

Abstract

OSBORNE, WILLIAM SCOTT. Immigration and its Impact on U.S Wages and Employment.
(Under the direction of Dr. Walter Wessels.)

This paper goes over some of the theoretical background for immigration supply and demand and reviews what should happen to wages and employment as immigration increases. Additionally, demographics of United States immigration are discussed to help predict the impact of immigration. Then the paper goes on to discuss several important studies which attempted to measure immigration's impact on these economic indicators. Finally, a regression analysis is run looking at the impact immigration has on the wages of people in different occupational and educational groups. The results support the existing research and theory but are quite small and in some cases not significant. The methodology of grouping by educational groups in the final part of the paper produced the clearest results.

Immigration and its Impact on U.S Wages and Employment

by
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Introduction

The new age of globalization has given rise to historically unprecedented opportunities for exchange of goods and services across international borders, an issue which has gained much attention. However, the movement of labor from one country to another becomes ever more relevant due to our increasingly interconnected world. Centuries ago, international migration was reserved for only the privileged few who could bare both a financial risk resulting from high transportation costs and the mortality risk of a difficult overseas journey. Aside from indentured servitude, laborers simply could not and did not make the move. A passage to America around the year 1650 cost roughly six pounds, equivalent to about five months of wages for a British agricultural laborer (Hatton and Williamson, 2005). Today, the composition of immigrant workers has completely changed as migration opportunities have opened up to more and more groups. Educated doctors and engineers continue to migrate to the United States, as do many low-skilled laborers from Latin America.

As an example of the unprecedented ease of migration, by 2004 ten and a half million Mexicans were residing in the United States. This is equivalent to ten percent of the entire population of Mexico (Ehrenberg, 2006). Most of these immigrants that arrive in the United States are coming increasingly from countries with levels of educational attainment that are much lower than the average rates in the United States an because of this they find

themselves severely lacking in human capital (Borjas, 1994). Given the often substantial differences present between immigrant workers and native workers, it is only natural to examine the impact that their move will have on the destination country.

Many questions arise from the movement of these workers. Do natives come out losers from immigration due to lower wages? Or do natives win out as immigrant workers lower business costs while leading to a greater specialization of labor and greater opportunities for skilled workers? These questions have attracted much attention in recent years and can be difficult to answer with a great deal of certainty due to the fact that immigration will trigger multiple effects of varying magnitudes often working in opposite directions for different groups of people. Nevertheless, quite a bit of research exists to provide some clarity to these important questions. This paper looks to serve as an examination of these different labor effects through a review of previous research and my own data collection and analysis. The goal of my research is to provide the reader with a broad understanding of immigration economics, which has become one of the more controversial socioeconomic issues of our time. Through examination of this labor issue for different groups of people, the reader will be able to understand the issue in its entire context. Mostly, the focus will be on the United States and its relationship with Latin America but other important examples of global migration will be touched upon when needed.

Theoretical Background

The impact of immigration on the host country will depend on several factors, most notably the skills of the immigrants and the skills of the natives. Simple economic theory can offer a prediction but will, of course, depend on the assumptions made.

Figure 1 illustrates the theoretical result of an increase in the supply of labor. This situation is based on the assumption that immigrants and native workers are close substitutes for one another. The labor demand is represented by the downward sloping curve. In this example it is assumed that the level of capital and technology in this economy are fixed. When a new batch of immigrants arrives, it shifts the labor supply from S_1 to S_2 . This lowers the wage rate from W_1 to W_2 and increases total profits from the area X to the new area of X + Y + Z. The loss of wages for native workers is represented in area Y with the net gain to society being area Z. Therefore, the gains the native capital owners experience are greater than the losses to native workers. Profits will increase and this will serve as a signal that causes investors to increase investments in the business. These higher profits will also have the effect of drawing more businesses into the market which will eventually bring profits back to normal in the long run (Ehrenberg, 2006). Thus, as a whole, this economy benefits from the new immigrants. In this particular example, the demand curve slopes downward at around a 45 degree angle. A more elastic demand curve would mean the wage drop would be smaller and thus native workers would lose less as a result of the increase in

labor supply. We say that the elasticity is very high when immigration induces a large change in the wage and very low when the wage decline is small. If the labor demand elasticity in this economy were -0.4 then that would mean for every ten percent increase in workers that the wage would fall by four percent. The net gain from immigration for natives as a whole is going to be fairly small.

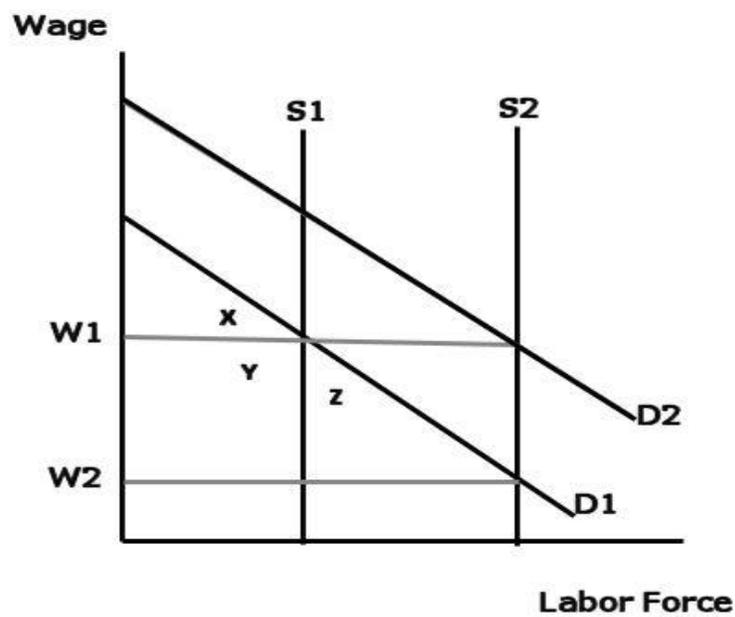


Figure 1 Effect of a change of supply and demand on the wage.

Örn Bodvarsson (2009) estimates the loss to native substitute workers at 1.9% of GDP and the gain to natives holding complementary capital at 2.0% of GDP. This leaves a 14.64 billion dollar surplus which translated to around \$45 per capita. Several more sophisticated studies have tried to estimate the surplus received from immigration and most have come up with numbers that are very low.

For instance, George Borjas (1999) estimated the aggregate national gain from new immigrants to be .1 percent of national income and Freeman (2006) estimates that for every ten percent increase in immigration, GDP increases around .2%. Of course, the distributional effects are not constant. This could explain why business and labor remain the most vocal proponents and opponents of immigration. Some segments of the population benefit more than others, which is a principal issue that this paper sets out to explore.

If we assume that capital is not fixed, as in the long run, then the labor market effect demonstrated in this chart could keep the wage at W_1 instead of W_2 . For instance, if capital is allowed to flow freely across borders as well then we can expect greater use of capital as its returns have now increased. Initially, labor productivity would fall with an increase in immigration but because an economy will be on a balanced growth path over time, the capital to labor ratio will normalize over the long term. This is because immigration causes a decrease in the capital to labor ratio due to the increase in worker numbers. With this below its long term trend the wage would fall. However, investing in capital increases and labor becomes more productive. Ultimately, the wage rises back to where it was (Ottaviano and Peri, 2006).

This diagram is also oversimplified by the fact that not all workers are identical. In real life each worker brings different skills and educational attainment from other workers. Even in the same occupational group with the same level of education it is unrealistic to assume native workers and foreign workers will be identical. Cultural and linguistic differences will

ensure this. It may be that immigrants tend to substitute for each other and not for natives. This is a topic that will be explored later on.

Any realistic example must account for workers that are skilled and workers that are less-skilled. Some workers can actually benefit if unskilled workers and skilled workers are complements in production. For instance, if a company were to hire a certain ratio of managers to laborers then a large influx of unskilled immigrants could be beneficial to natives with managerial skills. Even among workers with similar qualifications it is conceivable that they can complement one another and increase productivity. A team of scientists could be better as a group than just one scientist by himself. Borjas (1995) argues that immigration surplus will be larger when the group of immigrants is quite different from the native population's skill base. Also, it is conceivable that immigration can increase the labor market participation of native skilled workers in other ways. For example, unskilled female immigrants can do work around the home such as cleaning and child care and that will allow skilled workers to be released from home duties (Hatton and Williamson, 2005).

