners in the labor force divided by the total population in the labor market. Additionally, she used a control variable to represent local labor market conditions that would influence the change in regional unemployment rates. The control variable included values for the share of workers employed in many different sectors

$$\Delta u_{it} = \alpha \Delta f_{it} + x_{it-1} \gamma + \epsilon_{it},$$

such as low skilled positions, workers over 55, etc. Her model is shown as:

Where U_{it} is the unemployment at a given time in a given area, f_{it} is the number of foreigners divided by the total population aged 15 to 64, and the X_{it} are other control variables representing labor market conditions.

Galloway's research indicated that despite using panel data, OLS was the best estimator for her results based on the LaGrange Multiplier Test. This was also matching with the estimator used by Pischke and Velling (1997). However, in the econometric regression in this paper, the F-test determined that a two way fixed-effect model was the correct model by which to estimate the data.

Knowing what we do, we can use econometric methods to determine if illegal immigration has a distinct impact on the unemployment rate of border states. We will use the labor participation census

data on a state-by-state basis. The sub-variables included by Galloway in her model could not be ascertained within the available time, so we will be using per-capita GDP as an approximation to capture market conditions that affect unemployment. The number of foreigners available has been split into two variables; one for legal immigrants, the other for illegal. With this, we derive the following regression equation;

$$U_{it} = b_0 + b_1(X_{it}) + b_2(Y_{it}) + b_3(Z_{it}) + e_0$$

The U_{it} variable is the unemployment percent value for each given year for a specific state. This information is easily accessible via data from the Bureau of Labor Statistics. It is expressed as a percentage of the available workforce unemployed on a yearly basis. X_{it} is the number of legal immigrants per 1,000 residents. Y_{it} represents the number of illegal immigrants per 1,000 residents. By using each value as a per-capita figure, we can normalize the data across all states in the dataset.

There are many factors that affect the unemployment rate, ranging from local tremors in the economy to political climate to structural changes. In order to account for this, a large number of smaller variables are possible. Due to limitations of time and available data, these effects must be approximated in the Z_{it} variable using per-capita GDP as a measure of local effects on unemployment not related to immigration. In order to control for issues of specific labor distributions, we are going to separate the percent of GDP per-capita from agriculture in the state.

The difficult variable to quantify is our variable in question; Illegal immigration. By its very nature illegal immigration is meant to circumvent governmental monitoring, that means there are no perfectly reliable statistical values to monitor these values. In order to approximate this value, The most viable, and in fact one of the only possible measurements, is the number of illegal immigrants captured and/or deported in the given year from a given district. To do this, we are using annual report numbers from the Department of Homeland Security and the Border Patrol Division.

The border patrol region is divided up into sectors, rather than states, so getting a perfect

matchup is impossible. However, with some flexibility, we can approximate the areas we want by combining different sectors. The California Data is a combination of the San Diego, El Centro, and Livermore sectors. Arizona is encompassed by the Yuma and Tuscon sectors. New Mexico is almost perfectly framed by the El Paso Sector. Texas data is a combination of the Marfa, Del Rio, McAllen, and Laredo sectors. Due to the division of Border Patrol sectors not perfectly matching state lines, some of Nevada must be included in both the California and Arizona data, as well as a portion of Oklahoma included in the Texas data values. However, since there is no better way to measure the given variable at the time, we must accept the slight skewing effect this limitation has on our final results.

All data is taken on an annual basis, from the year 1999 to 2009. This is the longest amount of time possible given the data available. The Department of Homeland Security incorporated the United States Border Patrol, and revamped it's data collecting methods as well as it's district borders. Due to this, using data from both before and after this time is impossible.

DESCRIPTIVE STATISTICS: (Table 1)

<u>VARIABLE</u>	<u>MEAN</u>	<u>STD. DEV</u>	<u>MINIMUM</u>	<u>MAXIMUM</u>
ILLRATIO	28.8	36.81	0.55	136.69
LEGRATIO	3.64	1.96	1.23	8.21
PERCAPGDP	34020	4223	27682	42319
FARMPERCAP	796.72	269.88	311.41	1436
UNEM	5.35	1.11	3.6	9.2

The variable of interest, unemployment, varied from a minimum of 3.6% to 9.2%, reaching it's highest point in the most recent year in the data. The high standard deviation compared to the mean for the illegal immigrants per 1,000 residents may be an indicator as to the reason behind the regression results.

