Refining the Estimation of Immigration's Labor Market Effects

by

Sarah Bohn
Public Policy Institute of California
500 Washington Street
San Francisco, California 94111
(415) 291-4413
bohn@ppic.org

Seth Sanders
Department of Economics and MPRC
University of Maryland
3105 Tydings Hall
College Park, MD 20742
(301) 405-3497
sanders@econ.umd.edu

October 27, 2007

PRELIMINARY

The authors gratefully acknowledge support of NICHD and the insightful comments of Dan Black, Ethan Lewis, and Jonah Gelbach.

Refining the Estimation of Immigration's Labor Market Effects

Abstract

Reviewing a large set of papers that analyzed the effect of immigration on the wages of native-born workers in the U.S., the National Academy of Science Panel on Immigration (1997) concluded "there is only a small adverse impact of immigration on the wage and employment opportunities of competing native groups." Borjas (2003) argues that migration within the U.S. arbitrages local wage differentials and therefore the effects estimated in many previous studies are understated. He uses variation across skill groups over time in the national labor market and finds large negative impacts of immigration on the wages of native-born workers. A central theoretical prediction of his model is that the effect of immigration on wages should be equal across regions in the U.S. We test this prediction and reject it. The apparent effect of immigration on the wages of native born workers is three times larger in states with a durable goods manufacturing base. The effects are particularly large in manufacturing areas for high school dropouts and high school graduates the two groups most affected by deindustrialization. This suggests that the large effects reported in Borjas (2003) are at least in part driven by changes in labor demand. Immigrant share may be more a measure of labor demand than labor supply. We present several other pieces of evidence that suggest reason to doubt large negative estimates of immigrant share on the wages of native-born Americans. The measured effect of immigration on college graduates appears to be *positive*; this is traced to the number of college educated native born workers rising not the number of college educated immigrants workers rising. A rising supply of college graduates lowering wages is consistent with Murphy and Welsh (1992). Finally, we also show that the wages of high school dropouts were falling considerably *preceding* the rise in the fraction of the low-skilled workforce that were immigrants.

I. Introduction

Reviewing a large set of papers that analyzed the effect of immigration on the wages of native workers in the U.S., the National Academy of Science Panel on Immigration (1997) concluded "there is only a small adverse impact of immigration on the wage and employment opportunities of competing native groups." Most of the papers correlate the immigrant share of a local labor market against the wages of native-born workers in that market. The weak correlation between native-born wages and immigrant share of the labor market serves as evidence that immigrants have only a small adverse impact on native-born workers' wages.

Spatial variation for identification, however, is fraught with biases from a number of sources, including internal migration of workers. Most authors acknowledge that migration within the U.S. arbitrages local wage differentials and can nullify the effects of immigration on wages as measured in spatial difference models. If wages equilibrate across markets then regardless of the geographic distribution of immigrants, all areas of the country would have the same wages after workers migrate to exploit opportunities for higher earnings. Borjas (2003) uses a novel approach to lessen the bias induced by internal migration; instead of geographic labor markets, he focuses on labor markets defined by skill. Variation in wages and immigration within skill groups over time then identifies the effect of immigration on wages. In contradiction to the NAS conclusion, Borjas finds a *very large* effect of immigration on native wages; his estimate is at least three- to four-times the size of the leading estimates.

Studies of immigrations' affect on wages investigate this process over years if not decades. Many studies rely on examining the correlation between wage changes and immigration since the 1960s as the 1965 Immigration Act greatly expanded immigration to the U.S. and serves as a principle source of variation in the size of the immigrant population. However there is

a large alternative literature on other candidate reasons for the patterns of changes in the wage structure over the last 40 years. For example, Murphy and Welsh (1992) argue that a combination of factors is needed to explain the trends in both the returns to education and the returns to work experience within education groups since the 1960s. Further, they suggest that different factors affected different skill groups at different times over the last 40 years. Changes in industrial structure appear to have impacted the wages of high school educated workers while changes in the supply of college educated worker was the primary factor affecting this group's wages. Generally, all impacts are more pronounced among younger workers than older workers. This implies that these same factors change the slope of the wage-experience profile. If the shocks affecting more educated workers occur at different times than the shocks affecting low skilled workers, the wage-experience profile may change differentially between two time periods across education levels.

To examine whether immigration is responsible for the changes in the structure of wages, we conducts some simple tests that plausibility distinguish immigration's impact from the impact of other factors. If Borjas is right, a national labor market suggests that the national change in immigrant share should affect native-born workers by the same magnitude regardless of where in the U.S. they reside. If Murphy and Welsh are right, the correlation between the immigrant share and wages might be explained by the immigrant share proxying for labor demand rather than labor supply. We find evidence that immigration appears to have a large impact in the Rust Belt especially among high school dropouts and high school graduates, two groups who in this region were surely affected by shifts in labor demand. This counter intuitive result suggests that the immigrant share is likely proxying for labor demand.