Örn Bodvarsson (2009) presents the following hypothetical production function for skilled and unskilled workers:

$$Q = f(L_S, L_U) = f\{[bN + \beta M], [(1 - b)N + (1 - \beta)M]\}$$

In the above equation it is assumed that aggregate output is a function of two inputs, skilled labor and unskilled labor. The labor supply curve is perfectly inelastic and this production function yields constant returns to scale. L is the sum of N and M , which

represent native and migrant labor quantities. Also, b and β are the percentages of skilled workers among natives and migrants. Thus, $(1 - b)$ would be the percentage of unskilled native workers in the population. If the share of immigrants in each category were the same as natives then wages would not change at all since both L_S and L_U would increase proportionately. However, this situation is unrealistic in a real world setting. Even if two countries had identical skill proportions in their respective labor forces we would still expect the immigrant group to be inherently different in some way with the population that is staying home. Assuming the composition of immigrant labor is different from the composition of native labor, we would expect immigrants to impact the wage. If the immigrants were less skilled on average then this would raise the wage of skilled workers but reduce the wage of unskilled workers who compete with the immigrants for jobs.

These simple models do have a couple of shortcomings. They are assumed never to run into any wage obstacles such as a minimum wage. It is also possible that if the labor markets do not clear then immigrants will add unemployment. They can either dominate 'informal' type jobs with low productivity while natives take the better paying 'formal' jobs or immigrants can take jobs from natives, depending on business hiring preferences (Hatton and Williamson). Additionally, we assume that all workers in the area prior to the arrival of the immigrants stick around and accept a lower wage. It is possible, and maybe realistic, to expect that some of these workers leave the geographical area in search of higher wages.

Of course, an unrealistic idea is that the idea of a demand curve will remain

stationary despite the massive influx of new immigrants. Immigration triggers both supply and demand side effects. As immigrants arrive they will also consume products and services. This shifts out the demand curve and raises wages as immigrants begin to consume the minute they arrive. Once these immigrants find employment the supply curve shifts out and wages fall. Whether wages are shifted up enough to cover wage reduction induced by the increased supply of labor is unclear and will depend on wage elasticities, their preferences, and working skills of the immigrants. The impact on wages is thus the sum of the supply and demand effects. Because these effects work in opposite directions they tend to cause only small changes in wages as a result of immigration. Lach's model (2007) tackled this ambiguous demand issue using Jewish immigrants from Russia to Israel. If the new immigrants do not drive out natives at the same rate then the demand for goods and services should shift out and raise the prices. An influx of immigrants can also change the slope of the demand curve. Due to cultural differences, it is very likely that immigrants have different taste preferences and work ethic than the natives. The prices could rise or fall depending on whether these new preferences steepen or flatten the demand curve (Lach, 2007).

Previously, we had been looking at the benefits of a country that brings in immigrants with skill sets different from the native population. However, most countries that have highly skilled and highly educated populations also have immigration policies that tend to be more favorable towards potential immigrants that have a strong educational background. It is also

important to look at the possible benefits of expanding the base of educated workers even if it means more competition for native doctors, engineers, and scientists.

Many theories tend to look at labor market effects in a very short term. The Solow model shows that growth in long-term income cannot be obtained through factor accumulation. With a fixed number of workers we have the following situation.

$$\Delta K = I - \delta K$$

The change in capital is equal to the new investments minus the old investments multiplied by its depreciation rate. The level of capital (K) in the economy automatically adjusts to a steady state. If investment is greater than depreciation then the stock will grow and because of diminishing returns the capital will eventually only add enough to cover the depreciation of the existing stock. After this there is no growth in K. If immigration is incorporated into the equation then the new capital must grow at the same rate as the labor force. If we assume n is equal to the growth rate in the labor force then capital must now grow to cover not only the depreciation of the old stock but the new workers as well.

$$\Delta K = I - \delta K - nk$$

Now that the population has increased, the steady state for k is now lower than it would have been without the increased labor force. Thus, output per capita will be negatively correlated with a higher rate of immigration (Bodvarsson, 2009).

The Solow model also shows that growth in per capita output only occurs through technological progress. Immigrants could help speed up technological progress and make workers already here more productive and shift the production function outward. With the United States still being a very attractive place for the most educated people abroad, it could stand that having an open policy to bring in more immigrants may lead to greater technological advancement here and abroad through sharing of information. Or, more simply, if we assume that creativity and genius are randomly spread throughout the world then we have a much better chance of finding the next great idea with a larger pool of new Americans. Later on this paper will examine if these theoretical situations presented do manifest themselves in the data.

Origin of Immigrants to the United States

Because the immigrant population is not homogeneous, it is important to understand the current demographics and trends to be able to make sense of any research. Research involving immigration that uses dummy variables to account for country of origin has found

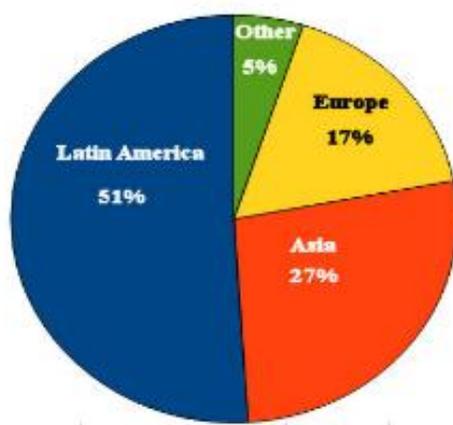


Figure 2 Immigrant Composition of the United States in 1997

that these variables explain thirty percent of the variation in education levels among immigrants (Card, 2005). The following is a pie chart detailing the origin of immigrants that were in the United States in 1997. The regions our immigrants are coming from are vastly important, as not all immigrants are the same. For instance, if the Asian section of the pie chart were to cover seventy percent of the chart's surface, we could expect much different supply and demand effects from what we see today. There are inherent differences in the average statistics of an Asian immigrant as compared to a Mexican immigrant. The composition of this pie chart represents a major change from what it would have looked like

just fifty years ago. In 1960, the Census Bureau estimated 9.7 million foreign-born individuals were living in the United States. Of this, 7.2 million came from European countries. Less than one million came from Latin America and less than five hundred thousand came from Asia (Census Brief, 2000). The vastly different composition of immigrants can be partially tied to U.S immigration law. In 1924 the federal government passed the Immigrant and Nationality act, which set up national origin quotas that strongly favored Northern Europeans. A later act passed in 1965 scaled back the old law in favor of preferences for immigrants with family already in the country (Card, 2005). This dramatic shift means that immigration today is much different than in the past. Modern immigrants bring different skill sets, educational backgrounds, and financial means than their counterparts of the 1960s. Because of this, wage shifts resulting from immigration produce different winners and losers than even a generation ago.

Immigrant Type

As discussed earlier, the impact of immigration on wages depends largely on the skill set of the immigrants compared with the skill set of the natives. In order to assess both the aggregate and distributional impacts that immigrants have on wages in the destination country, we must know which types of people from the source country are choosing to emigrate. Clearly, those that decide to leave are not a random selection of the population. For instance, there could be high costs associated with leaving or there could be particularly

low wages in a given sector of the source country relative to the destination country which causes a migration of workers. Due to these reasons and many others we say that there exists a selection bias in the flow of immigrants. This bias can work in either direction where immigrants can be more skilled than the average worker or less skilled. These are referred to as positive and negative selection biases (Bodvarsson, 2009). Many economists including Borjas (1994) argue that immigrants from Latin America who are moving to the United States tend to be less productive workers and earn less than native-born Americans. If economic opportunities are reduced for a particular group in the source country then they will be disproportionately represented in the immigration numbers.