RESULTS:

F-tests indicate that Galloway's method does not hold for this model, and a two-way fixed effect is the best method to estimate results. The resultant R-square value from the model is 0.83. But a high R-square value is to be expected in fixed effect models.

None of the variables of interest were statistically significant, with P-values ranging from 0.2095 to 0.8203 (Table 2). However, the parameter estimates given are interesting. If the regression model holds true, the positive value of the legal immigrants tells us that legal immigrants serve as substitutes, and increase unemployment in the states observed. However, the opposite is true of illegal immigrants. The negative parameter estimate indicates theory is correct that illegal immigrants serve as complementary labor, lowering unemployment. It is also possible that this is due to illegal immigrants entering a country during times of economic prosperity. Time restrictions prevented the testing of that hypothesis. However, the diminished size of the parameter estimate indicates that the effect of illegal immigration is less than 1/10th of the effect of legal immigration.

Even though our parameter estimates are low for both legal and illegal ratios, this does not indicate there is no effect. Given that these are immigrants per 1,000 residents, and states have millions of residents, even a small parameter estimate could have large effects. In this case, this would mean a dramatic shift in unemployment.

TABLE 2:

<u>VARIABLE</u>	<u>ESTIMATE</u>	<u>ST. ERROR.</u>	<u>T-VALUE</u>	<u>Pr > t </u>
INTERCEPT	-2.98	7.14	-0.42	0.68
PERCAPGDP	0.00025	0.00019	1.29	0.21
FARMPERCAP	0.000033	0.00145	0.23	0.82
ILLRATIO	-0.0113	0.0104	-1.09	0.28
LEGRATIO	0.197	0.256	0.77	0.45

LIMITATIONS AND FUTURE RESEARCH:

With data being taken by purely legal means, and the immigrants themselves being in this country by illegal means, collecting accurate data on how many illegal immigrants are currently working is difficult. Instead, the proxy variable is likely to only be a somewhat effective measure of the variable of interest,. However, as there is no other method we currently have to measure it more accurately, this is the only means we can reliably use, as was discussed in Hanson (2006).

Due to data restrictions and collecting methods, the Department of Homeland Security has divided their jurisdictional areas up into regions that overlap multiple states, or are only sub-sections of states. Due to this, the study must, by necessity, include some small areas that it should not. Without any other method by which to acquire the needed data, this was an unavoidable limitation to this research project. Also, with the restructuring of the Border Patrol and re-coding of their sectors of jurisdiction, there is no data available before 1999 that would be compatible for comparison with data after this year. This limits the number of years, and size of the dataset available to us.

Given the reduced timeframe (15 weeks) and the limited access to data without spending considerable amounts of money on restricted data, the econometric model used for this regression does not match perfectly with other econometric models. The per-capita GDP variable was used to account for most economic factors for which data was not specifically available at the present time without massive investment. This still leaves some questions unanswered about the nature of our results, and if there is an omitted variable bias. Future research would do well to separate out and test for other mitigating factors in unemployment next to illegal immigration values to attempt to discern if omitted variables may have affected results. Other factors that can affect unemployment should be controlled for in future studies.

CONCLUSION:

Using recently developed data from different government agencies, we have attempted to determine the likelihood that illegal immigration has a significant impact on the unemployment rate in states across the United States/Mexico border. While the final results for all data was insignificant, this does not mean the research was useless. Future research can be done to determine what effect illegal immigration has on the surrounding economy, and if this may, in fact, have displaced effects on unemployment.

Illegal immigration may not be significant in this study numerically. But that does not mean it has no effects on the larger scale. While unemployment may not be affected heavily in the area studied, the effects may be further reaching, as these immigrants move throughout the country, and displace workers in other locations. Not only will immigrants move, but they may also displace domestic workers, who then must move and find employment elsewhere, causing a ripple effect. Even with a low level of significance, the sheer number of illegal immigrants may still be a strong factor in future economic decision-making.

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