While understanding the effects of immigration on the wages of native-born Americans helps economists distinguish between alternative views of the operation of U.S. labor markets, it is perhaps its policy relevance that has attracted the large number of studies. Over the 20th century, immigration policy has changed enormously, going through periods of relatively tight limits and periods of liberal admissions policy. The effect of immigration on the wages of native-born Americans is a central part of the debate about the distributional impacts of changing the number of immigrants the U.S. chooses to admit into the U.S. While there are other important elements of U.S. immigration policy, such as the type of visas issued (which affects the composition of new entrants), the policy of the total number of visas granted is perhaps the policy that is most visibly debated. There are advocates on both sides arguing for and against liberalization of admission to the U.S., and evidence adopted by each side is used to bolster their position. The conflicting scientific evidence on the impacts on native-born workers fuels this debate.

This paper proceeds as follows. Section II presents a brief literature review on the effects of immigration on the earnings of the native-born. Section III discusses the primary data source for this study, the 1960-2000 U.S. decennial censuses of population data. The section also describes the changing pattern of immigration in the U.S. as well as the basic changes in the wage structure of the U.S. economy over the last 40 years. Section IV briefly summarizes the methods used in Borjas (2003) and our methods for calculating the influence of each skill group on the regression line. Section V replicates Borjas (2003) and assesses the sensitivity of these estimates to competing explanations for the same result. Section VI is a discussion and conclusion. In the end we find evidence that the immigrant share is likely correlated with wages but this is largely because it is correlated with labor demand for low skilled workers; ironically,

for college educated workers it is also correlated with wages. But this occurs because a rising number of native-born college graduates appear to have lowered wages of this group with almost no evidence that competition from college educated immigrants has any impact.

II. Literature Review

"Demand curves slope down." This is perhaps the best-understood principle in all of economics. Economists believe this principle applies in a wide variety of contexts and the demand for labor is no exception. Just as with any other good, an increase in the supply of labor should, all other things equal, reduce labor's equilibrium price. Immigration, which is an increase in the supply of labor to a country, should reduce the wages of all workers in the market. The magnitude of the wage effect is dependent upon the size of the supply shock, the elasticities of supply and demand, and upon simultaneous changes in labor demand. To accurately measure the effect of immigration then, we must be able to isolate supply shocks from demand shocks.

Hansen and Slaughter (2002) and Lewis (2003) suggest that the complication to the textbook interpretation rests on the responses of firms to immigration. In a Hecksher-Ohlin (HO) model, where local areas are open rather than closed economies, firms face the choice of the amount of labor to employ relative to capital. Local areas that receive large immigrant flows may substitute towards the production of labor-intensive goods. In the extreme version of the model there is enough specialization in labor-intensive production (and enough trade across local markets) that there is no effect on wages either in the local labor market or the national labor market. Lewis (2003) finds some empirical support for this theory.

Alternatively, immigration may have small effects on the wages of native-born workers when both wages and housing prices are set in a local market. The Roback (1982) model suggests that *both* wages and housing prices adjust to differences across regions in the supply

and demand for labor caused by local amenities. The effect on wages and housing prices to a shift in the local supply of labor will depend critically on the elasticity of housing supply relative to the elasticity of labor demand. The more inelastic the supply of housing the more an increase in the local supply of labor raises housing prices and the less it raises wages. In the extreme version of the model, when housing supply is highly inelastic the market equilibrium across regions is restored entirely by increases in the differential of housing prices across regions. Both the HO model and a version of the Roback model suggest that the effect of immigration on the wages of native workers is far from clear.

Even when we can abstract from these complications, gathering evidence to support the simple "demand curves slope down" theory proves difficult. If a country were made up of many small and closed economies then exogenous influxes of immigrants would allow us to test the basic textbook model using cross-sectional data. The relationship between changes in the number of immigrants and changes in wage across these small economies (e.g. cities) could identify the effect of immigration. Indeed, immigrants tend to cluster in a few cities, giving variation across cities in immigrant share of the local labor market. Studies that use this variation to estimate the wage effects of immigration find both positive and negative effects, with most estimates close to zero (Goldin (1994), LaLonde and Topel (1991), Altonji and Card (1991)).

A basic concern with these studies is that immigration to the U.S. and to particular U.S. cities is not exogenous but rather is related to local labor market conditions.[1] If immigration decisions are indeed endogenous in this way, then estimates of the effect on wages using variation across cities are biased upward since immigrants choose to locate in markets with

higher wages. LaLonde and Topel use individual data in their analysis so that they can control for characteristics that may lead people to live in certain areas, potentially reducing the bias from simultaneity. Goldin uses time series data and estimates the effect of a *change* in immigration density on the *change* in wage, which mitigates the endogeneity problem assuming that immigrants choose their location based on wages at the time of arrival, not projected wages. Both of these analyses, however, still find relatively small effects: a 1 percentage point increase in the fraction foreign-born reduces wages by 1-1.6% in Goldin's paper and a 10% increase reduces wages by 0.3% in LaLonde and Topel's analysis. Further, Altonji and Card (1991) use an instrumental variable strategy to correct for the endogeneity of immigrants' locational decision. Since immigrants tended to locate in areas where other immigrants already were living, Altonji and Card use the stock of immigrants in a local market as an instrument for the change in immigrants. They find larger negative effects of immigration (consistent with the belief that previous estimates were biased toward zero). In their study, a 1 percentage point increase in the stock of immigrants reduces the wage of less-skilled natives (that is, the most highly affected group) by an estimated 1.2%, which is in the range of Goldin's result. These studies, and many others, have used different techniques, data sources, time periods, and subgroups of the population, but still find results in the same range.