Borjas predicts that when the average expected wage in the source country falls below the mean of the source country that the source country will likely send out more highly skilled workers or exhibit a positive selection bias. Borjas draws several conclusions from his research. First, the lower migration costs are, the less selection bias will occur. Second, a scale effect is produced when the source country's income level changes. A drop in income in the source country will cause more people to emigrate just as a rise in mean income will cause more to stay at home. Lastly, is that increases in the earnings gap in the source country will cause more lower income individuals to migrate, as their wages fall with the earnings gap increase. This last prediction is especially relevant when examining Latin American immigration to the United States due to the wide income gap currently present in Latin American countries (Bodvarsson, 2009).

Chiswick (1999) developed a model to show the rate of return to migration. The equation is as follows:

$$r = (W_D - W_S) / (C_I + C_E)$$

The numerator ($W_D - W_S$) represents the difference in wages between the destination country and the source country. The denominator ($C_I + C_E$) represents the sum of explicit migration costs and the implicit opportunity cost. Chiswick theorizes that migration will occur if the rate of return to immigration is greater than the rate that could be obtained from investing the costs. Suppose wages for high-skilled workers are k percent higher than for low-skilled workers. This leaves:

$$W_{D,h} = (1 + k)W_{D,l}$$

$$W_{S,h} = (1 + k)W_{S,l}$$

Therefore, because the explicit costs of immigrating are assumed to be the same for both low-skilled and high-skilled workers that leave us with the equation:

$$r_h = \frac{(1 + k)(W_{D,l} - W_{S,l})}{(1 + k)C_{I,l} + C_E}$$

The returns for highly skilled workers are greater than the returns for low-skilled workers in the source country. Under this model above we would expect to see a bias

towards the most skilled workers in the country (Bodvarsson, 2009).

Below is a collection of data collected by Hatton and Williamson (2005) displaying the out migration rates of average citizens of various developing countries contrasted with the out migration rates of those citizens with higher than average levels of educational attainment.

Table 1 Migration Rates from Developing to Developed Countries (1990)

Country of Origin	Total Migration rate	Workers with 13 or more years of education
Argentina	0.6	2.7
Bolivia	0.7	4.2
Brazil	0.2	1.4
Chile	1.1	6
Colombia	1.1	5.8
Costa Rica	2.4	7.1
Dominican Republic	6.5	14.7
Ecuador	1.9	3.8
El Salvador	11.3	26.1
Guatemala	3.4	13.5
Guyana	14.5	77.5
Honduras	3	15.7
Jamaica	20.3	77.4
Mexico	7.7	10.3
Nicaragua	4.7	18.8
Panama	6.7	19.6
Paraguay	0.2	2
Peru	1	3.4

Trinidad and Tobago	9.5	57.8
Uruguay	1.1	3.8
Venezuela	0.4	2.1

In every country the most educated are leaving at a higher rate than the general population. Many of these countries are losing a staggering percentage of their college educated population such as 77.4% in Jamaica. This is a fear known as the “brain drain” where the best minds in a country choose to live elsewhere. However, many who have left their home country have come to Western Europe, Australia, or the United States specifically to further their education. Between 1995 and 1999 around one third of all foreign citizens staying in the United Kingdom were students. Among colleges and universities in the most popular host countries, nearly 37 percent of all students are foreign with about half of those being from developing countries (Hatton and Williamson). This means that these individuals are likely only temporarily in the destination country and will return to their home country with a greater skill set. This fact makes the brain drain much less pronounced and means that many of these educated immigrants are not coming to developed countries to compete with skilled workers and thus will not have an impact on the wage rate. Despite the fact that the most educated are emigrating from their home countries this does not mean that immigrants necessarily have higher educational levels than the natives in the destination country. The issue of educational attainment of immigrants relative to natives is a major factor in determining wage shifts and will be explored later.

Educational Attainment of Immigrants and Natives

One way to measure the type of immigrants coming to a new country is to look at education rates. We would expect the wage impact of arriving immigrants to be felt the most by those that compete for jobs with the immigrants. In order to analyze this impact, it is necessary to examine the educational attainment and career preferences of the immigrants as they compare to the natives. This can help predict whether natives and immigrants will be likely to act as substitutable workers or complementary workers, which is critical in any wage study. Also important are the trends in place so we can make inferences about the future. Understanding the educational gaps will allow us to make sense of trends and better predict migration impacts for both natives and immigrants.

Because wages are directly related to the amount of education one obtains in a lifetime, the impact of immigrants on the educational system has direct results for the lifetime wages of both natives and immigrants. Several situations are possible. First, if less-skilled workers were to migrate to a new country this would drive down the wages of the less-skilled natives that compete with them for jobs. Thus, additional incentives to obtain a higher education are created. On the other side, immigrants who have not learned the native language can make secondary schools less effective. At the university level, new immigrants who are more educated offer competition with natives for admissions.

There exists a significant difference in educational attainment of immigrants compared to natives of the United States. Furthermore, there also exists a large difference in the growth in educational attainment. For instance, between 1970 and 1990 the already lower mean level of education for immigrants only grew by two-thirds of a year. The educational level for natives grew by one and one-third over this same period. While the education level did increase among immigrants, it actually decreased when looking at it relative to natives. The educational attainment of the top half of immigrants grew by, and matches, the educational attainment of natives. The mean is pulled down by much lower levels of education by the bottom half of immigrants. In the United States, the less educated bottom half tends to be occupied with immigrants from Mexico and Latin America, whereas the top half mainly consists of immigrants and temporary students from East Asia, Europe, and Canada (Betts and Lofstorm). As was shown earlier, because less educated immigrants from Latin America are beginning to dominate the composition of new immigrants to the United States, the high average educational levels of European and Asian immigrants are being pulled down.

To measure education, many studies have looked at enrollment rates at different levels of schooling. The average Hispanic immigrant was found to have an average of seven years of schooling and had been out of school for a year or more by reaching the age of 16 (Betts and Lofstorm). Many of these immigrants may find it difficult to keep up with native classmates. While immigrants comprised only 13 percent of the working age population in

2000, they made up 28 percent of the population with less than a high school diploma, and over half of all those with less than 8 years of schooling (Card, 2005). Interestingly, immigrants are 18 percent less likely to graduate from high school but are not less likely to graduate from college (Betts and Lofstorm). An explanation for this would be that the United States is attracting two types of immigrants – one segment more educated than the native population and one segment substantially less educated than the natives. This implies a great diversity in the types of immigrants in the United States and that grouping them all together may produce some misleading conclusions. This can be further illustrated by the following educational attainment chart (Betts and Lofstorm) for natives and immigrants in 1970 and 1990.

Table 2 Educational Attainment (Years)

Group	Natives (1970)	Immigrants (1970)	Natives (1990)	Immigrants (1990)
All	11.36	10.59	12.69	11.28
White	11.63	10.97	12.88	13.07
Black	9.49	11.01	11.6	12.18
Hispanic	9.46	8.83	11.44	8.86
Asian	12.09	11.86	13.38	13.45

In every group except for Hispanic immigrants, natives of the United States were less educated than their immigrant counterparts in both periods. The education level of incoming Hispanics was also virtually constant across this time, whereas attainment among all other groups increased. This fact would explain an earlier statement of how average immigrant levels of education have fallen relative to natives over this time horizon.

These educational differences are likely to manifest themselves in the labor market with consequences for earnings. In 1990 this earnings gap was close to 18 percent between natives and immigrants. The addition of regression controls that accounted for education and education interactions, caused the gap to fall to seven percent. Essentially, more than half of the difference in wages can be attributed to the education gap. This gap was found to be larger with older workers than younger, indicating other involved factors such as age (Betts and Lofstorm).

A likely faulty conclusion would be that one year of education abroad directly corresponds to one year of education in the new country. Friedberg (1996) found that returns to education in the source country are much lower than returns to education in the destination country. This suggests labor markets may be placing less emphasis on education done elsewhere. Betts and Loftstrom conducted a regression analysis to test this and discovered that we cannot reject their null hypothesis for equal returns on education with Europeans and Asians who were educated in their home countries. Whereas, the opposite is found with Hispanics, as it was more obvious that a year of schooling in Mexico does not

translate to a year of schooling in the United States. This issue further reinforces the notion that immigrants to the United States from Latin America are inherently different than immigrants from elsewhere. Traveling from Europe, Asia, or Africa presents much higher explicit costs than travel from Latin America. This is consistent with the previously mentioned Borjas assumption that higher migration costs lead to a selection bias. This fact also validates the Chiswick equation. We would assume the explicit costs to be very high for potential Asian immigrants and much lower for nearby Hispanic immigrants. Thus, a favorable rate of return to immigrate to the United States is less dependent on skills in Latin America than it is in Asia, Africa, and Europe. Because the average educational attainment of each type of immigrant is looking less and less like the native average attainment, it raises questions about the actual substitutability of native and foreign-born workers.

Substitutability of Native and Immigrant Workers

As mentioned earlier in the theoretical section of this paper, substitute workers could lose from immigration while complementary workers could gain. An interesting issue investigated by Ottaviano and Peri (2006) is whether or not American workers should even be considered substitutes for immigrant workers. They argue that low wage immigrants are mainly competing with each other for jobs and driving down the wages of other immigrants and not natives. The average educational attainment for Americans is beyond high school but below finishing a four year college degree. Immigrants to the United States tended to

occupy the extremes on educational attainment meaning that the United States attracts those with very low levels of education as well as those with the highest levels of education while native born Americans sit in the middle. In 2003, thirty percent of PhD scientists, engineers, and technology workers were foreign-born. Meanwhile, another twenty three percent of foreign born workers lacked a high-school diploma. For natives, the number with less than a high school degree is under ten percent and shrinking. Sixty percent of native-born Americans have either a high school degree but not a four year degree. Only eight percent of foreign-born workers fall into the category of just 12 years of education (Ottaviano and Peri, 2006). The conclusion drawn by the research of Ottaviano and Peri is that those with intermediate levels of education, the native born Americans, are made more productive and thus get a higher wage due to the increase in complementary workers on both ends of the education scale.

Even with equal educational levels foreign workers and domestic workers occupy different sectors of the economy. Less educated foreign born individuals tend to work in agriculture and personal services while lesser educated Americans dominate work in manufacturing and mining.

Immigration and Domestic Migration

One important question about immigration that must be answered in order to estimate immigration's impact on wages is the question of native migration as a direct

response. It is theorized that after a large influx of immigration to a particular location many natives could move out due to the increased competition for jobs. If this were to occur we would be left with an unchanged wage assuming that one native departed for every new immigrant that arrived. It is theoretically possible that this is occurring and for every immigrant that moves to a particular location that the population grows by some number less than one. This possibility is one of the main criticisms and shortcomings over city to city correlation studies. The extent to which this is happening has triggered some interesting research. The above graph is a simplified version of a potentially real issue complicating research. In period one a batch of immigrants arrive and shift the supply of labor from S_1 to S_2 . This raises total employment and lowers the wage from W_1 to W_2 . Now, in the second period, many natives who are dissatisfied with the new wage migrate to other areas of the

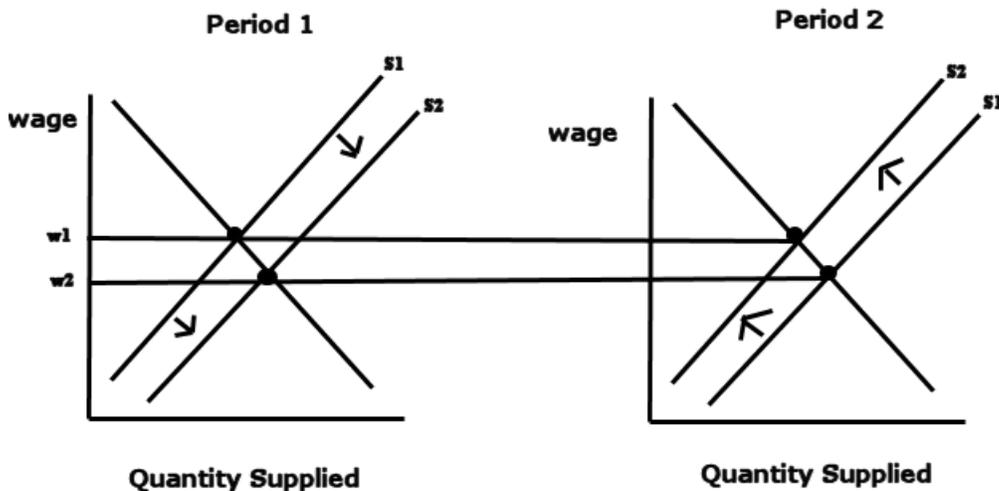


Figure 3 A constant wage through domestic migration

country. The quantity of labor supplied now falls back to its original point and the wage rises back to W_1 . Without considering the possibility of domestic migration as a direct result of immigration, we could wrongly conclude that immigration has no impact on wages.

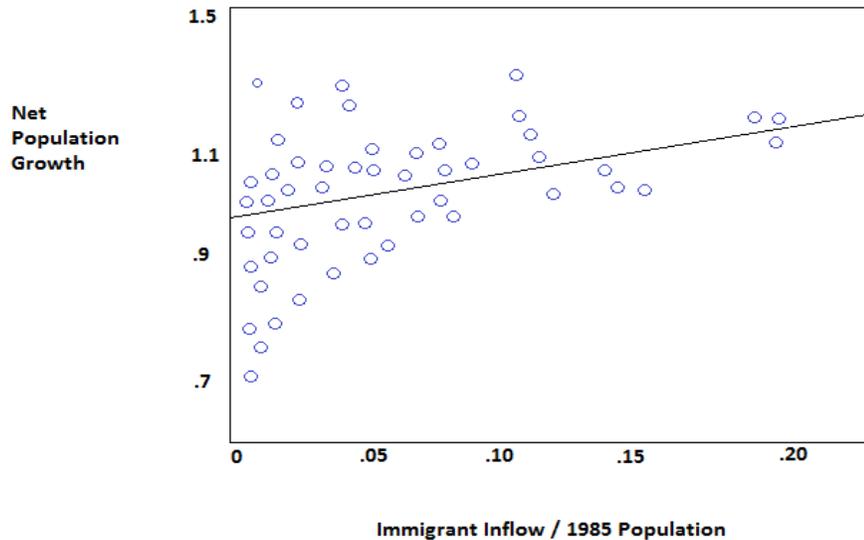


Figure 4 Immigrant Inflows and the Growth in Population

in the industry in figure 3. Furthermore, it is also possible that natives looking to move to this theoretical location may be deterred due to the recent inflow of immigrants. The diverse immigrant population further complicates any research. Immigrants with different skill sets tend to concentrate in different areas and it is also likely that native workers in some sectors are more likely to move than native workers in other sectors. Several important studies seek to examine this phenomenon and determine its magnitude. David Card (2001) correlated the net population growth among laborers and low-skilled service workers in the 175 largest cities with the growth in immigrants relative as a percentage of the 1985 population. Card

lagged the net population growth behind his independent variable because it is unlikely changes in native migration would be instantaneous. What he found was a diagonal upward sloping line with close to a 1 to 1 ratio between his x and y variables. So for roughly every one new immigrant, the total population grew by around 1, as seen in the graph of his results. If the theoretical example presented above held true then this line would be closer to horizontal and would have a slope near zero as one native departs for every immigrant that arrives.

The table to the left includes the OLS and IV results from Card and Dinardo (2000) and uses a lagged dependent variable which is the relative growth in native population between 1970 and 1980. Also included is the fraction of immigrants in the relative skill group in 1980. Finally, they include measures of city population growth from two periods: 1970-1980 and 1980-1990. Interestingly, the relative growth of immigrant population leads to a positive coefficient with growth of unskilled natives. The results they found were mixed among cities that have the highest rates of immigration. Even cities close by one another in the same state yielded very different results. In California, the low-skilled immigrant population grew significantly over the 1980s. San Diego saw its native born population rise drastically while the native population stayed constant in San Jose and fell six percent in Los Angeles. In Florida, Miami and Tampa experienced increases in population of similar size. However, in Miami this was mainly immigrants and in Tampa this was mainly natives. In Miami the increase was associated with large jumps in the number of unskilled workers

while the increase was more uniform in Tampa. Meanwhile, New York, Chicago, and Philadelphia has small increases in immigrant population but had more noticeable declines in native-born population. (Card and Dinardo, 2000).