A concern with these and many other immigration studies is that they must make the assumption that local labor markets are closed and native workers do not relocate in the face of worsening labor market conditions. Ignoring this shortcoming biases estimates towards zero if migration of natives equalizes wages across cities. However, the evidence on whether migration of natives is a significant issue is mixed. Card (2001) models the local labor market outcomes

[1] Card [1990] uses the rare event of an exogenous immigration shock and finds no discernable

and migration decisions jointly and finds that outflows of the native born are not sensitive to immigrant inflows, and that wages of low-skilled natives in immigrant "gateway" cities were reduced by only 1-3 percentage points in the 1980s due to immigration. Borjas, Freeman, and Katz (1997) investigate wages and immigration at the national level using a variety of techniques and find the opposite results: natives migrate in the face of immigrant shocks, immigrant shocks do not have a clear effect on local area economies, and low-skilled natives are greatly harmed by immigration.

In addition to this inconsistent evidence on the outflow of natives from immigrant-receiving cities, one must recognize that outflows from cities are only half of the migration issue – immigration may slow population inflows to cities. Studying this is complicated by the fact that native-born workers tend to be attracted to the same robust labor markets as attract immigrants. There is no consensus on the degree to which immigration effects labor flows or on the bias in results that rely on local labor market variation in the immigrant share.

Borjas (2003) circumvents these problems by using a novel kind of "closed market." He uses skill (education-experience) groups in the national labor market, rather than local areas, as his "closed market." This approach assumes that workers in different education-experience groups are imperfect substitutes, and thus compete in essentially independent labor markets and also that they do not "migrate" between groups. Borjas cites the importance of experience found in the literature on human capital as evidence that workers are less than perfectly substitutable, even when they have the same level of education. In addition, he compares the occupational distributions across skill groups and finds they are different enough to suggest that skill groups are not substitutable. For the purposes of this study, we take his assumptions to hold. Borjas'

---

effect on the labor market.

idea of closed skill markets, then, allows him to exploit the differences between education-experience groups and the variation in immigrant shares within these groups nationally over time. Using this strategy, Borjas estimates quite a large effect: a 10% increase in supply of workers causes a 3-4% decrease in the wage, more than double the largest effects estimated in previous literature. In related work, Borjas (2004) estimates the effect of immigration by education level. He finds that among high school dropouts immigration over the 1980s and 1990s lowered the wages of high school dropouts by 7.4%. He concludes "It is clear that Mexican immigration, which is predominantly low-skill, accounts for virtually the *entire* adverse impact of immigration on low-skill native workers."

The result in Borjas (2003) rests on the correlation between changes in immigrant share and changes in wage within education-experience groups over a 40-year period. Interpretation of his findings is complicated by the many factors theorized to effect within-group changes in wages over the period of his study, which have been documented in a wide body of literature. For example, Murphy and Welsh (1992) examine changing returns to skills where skills are defined by age and education as they are in Borjas (2003). They document that the return to schooling increased between 1962 and 1971. Then the return to education decreased beginning in 1971, first for younger workers and then for older workers until the end of the decade. Then over the 1980s there was a dramatic rise in the return to education. As for the returns to experience, the wages of younger workers fall relative to more experienced workers at all levels of education from 1964 until 1979. Thereafter, the wages of young workers with college degrees rise relative to older college graduates; however, the wages of workers with lower levels of education continues to fall throughout the 1980s. There are both demand side and supply side explanations for changing returns to skill and some explanations are specific to only some skill levels. Murphy

and Welsh (1992) suggest that deindustrialization played a major role in explaining both the changing returns to education and the continued steepening of the wage-experience profile for workers with high school level education or below. They suggest, however, that there is also a role for a supply side explanation – especially for the changing wage patterns for college educated worker. They point to the fact that as the number of college graduates from the baby-boom generation entered the labor market, the relative wages of college graduates declined; and as the smaller baby-bust generation entered the labor market the wage premium for a college degree increased again. Many other papers have posited other explanations for the trends in wages, citing skill-biased technological change, rapid de-industrialization, increased international trade, changes in the minimum wage, decreasing unionization rates, and, now of course, immigration.

Borjas (2003) recognizes this potential confounding of changes in the demand for labor that are correlated with the immigrant share. While he presents results without taking into account bifurcation in earnings over-time by skill groups, most of his econometric analysis in the paper includes a large number of fixed-effects to take just such changes into account. However, by construction, the skill-group approach can not allow the human capital earnings function to vary across education group, labor market experience level and year; these three factors exactly define the immigrant share. Therefore, the econometric set up restricts the wage-experience profile to shift over time equally across the level of education. Any differential shift in the wage-experience profile become part of the error term in the wage regression; the central question is are there such shifts and if so are they correlated with changes over time in the immigrant stock within skill groups. We now describe our data and the basic patterns of changes in immigration and wages in the U.S. over the last 40 years.