Admittedly, it is possible that favorable demand conditions in a particular city can lead to an inflow of both natives and immigrants. Card theorizes that immigrant migration patterns may be related to the locations of other established immigrants from their country. The existing stock of immigrants is then used as an instrumental variable for changes in the immigrant skill share. As had been predicted, Card found a strong association between the percentage of Mexican immigrants in a city in 1970 and that city's growth of low skilled immigrants between 1980 and 1990. In the bottom of table 2, they reported their t-statistics for the instrumental variable coefficient. This removes concerns that the IV method in this case may not be accurate if the endogenous variable and instrumental variable are not highly correlated.

Given the higher coefficient values, the IV results depicted in columns iii and iv are contrary to what we would expect. It would seem on the surface that the ordinary least squares results would be biased upwards due to exogenous growth conditions of the city. However, the instrumental variable approach yields coefficients that are larger in every instance than the OLS coefficients. Card suspects there is a downward bias of the OLS results due to errors in measuring the immigrant inflow rates as a result of “slippage in our definition of skill groups, and possible errors arising from changes in the geographic boundaries of cities” (Card and Dinardo, 2000). The authors ultimately conclude that the

Table 3 Card's OLS Results for Migration and Immigration

Variable	OLS (i)	OLS (ii)	IV (iii)	IV (iv)
Low Skilled Group				
Growth of immigrants	.12 (.07)	.24 (.13)	.41 (.16)	.61 (.34)
Growth of natives (1970-80)	-	-.24 (.10)	-.34 (.12)	-.32 (.12)
City growth (1980-90)	-	-.02 (.02)	-.03 (.02)	-.04 (.03)
City growth (1970-80)	-	-.02 (.02)	-.03 (0.02)	-.04 (.03)
Immigrants in skill group (80)	-	0.0 (.04)	-	-.1 (.1)
R ²	0.03	0.1	0.09	0.09
t for instrument in first stage	-	-	6.95	4.77
Pooled Models for Three Skilled Groups				
Growth of immigrants	.15 (.06)	.11 (.08)	.28 (.09)	.24 (.22)
Growth of natives (1970-80)	-	-.17 (.05)	-.17 (.05)	-.17 (.05)
Immigrants in skill group (80)	-	.24 (.15)	-	.08 (.28)
R ²	0.81	0.82	0.81	0.81
t for instrument in first stage	-	-	13.51	6.74

overall results here show that immigration does cause some outflows of natives but we can tell this is very modest as evidenced by the small coefficients (Card, 2001).

Previous research methods and results

Studies on immigration and its impact on the destination economy can generally be categorized into two broad areas. The geographical correlation approach uses various regions in the country to search for key differences. Clearly, some parts of the country receive more immigrants than other parts of the country. Places like California, Texas, and Florida receive the bulk of immigrants to the United States, while other states like South Dakota and Wyoming receive relatively few immigrants. These differences make a cross-sectional approach appealing where researchers try to control for other important factors to isolate the effect of immigration on various parts of the economy like wages or employment. The majority of the research in this field follows this methodology.

One important cross-sectional study was conducted by Altonji and Card (1991). Their results showed very slight negative effects for low skilled workers in the United States. Their study looked at groups which were sorted by race, age, sex, and educational attainment. They found that for black male high school graduates, immigration slightly raises the employment rate but lowers the earnings. For black females with the same educational level the effect was a lower return on earnings and no measurable impact on the employment

rate. For white females, there were no observed effects on either the employment rate or the wage rate (Card and Altonji, 1991).

A study conducted a few years later by Borjas, Freeman, and Katz found that the impact of immigration is not consistent across time. That is, sometimes the net benefits can be positive and sometimes they can be negative. In this study, data were collected from different decades. The returns to immigration seemed to change across time. During the 1960s the returns were negative. During the 1970s the returns were positive. They were again negative in the 1980s (Borjas, 1997). In all cases the coefficients from the regression results are low. This would indicate that either the impact of immigration is small enough that it is possible to flip to the other side of zero depending on other interacting factors or that the regression methods used to estimate this were not capturing all that there was to capture or that different types of immigrants impact the destination country differently and immigrant composition changed.

Another approach is a time series analysis where some kind of outside change occurs so that before and after effects can be analyzed. Usually studies like these find an exogenous event that caused a huge surge of immigration in one particular year. Researchers prefer the exogenous event for simplicity purposes. Hypothetically a situation could arise where immigrants are attracted to a particular location simply because it is experiencing fast wage growth. Even if immigrants came and had a negative impact on wages, we could still see wages increase after their arrival and thus cause someone to perhaps falsely conclude that

immigration had a positive impact on the city's wage. This type of research is generally preferable if possible because the endogeneity factor is automatically removed. Generally researchers refer to “push” and “pull” associated with immigration. Push would refer to a situation in the source country such as a war that “pushes out” many citizens. Pull is when there is something enticing about the new destination, such as much faster wage growth. Of course, research is tricky because most immigrants experience both effects simultaneously. Immigrants from Northern Mexico, for instance, are “pushed” by the high crime and few job opportunities and “pulled” by the relative wealth of the United States.

This type of analysis is useful because researchers do not have to deal with different geographical locations and adjust for other factors in the same way they would with a cross-sectional study. A potential problem with this is that huge immigration shocks are not typical which means that studies have to focus on only a small number of occasions. Also, the impact of a massive influx of immigrants on a city may well be different from a gradual increase, which is what we typically experience. Nevertheless, we will look now at four important studies of modern immigration shocks and the resulting impact.

Perhaps the most important time-series study on exogenous shocks was conducted in 1990 by David Card. Here, Card studied the Mariel Boatlift – a large inflow of Cubans to the United States over the summer of 1980. This event was facilitated by economic turmoil in Cuba and the Cuban government’s decision to let anyone exit the country who desired to do so. The result is that South Florida was hit with more than 100,000 Cuban immigrants. Half

of all the Cuban immigrants settled in Miami. This increased the labor force by seven percent and increased the number of Cuban workers by twenty percent. These increases provided a good natural experiment for studying immigration by comparing the before and after. Additionally, Card's data was collected from the Current Population Survey which distinguishes Cubans as their own ethnic group. Therefore, the study was able to estimate wage changes and employment changes for Cubans and non-Cubans. Prior to the examination of the data, it was calculated that a one percent increase in the fraction of Cubans in Miami would lead to a .95% weighted average increase in the supply of labor to occupations held by whites, a .99% increase for blacks, 1.02% for Hispanics not from Cuba, and 1.06% for already settled Cubans. This indicates that they competed for jobs fairly equally across groups. Because most of the Cubans entered the United States illegally, the exact composition of the immigrants is unclear. Several hundred inmates in Cuba were among those permitted to leave. Some other reports have concluded that the fraction of unskilled workers with poor English comprehension in this group was disproportionately high (Card, 1990).

The results showed that despite the 7% increase in the labor force that the Cuban immigrants had almost no impact on the change in wages or employment in Miami. The impact on whites was nearly non-existent and the impact on other Cubans was weak. Card speculates that there are several reasons why this may have been the case. The first is because Miami was already geared towards low-skill employment and already had a large

Hispanic population which helped the new immigrants assimilate and find employment.

Though, in this particular study Card found that there may have been native migration out of Miami. Prior to the Mariel Boatlift, the population of Miami grew at an annual rate of 2.5% per year compared to 3.9% in the rest of Florida. After the influx of Cuban immigrants, Miami's population had slowed to 1.4% while the rest of the state only fell to 3.4%, a much lower percentage drop. The departure of low-skilled native workers served to raise the wage of those types of jobs while the arrival of Cuban immigrants lowered the wage rate. These two migration effects could have balanced each other out to leave the wage rate constant in Miami. Furthermore, it is possible that the arrival of the new immigrants discouraged natives from moving to Miami who otherwise would have done so.

Another significant shock occurred when over a million Jewish Russians arrived in

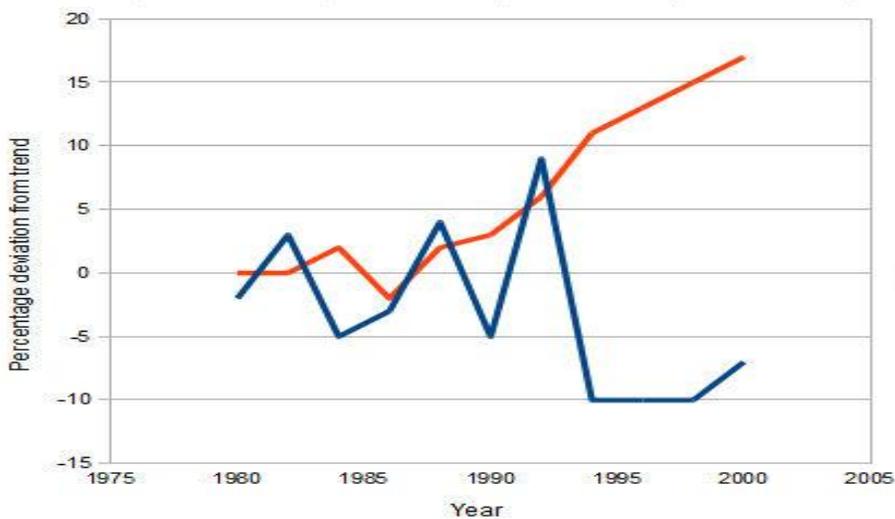


Figure 5 Israeli Labor Force Growth and the Real Wage.

Israel following the collapse of the Soviet Union. In 1989 the Soviet Union was undergoing many policy changes. Like with the Mariel Boatlift, one of these changes was the liberalization of exit requirements. As a result, many Russian Jews emigrated with most going to Israel. However, this influx of immigrants was much larger than the previously discussed shock in Miami. Israel's immigration rate surged from 3.7 per thousand Israelis during the 1980s to more than 35 per thousand in the early 1990s. This translated to an inflow of more than 600,000 immigrants, or an increase of seven percent of Israel's population (Hatton and Williamson). Here the Jewish people were escaping a country towards one with a more favorable attitude towards them. Because they were not moving to Israel for its economic growth, this serves as a rare exogenous immigration shock and makes for a good real-life study.

As was discussed earlier, the large arrival of new labor sparked a surge of investment of capital. Gross investment in machinery increased from 12 percent of the stock to 19 percent over the decade. The evidence showed that the real wage fell by five percent for every each ten percent increase in the labor force (Hatton and Williamson). Other differences from the Mariel Boatlift include the fact that the Russians were more educated than the Miami Cubans and settled all over the country instead of in select geographic areas. These immigrants entered Israel with a stronger educational background than the average Israeli. Twenty-five percent held college degrees compared to only twelve percent of the native Israeli population. However, partly due to poorer Hebrew language skills and other

barriers, the Russian immigrants earned 45 percent less than a native Israeli (Hatton and Williamson).

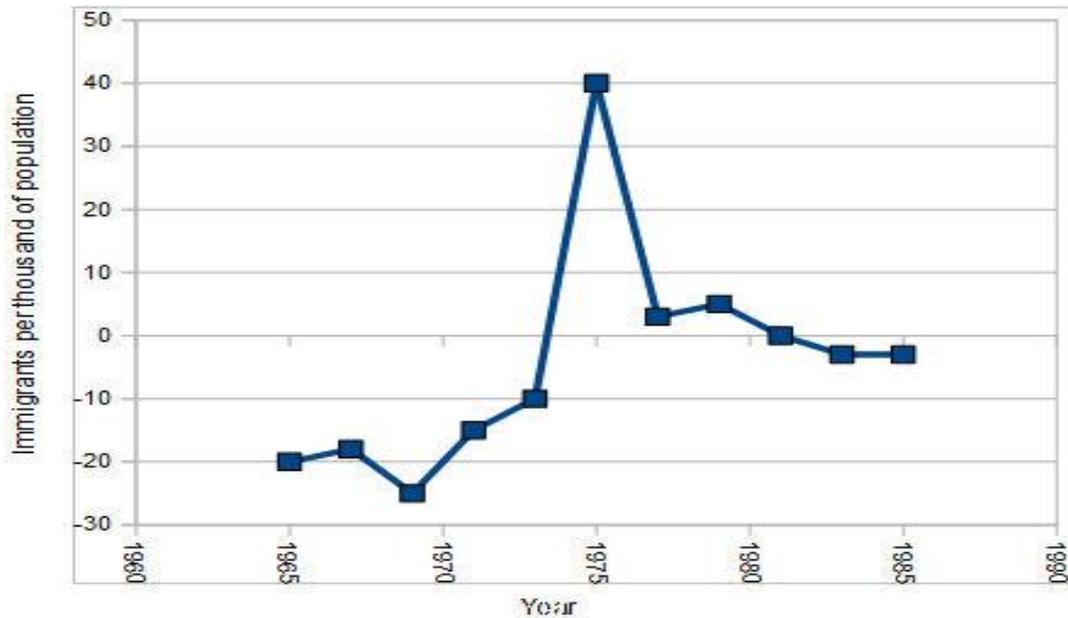


Figure 6 Immigration to Portugal By Year.

Another very large influx on a small country occurred in 1962 when 900,000 people of European origin returned to France after Algeria became an independent state that was free from French control. This event was completely exogenous, as it had nothing to do with the French economy at the time. Those returning to France had some advantages that other immigrants do not enjoy. First, there were not language barriers to overcome. Secondly, the French government took steps to make sure these people assimilated. Businesses were asked to give these returning French citizens priority when hiring. Because most of their

wealth had been tied up in lost property in Algeria, the French government transferred unemployment payments and subsidies for housing (Hunt 1992).

These immigrants were also different from the general population of France in that, when hired, they were disproportionately hired into management, engineering, and other high-end professions. As was the case with the Cuban immigrants, most settled in the southern part of France instead of dispersing throughout the country. Hunt compares the areas they settled in with other areas of the country and also looks at some before and after issues. The beta coefficients of this regression turned out quite small. She concludes that amongst people that had been in France prior to this immigration shock the unemployment increased by a maximum of one third of one percent. However, the unemployment rate among those returning to France from Algeria was significantly higher than for the rest of the country (Hunt 1992).

A similar study to the Algerian repatriation occurred with a return of Portuguese from Angola and Mozambique. Armed conflict for independence forced many Portuguese to leave Africa and return to Portugal. Nearly 600,000 people came to Portugal, adding seven percent to the population. Immigration to Portugal increased drastically and reached forty per thousand natives by 1973. Prior to 1973, immigration rates in the country had been negative due to the outflow of many guest workers. Additionally, around this time the guest worker outflows to France and Germany were stopped. Carrington and de Lima (1996) estimated this reduced the real wage in Portugal by 5 to 9 percent for every ten percent increase in the

population. Just like in Israel, the arriving immigrants dealt with a much higher unemployment rate – 14 percent to 6 percent despite having more formal education than the population in general (Carrington and de Lima, 1996).

The small beta values and conflicting studies appear to suggest that if we could quantify a numerical impact of immigration on our economy that this figure would be quite low. However, effects are felt differently for different groups of people and the effect of immigration on particular sectors of the economy is different from zero.

My Research

Using other cross-sectional studies as a model, I attempt to measure the impact of immigration, specifically from Latin America, on wages and employment of those currently working jobs in the United States. I first compiled datasets for different types of jobs and each data set contained fifty observations (U.S states). The statewide measurements for growth in wages and growth in immigration served as the independent and dependent variables, respectively. I also assembled five more datasets to cover education groups. Each dataset contains fifty state observations and then the median wage change for people in that education demographic. These datasets also contain immigration growth statistics to use predictors in the cross-sectional study.