III. Data

III.1 Data Description

The data source for this study is the 1960 – 2000 U.S. Censuses of Population and Housing. We use the U.S. Census data available from the Integrated Public Use Micro Sample (IPUMS). In 1960 the Census Bureau released only a 1% sample of the U.S. population. However, beginning in 1970, the Census Bureau released various 1% and 5% samples. These samples are all independent samples from the Decennial long form data. The samples vary on the geographic detail released and in 1970 in a sub-set of the questions asked. In particular only a 2% sample in 1970, and a 5% sample in 1980 and 1990 record the state of residence. In our analysis below we use as much data as is available. We combine samples to construct a 6% sample of the U.S. population for each census year between 1970 and 2000 and use this when state of residence is not at issue and use the smaller subsamples when state of residenc is needed.

The key variables of interest are weekly wages (constructed from wage and salary income and weeks worked), education, and labor market experience (constructed from age). In following Borjas, our sample is subset in the following ways. We use only males of age 18-64 who do not reside in group quarters and participate in the labor force. All of our calculations of wages further subset this group to include the wage and salary income of those who are native (non-immigrant), not in school, who are not self-employed, and have worked greater than zero hours, greater than zero weeks, and made greater than zero earnings in the year prior to the survey. An immigrant is defined as a person foreign-born and either a non-citizen or a naturalized citizen (that is, foreign-born but not of American parents). Sample Size for each education-experience cell are presented in Appendix B.

III.2 Wage Trends in the U.S. 1960-2000

Before discussing how likely it is that the correlation between the immigrant share and wages is causal it is useful to review what has happened to the returns to schooling and the wage-experience profile over the last 40 years. Table 1 summarizes changes in the return to labor market experience. Panel A presents the log difference in weekly earning between workers with earnings at the peak of the wage-experience profile and those of labor market entrants. Murphy and Welsh present a similar analysis using CPS data for 1964-1989 for hourly rather than weekly earnings. While there are some differences between the CPS and Census data, over overlapping time periods the patterns are general the same. The wage-experience profile at all levels of education became steeper between 1960 and 1990. However, the steepening of the profile occurred earlier for College Graduates (over the 1970s) while it occurred later for workers with less educations (over the 1980s). With the addition of data from 2000, it is clear that that over the 1990s, the earnings of young workers at all levels of education rose relative to the earnings of older workers for the first time in 40 years.

Table 1
Log Difference in Weekly Earnings by Level of Education and Year
[Native Born Men]

	Panel A: Peak Earners (Experience 25-30 Years) vs. New Entrants (1-5 Years)				**Panel B:** Oldest Workers (35-40 Years) vs. Peak Earners (Experience 25-30 Years)			
	Years of Schooling Completed				Years of Schooling Completed			
Year	0-11	12	13-15	16 +	0-11	12	13-15	16 +
1960	0.65	0.53	0.47	0.52	-0.04	-0.06	-0.04	-0.06
1970	0.68	0.55	0.54	0.52	-0.05	-0.05	-0.09	-0.10
1980	0.65	0.57	0.55	0.67	0.03	-0.03	-0.05	-0.11
1990	0.77	0.73	0.67	0.68	0.04	-0.04	-0.11	-0.17
2000	0.64	0.64	0.57	0.59	0.06	0.02	-0.03	-0.12

Panel B presents a similar analysis for the earnings of the oldest workers relative to the wages of peak earners. Here the change in how steeply earnings fall at the end of the work career are quite different by the level of education. For college graduates, the fall in earnings is pronounced. In 1960, the oldest college graduates earned 6% less than workers 10 years their

younger; by 1990 they earned 17% less. There appears to gave been some flattening of the downward trend in wages at the end of the work career for college graduates over the 1990s. For high school dropouts, the wage-experience profile at older ages goes from being negative to positive.

Table 2 summarizes changes in the return to education from 1960 to 2000. Panel A presents the return to a college degree. What is clear is that the return to a college degree declined between 1970 and 1980 and then rose dramatically between 1980 and 2000 at all levels of labor market experience. This fact has been noted by many scholars including Murphy and Welsh (1992) and Juhn, Murphy and Pierce (1993). Panel B presents the return to a high school

Table 2
Log Difference in Weekly Earnings by Level of Labor Market Experience and Year [Native Born Men]

Panel A:
College Graduates vs. High School Graduates

	Years of Labor Market Experience							
Year	1-5	6-10	11-15	16-20	21-25	25-30	31-35	36-40
1960	0.42	0.36	0.37	0.39	0.39	0.40	0.42	0.40
1970	0.50	0.42	0.45	0.47	0.48	0.47	0.44	0.42
1980	0.32	0.35	0.43	0.44	0.45	0.43	0.41	0.34
1990	0.61	0.60	0.59	0.58	0.61	0.56	0.52	0.44
2000	0.67	0.64	0.73	0.71	0.65	0.62	0.59	0.48