Cross-sectional studies could be conducted by simply collecting a sample of different cities and comparing average wages for a group with the amount of immigrants in that group

and then comparing city by city to look for trends. This approach is most likely an oversimplification that could produce misleading results. First off, to use this approach we would have to assume that immigrants randomly pick spots on the United States map and then move there. This is unlikely and the distribution of Latin American immigrants seems to prove it. Latin American immigrants are highly concentrated in a few major states and specifically a few cities in those states. There are probably two main considerations made when deciding to immigrate to the United States. First, they are likely to move to states and cities that already have high wages. This fact could distort an analysis that compares a high wage and high immigrant state like New York with a low immigrant and low wage state like Idaho. Also, immigrants seem to be more likely to settle into areas that already have lots of immigrants. If these areas are lower wage by some other factors then this could create a downward bias on the impact of immigration on our economy, as the areas with heavily foreign demographics would fall below the control areas. I'm seeking to adjust for this by using changes in wage and changes in the ratio of Latin American immigrants to natives to hopefully eliminate some of the bias. Also, the state economies are going to naturally fluctuate for reasons that have nothing to do with immigration rates. This can also cloud the results. I am including a measurement of the rate of change to per capita GDP to better fit the model.

Another important factor here is that not all immigrants are equal. They will likely bring different skills and have different impacts on our economy based on their country of

origin. I collected data on all immigrants but broke it up into two categories - immigrants from Latin America and immigrants from the rest of the world. Immigrants from Mexico have been documented to be generally less educated than U.S citizens. However, given the high costs of trans-Atlantic and trans-Pacific travel, immigrants from Asia and Europe are likely to bring more human capital with them to the United States. We would expect them to be more likely to be substitutes for the more educated U.S workers while immigrants from Latin America would be more likely to substitute for our workers without a high school education.

I am using data from the last decade (2000-2008) where I look at the change in variables like wage, employment, and demographics from the beginning to the end of this period. My method compares state by state. This seems to be a better geographic area than city, as displaced natives are less likely to move out of the state than the city. Domestic migration as a result of the immigration would make the results less reliable. As stated earlier, David Card has researched this topic and found that migration did occur following the Mariel Boatlift but argues that in normal cases that out migration as a result of immigration is small. Most of the notable research studies I read took place at least twenty years ago. Hopefully, some new data can add to our understanding of this issue. Also, I'm trying to look at the impact on the overall wage in various occupations. The studies I have read previously are focused on explaining the impact of immigration on the wages and employment of U.S citizens. Given that there are millions of immigrants already here and thousands more arriving every week, I think it is important to look at the effect of the overall wages for the

particular industry and not just how it impacts one group.

I was able to collect all my data through various government bureaus. I used to the American Community Survey data collected by the Census Bureau for 2000 and 2008 to get demographics ratios and salaries by educational attainment. On the Bureau of Labor Statistics' website I obtained state data on average wages for each occupation. The Bureau of Economic Analysis kept annual data on state GDP so I could include this in my model to hopefully account for some other reasons for the increase in wage over the eight years. Because state data was used, there are fifty observations.

The twelve occupations I collected wage growth for included accountants, construction laborers, housekeepers, computer system analysts, lawyers, managers, food prep workers, and farm workers. I also collected data for salary changes based on five educational groups such as no high school degree all the way through post graduate degree. I ran all the regressions and found some consistencies. For simplification I'm only going to report a few sample regressions and correlation plots. The percent change in wage for the occupation between 2000 and 2008 is the dependent variable. Factors like the growth rate

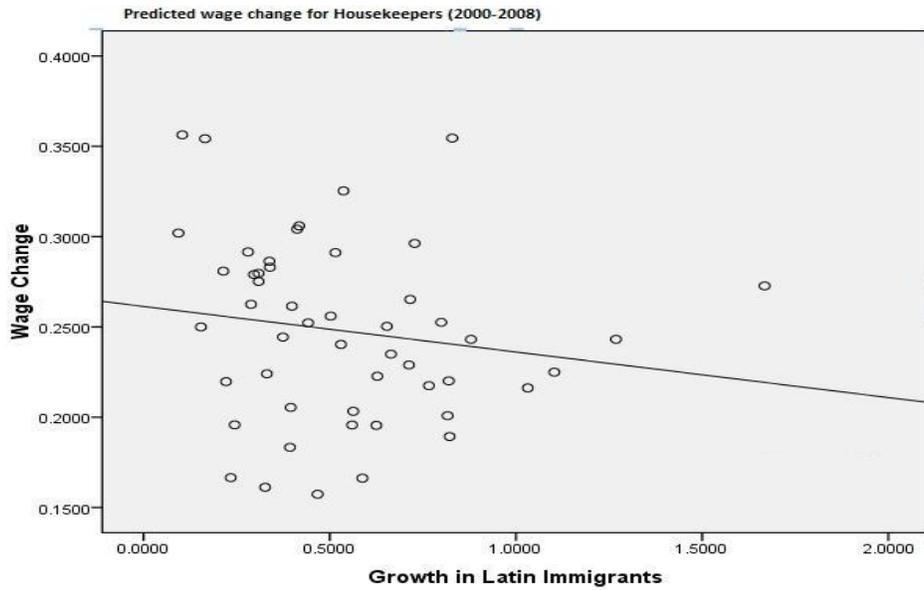


Figure 7 The Predicted Wage Change for Housekeepers Between 2000 and 2008.

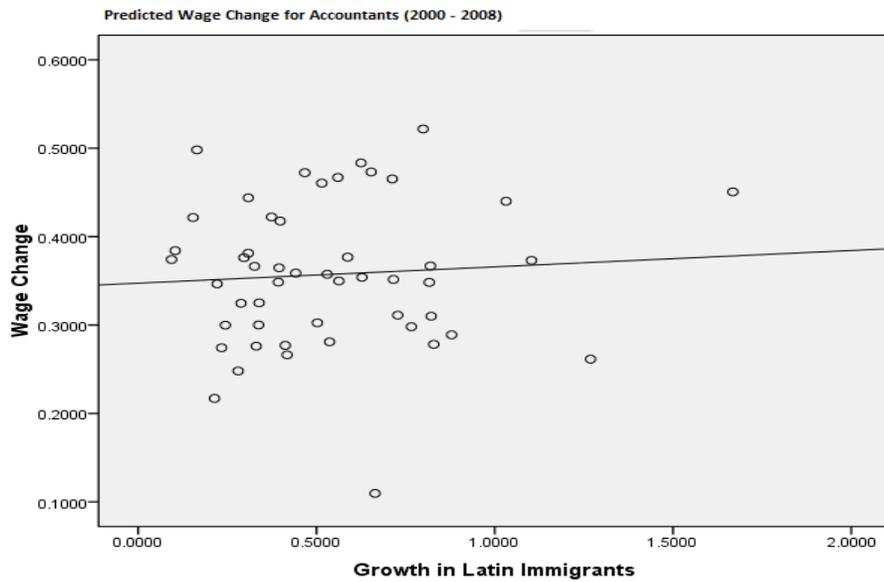


Figure 8 The Predicted Wage Change for Accountants Between 2000 and 2008

of immigration and change in proportion of immigrants were used as potential explanatory variables.

The state results generally yielded slight negative coefficients for the occupations that tended to have higher percentages of migrant workers such as construction and housekeeping. The chart on the left is for the housekeeping data set and the chart on the right is for the accountant data set. Here the percent change in wage was plotted on the vertical axis. On the horizontal axis I plotted growth rate of Latin American immigrants between 2000 and 2008. The correlation here for housekeeping is slightly negative but not significant. The correlation for the accountant data is slightly positive but weak. Each mark on the plot represents a state's predicted percent wage change in the occupation plotted