Panel B:
High School Graduates vs. High School Dropouts

	Years of Labor Market Experience							
Year	1-5	6-10	11-15	16-20	21-25	25-30	31-35	36-40
1960	0.39	0.34	0.28	0.27	0.29	0.27	0.27	0.26
1970	0.37	0.32	0.27	0.27	0.26	0.25	0.27	0.24
1980	0.36	0.31	0.33	0.31	0.28	0.27	0.23	0.21
1990	0.34	0.32	0.30	0.31	0.32	0.30	0.26	0.23
2000	0.29	0.28	0.24	0.28	0.28	0.28	0.27	0.23

degree. What has been less noted is that the returns to a high school degree vs. dropping out of

high school have steadily declined among new job entrants. In 1960 a high school graduate earned 39% more than a dropout upon labor market entry; by 2000 the wage gap was 29%.

What is clear from Tables 1 and 2 is that over the last 40 years, the wage structure has moved around considerably, often differentially by year, education level and level of labor market experience. Identification of the "immigrant effect" comes from changes in earnings within an experience-education cells over time not captured by the regression model that are correlated with the immigrant shock. To review the central changes were a (1) steepening of the earnings profile, starting in the 1970s for college graduates and 1980s less educated workers; (2) a rise in the return to a college degree since 1980; and (3) importantly, all changes more pronounced among less-experienced workers than more experienced workers. Any factor, including immigration that can explain these facts would also be correlated with wages.

III.3 Immigration to the U.S. 1960-2000

Understanding the history of immigration is helpful. Beginning in 1924, federal law limited the number of immigrants and their source countries of origin by restricting the annual rate of immigration from a country to 2% of the stock of immigrants from that country in the U.S. in 1890. Following this act, the level of immigration declined for 40 years until in 1965 the Immigration and Nationality Act abolished the national quota system and allowed for a greater level of immigration.

Table 3 shows the change in the distribution of the countries of origin of immigrants to the U.S. The U.S. has experienced a decrease in the percentage of immigrants from Europe and an increase from Asia. Also notice that while immigration from Latin America was never officially restricted by the 1924 Immigration Act, since 1965 there has been a steady increase in the fraction of immigrants from Latin America.

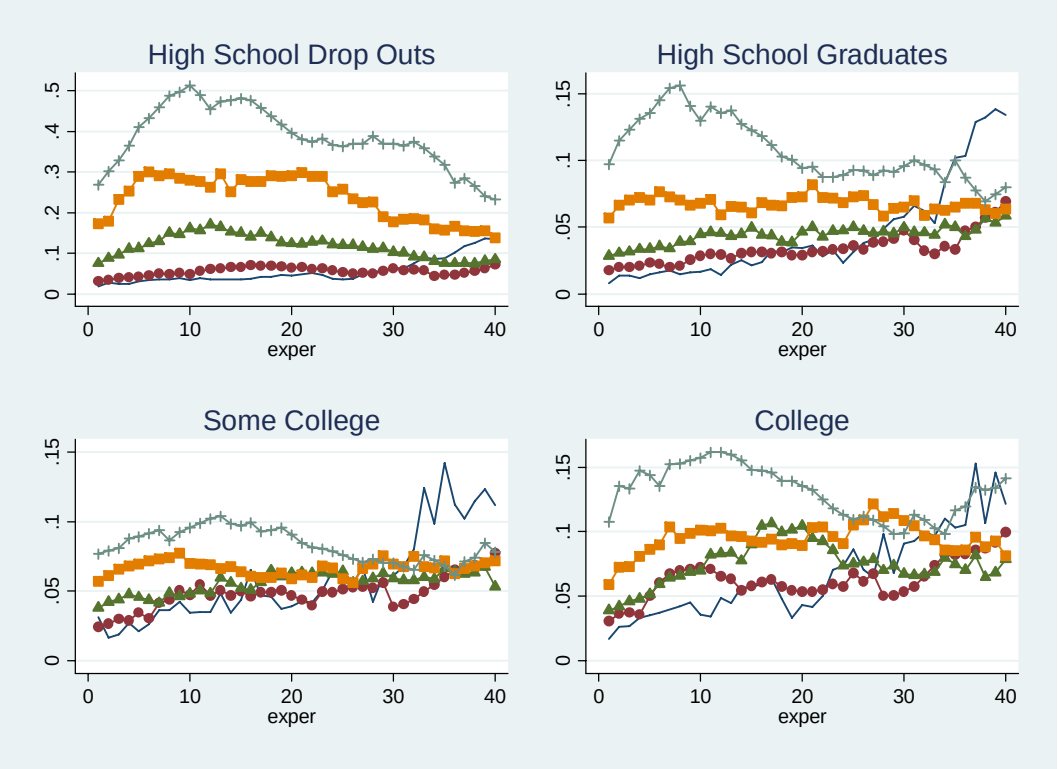
Table 3:
National-Origin Composition of the Stock of Immigrants

	U.S.			
	1970	***1980***	***1990***	***2000***
North America	9.43	4.87	2.70	2.26
Central and South America	25.05	38.50	48.71	54.45
Europe	50.41	29.68	16.83	13.14
Asia	10.83	19.35	24.97	26.10
Africa	1.03	1.82	2.57	3.49
Other	3.26	5.81	4.22	0.56

Source: author's tabulations from U.S. Census PUMS

Figure 1 shows the fraction of immigrants by schooling level for 1960 through 2000. There are several notable features. First the fraction of immigrants at each level of education had increased over time. Secondly, the fraction immigrants generally increased with age in 1960. In 1960, the immigrants who arrived prior to the 1924 Immigration act were now in their final years in the labor market. As the fraction of older immigrants from 1960 aged out of the workforce, and as young new arrivals entered the workforce after the 1965 Immigration Act, the fraction of immigrants of younger ages increased. For college graduates there is a clear pattern; a large wave of young immigrants came following the 1965 Immigration Act; this surge propagated through the age distribution from 1970 through 2000; and then over the 1990s a new wave of H1B visa immigrants joined the labor force increasing again the fraction of immigrants among young college educated workers.

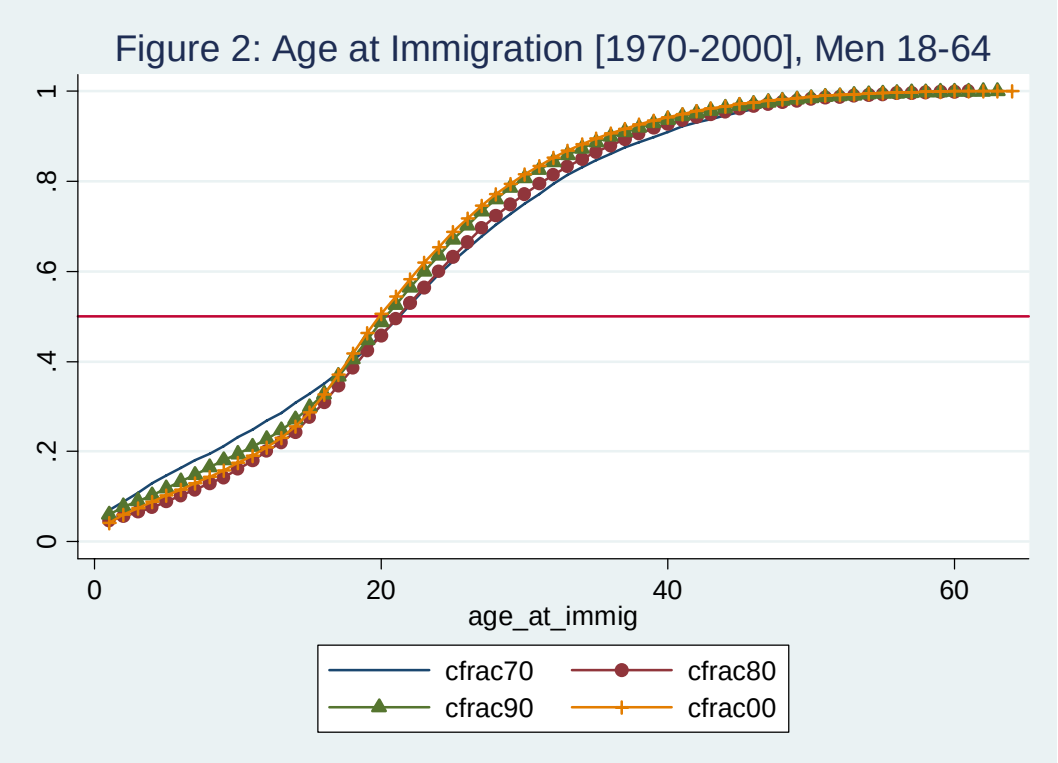
Figure 1: Fraction of Immigrants in an Experience Cell by Education Level



There are two features to keep in mind from in the analysis below. First, among high school dropouts and high school graduates, the fraction of the workforce that was immigrant workers, increased particularly after 1980 and most dramatically at young ages. Second, among college graduates there was an immediate rise in the fraction of young workers who were immigrants and then a relatively steady flow into the U.S. at young ages for the next 20 years and then a large increase in the 1990s. As a result there is a noticeable change in the relative fraction of immigrants who are older v. younger for the college educated.

One fact to keep in mind is that most immigrant workers arrived in the U.S. many years prior to entering the workforce. Figure 2 shows the age at entry into the U.S. for immigrant men ages 18-64 in 1970-2000. There has been remarkably little variation in the age at entry over the last 30 years. The median age of entry is age 20 and almost all immigrants enter the U.S. prior to

age 40. History largely explains the changes in the fraction of immigrants by experience. In 1960 a large fraction of older workers were immigrants because immigration had a strong flow prior to 1924. These entrants had aged and were now towards the end of their work career. With The steady flow of immigrant children and adolescents into the U.S. after 1965 meant that when these children enter the workforce the fraction of immigrants in the workforce at young ages would surge. Thus the current stock of immigrants in the workforce is to a large degree a function of the flow of young people into the U.S. in earlier years.