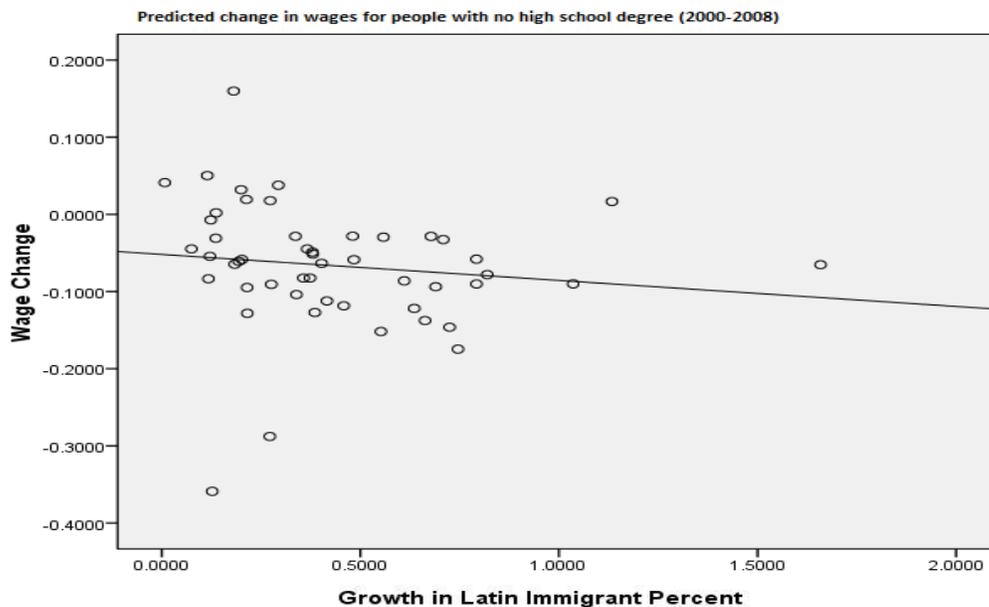


Figure 9 Percent Change in Wages for People with No High School Degree

with the percentage increase in immigrants.

My results for the previous section could be misleading if there exists an endogeneity problem. It is possible that natives switch out of occupations that tend to attract lots of immigrants in favor of other occupations. This would cause the wage to appear higher than it should be due to labor suppliers dropping out of the market. In order to hopefully account for this, I examined five different education groups. Although, it is even possible that lowering wages for the least educated workers could push more and more natives to finish high school over the long term. The two graphs below come from my analysis for five different education demographics. Growth in the percentage of Latin American immigrants is trying to predict the percent annual salaries increased between 2000 and 2008. I studied non-high school graduates, high school graduates, college attendees, college graduates, and people with post graduate degrees. The graph on the left is for post graduates and the graph on the right is for people without a high school degree. Again, the data is by state. Of the five regressions I ran, only people without a high school degree saw their wages fall as the percentage of immigrants relative to the whole population increased. This is consistent with the theory that these workers are substitutes for the labor from abroad while more educated workers are complementary. However, the ratio of immigrants and the growth rate of immigrants do not appear to be significant variables in predicting wage growth some of the time. A few sample regressions and explanations can be found in the Appendix.

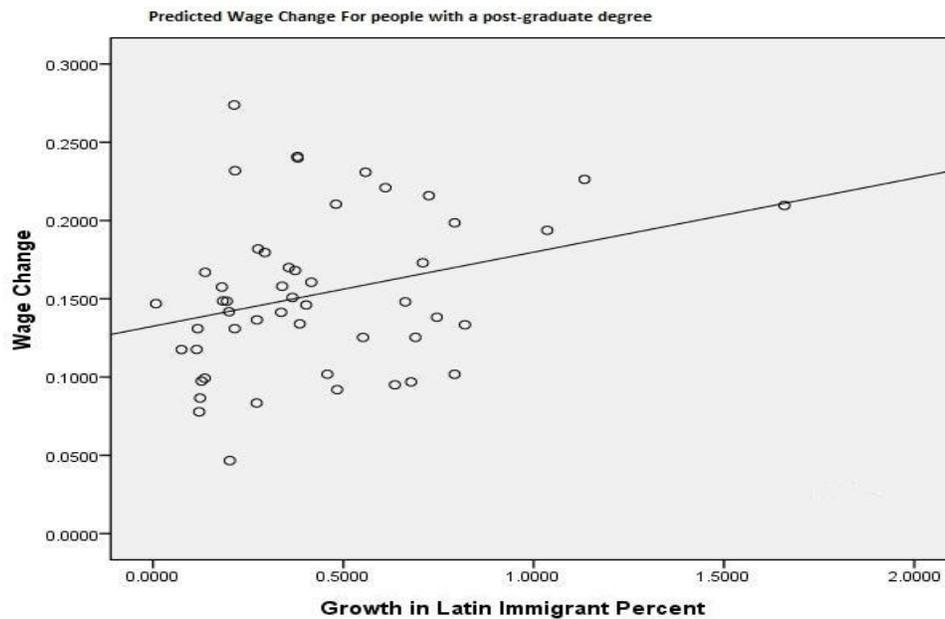


Figure 10 Percent Change in Wages for People with a Post Graduate Degree

Concluding Remarks

My data suggest that the positive or negative impact of immigration from Latin America on wages in the United States depends upon the ease of substitution of native workers and immigrants. The least educated workers stand to lose due to increased competition for jobs while the most educated workers benefit from the increased demand. My research has been consistent with the theory behind immigration labor supply and demand and with other empirical studies. It would appear that the only group significantly harmed here are among the least educated and those who work in occupations attractive to

Latin American immigrants, most notably other Latin American immigrants. Still, these negative effects are quite small for now.

A way to improve this research would be to incorporate a two-stage least squares analysis to hopefully fix the endogeneity problem where the variable is correlated with the error term. In this type of analysis, an instrumental variable could be used to replace the problematic variable.

A future study that would be interesting would involve Latin American migration within the United States. Because other immigrants tend to closely substitute for one another and because most immigrants are mostly geographically located in a few select locations, it would be interesting to see if more immigration to the United States causes immigrants of today to become more spread out evenly throughout the United States as more and more competing workers arrive in Miami, New York, and Los Angeles.

Developing a framework to study this issue without problems is quite difficult. Other issues that can be important would include the change in educational patterns that result from lower wages of the least educated. Furthermore, the altering of preferences from an immigration influx and the resulting changes in production are more factors that are rarely studied but are an important result of immigration. Because of all these unanswered and difficult questions, this topic will continue to interest researchers and spark debate.

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Appendix

Model 1

This model attempts to predict change in post graduate wage using the growth rate in immigrants and the per capita GDP growth rate as predictor variables. This growth rate is statistically significant.

Model Summary

Model	R	R Square	Adjusted R Square
1	.569 ^a	.324	.296

a. Predictors:
(Constant), Growth
in Latin
Immigrants,
PCGDPC

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t
		B	Std. Error	Beta	
1	(Constant)	.058	.021		2.769
	PCGDPC	.177	.042	.500	4.162
	Growth in Latin Immigrants	.050	.019	.309	2.574

a. Dependent
Variable:
CNGSCHL

Model 2

This model attempts to predict change in post graduate wage using the growth rate in immigrants and the per capita GDP growth rate as predictor variables.

Model Summary

Model	R	R Square	Adjusted R Square
1	.103 ^a	.011	-.031

a. Predictors:
(Constant), Growth
in Latin
Immigrants,
PCGDPC

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t
		B	Std. Error	Beta	
1	(Constant)	-.085	.041		-2.079
	PCGDPC	.056	.083	.099	.680
	Growth in Latin Immigrants	-.006	.038	-.023	-.157

a. Dependent
Variable:
CNGSCHL

Model 3

This model attempts to predict housekeeper's wage using the growth rate in percentage of immigrants relative to natives and the per capita GDP growth rate as predictor variables.

Model Summary

Model	R	R Square	Adjusted R Square
1	.131 ^a	.017	-.025

a. Predictors:
(Constant), Growth
in Percent,
PCGDPC

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t
		B	Std. Error	Beta	
1	(Constant)	.248	.023		10.826
	PCGDPC	.021	.050	.059	.407
	Growth in Percent	-.019	.023	-.118	-.813

a. Dependent
Variable: Wage
Change

Model 4

This model attempts to predict accountant's wage using the growth rate in immigrants and the per capita GDP growth rate as predictor variables.

Model Summary

Model	R	R Square	Adjusted R Square
1	.078 ^a	.006	-.036

a. Predictors:
(Constant), Growth
in Latin
Immigrants,
PCGDPC

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t
		B	Std. Error	Beta	
1	(Constant)	.355	.041		8.591
	PCGDPC	-.020	.084	-.035	-.237
	Growth in Latin Immigrants	.018	.038	.068	.464

a. Dependent
Variable: Wage
Change