III.4 The Relationship between Wage Changes and Immigration

In the analysis below, Borjas adds year-by-schooling, year-by-experience and experience-by-education fixed-effects to his simple specification over the concern that other changes to the economy that might be driving the returns to schooling or education differentially across years. The central question is, "are these fixed-effects enough to purge these other factors" or are other factors correlated with the immigrant shock still at work in affecting the wage structure. The most damaging "third factor" would be a shock that was correlated with the immigrant shock and also affected young workers more than old workers. A natural candidate that has been raised in the literature is deindustrialization that greatly impact lower skilled workers, and differentially impacted younger workers.

By its set-up, there is a limited amount that can be done to sort this out using only national level data. It is possible to be more flexible in the specification of the wage, introducing restricted interactions that allow the returns to experience to change differentially across years by level of education. But making the wage function more flexible only avoids the central question of whether it is immigration that is causing these differential changes to the returns to experience across years by the level of education. The one hope of assessing the Borjas hypothesis is to examine its central theoretical insight – regardless of where immigrants arrive, are their impacts equal across regions of the U.S. If this is true, this is strong evidence that Borjas is correct; if it is untrue, this is evidence to the contrary; and if the apparent returns to immigration is greater specifically when another candidate explanation is occurring this suggests that that "third factor" might be an underlying cause. Below, we examine only one "third factor" – the historic presence of durable good manufacturing which, with its decline, might have (1) steepened the earnings profile over the 1980s of less educated workers; (2) caused a rise in the return to a college degree

since 1980; and (3) importantly, affected less-experienced workers than more experienced workers. We do not suggest that this factor is the only factor that might be correlated with immigration. In fact, deindustrialization might have had only a limited impact on college graduates. Therefore a second key question is "Are the negative impacts presented a result immigrations affect primarily on lower skilled workers or on higher skilled workers?"

IV. Methods

We first replicate the Borjas (2003) results using 1960-2000 Census IPUMS data. Using a fixed-effects model we estimate the effect of the immigrant share on a w by year-experience-education group, accounting for the fixed effects from his 4 education groups, 8 experience groups and 5 years of data:

$$Y_{ijt} = \theta X_{ijt} + s_i + x_j + \pi_t + s_i x_j + s_i \pi_t + x_j \pi_t + \varphi_{ijt} \quad (1)$$

where *i* indicates schooling group, *j* indicates experience group, and *t* indicates decade. Y is the logarithm of weekly wage, X is the immigrant share (ratio of immigrants to all persons in skill group), and s, x, and π are vectors of fixed effects for schooling group, experience group, and time, respectively. θ is the main parameter of interest. The model accounts for the across education-experience group variation and time trends, so the within group variation over time is what identifies θ, that is, identifies a correlation between the immigrant proportion and the average log weekly wage over time.

There are several ways of judging the importance of an observation on the regression coefficient. In their important book, *Regression Diagnostics: Identifying Influential Data and Sources of Collinearity*, Belsley, Kuh & Welsch (1980) [hereafter BKW] suggest several methods for measuring the influence on parameter estimates of observations in multiple

regression models. The "DFBETAS" statistics are a scaled measure of the change in each of the *l* parameter estimates and are calculated by deleting the *k*th observation:

$$DFBETAS_l = \frac{\hat{\beta}_l - \hat{\beta}_l^{(k)}}{s^{(k)}\sqrt{(X'X)_{ll}^{-1}}} \tag{2}$$

where the error variance is estimated by $\left(s^{(k)}\right)^2$ without the k_{th} observation, $\left(X'X\right)_{ll}^{-1}$ is the $(l,l)_{th}$ element of the standard regressor matrix $\left(X'X\right)^{-1}$. In general, large values of DFBETAS indicate observations that are influential in estimating a given parameter. BKW recommend a size-adjusted cutoff to indicate an influential observation of $2/\sqrt{n}$. Using the BKW suggested cutoff, we can then isolate observations having the largest influence on the initial regression.

V. Replication and Analysis Competing Explanation

V.1 Graphical Evidence on the Effect of Immigrant Share on Native Wages

Before presenting our replication of estimates from equation (1) we first examine a simpler analysis presented in Borjas (2003) where a scatter plot of the demeaned decadal changes in wages is plotted against the demeaned decadal change in the percentage foreign born (Figure 1). A simple way to construct this is to recognize that the regression through the scatter plot in Figure 1 is simply:

$$Y_{ijt} = \theta X_{ijt} + s_i + x_j + \pi_t + \varphi_{ijt}, \tag{3}$$

where the demeaned decadal changes in wage can be estimated as

$$Y_{ijt} = s_i + x_j + \pi_t + \varepsilon_{ijt}, \tag{4}$$

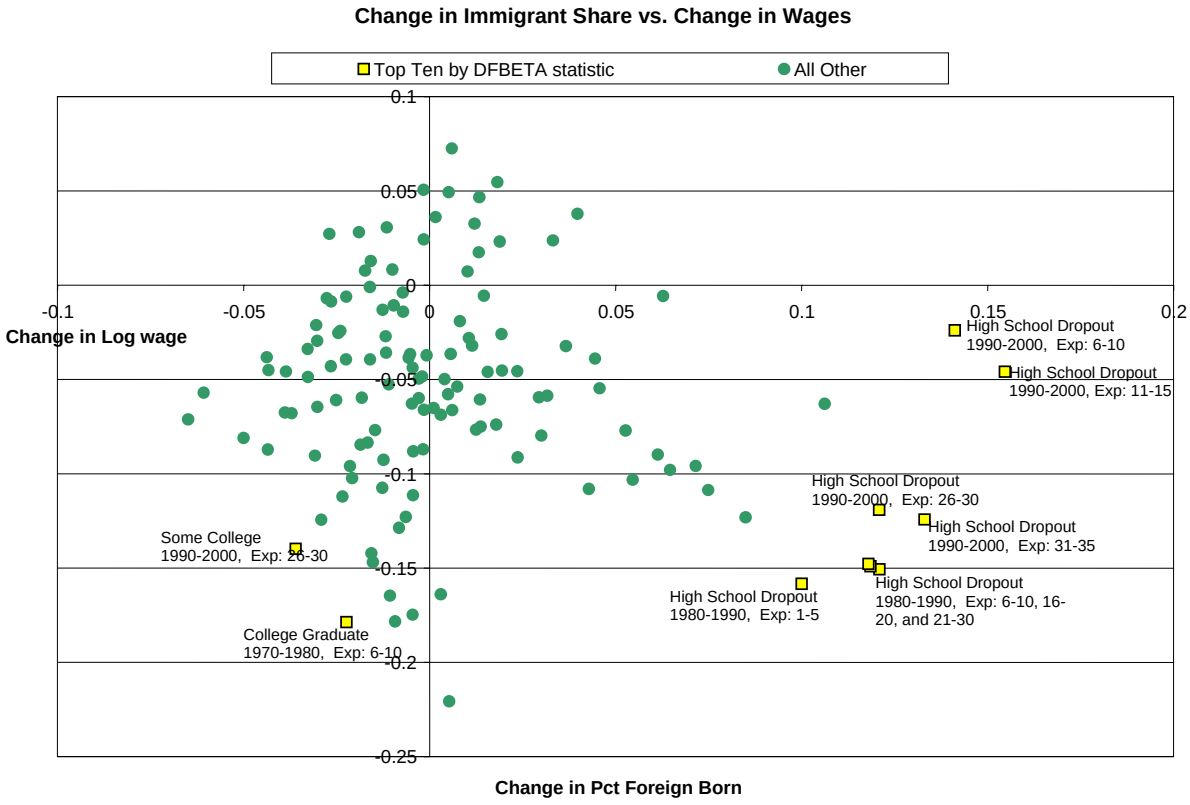
for the fixed-effect model or as $\Delta Y_{ijt} = \pi_t + \varepsilon_{ijt}$ for the first difference model and the demeaned decadal change in the immigrant share can be estimated for the fixed-effect model as

$$X_{ijt} = s_i + x_j + \pi_t + \eta_{ijt}, \tag{5}$$

or for the first difference model as $\Delta X_{ijt} = s_i + \eta_{ijt}$.

Figure 3 also labels the 10 observations with the largest values of DFBETA for the first difference model presented in Borjas. What is clear is the heavy influence of low-skilled workers. Almost without exception, these are high school dropouts observed between 1980-1990 or 1990-2000; and these low-skilled workers experienced a decrease in log weekly wages.

Figure 3:
Change in Wages of Native-born vs. Change in Immigrant Share
Highlighting Top 10 Influential Observations



We next examine the influence of cells by education and year groups, to give a fuller picture than simply looking at the individual year-education-experience cells that exceed the DFBETA cutoff. We want to calculate the fraction that each year-education group of cells contributes to the total weight on the regression line. Fortunately there is a simple way to represent this. Using equations

(4) and (5) it is easy to recover estimates of $\hat{\eta}_{ijt}$ and $\hat{\varepsilon}_{ijt}$ which are know as the "Yulized" residuals.

Then

$$\hat{\beta} = \frac{\sum_{i=1}^{4}\sum_{j=1}^{8}\sum_{t=1960}^{2000} \varepsilon_{ijt}\eta_{ijt}}{\sum_{i=1}^{4}\sum_{j=1}^{8}\sum_{t=1960}^{2000} \varepsilon_{ijt}^{\ 2}} = \sum_{i=1}^{4}\sum_{j=1}^{8}\sum_{t=1960}^{2000} w_{ijt}\eta_{ijt}, \tag{6}$$

where $w_{ijt} = \varepsilon_{ijt} / \mathrm{var}\left(\varepsilon_{ijt}\right)$ and *i* indexes education, *j* indexes experience, and *t* indexes year. This influence weight is calculated for every year-education-experience cell and then summarized across year-education groups.

Table 4 summarizes these approximate regression weights w_{ijt} by year and education. When we look at which year and education cells most influence the regression line, we find that high school dropouts account for approximately 51% of the influence on the regression from the right-hand side variable, shown in Table 4. Specifically, high school dropouts in 1990 and 2000 account for over 40% of the influence.

Table 4: Percentage of Total Weight, w_{ijt}

	1960	***1970***	***1980***	***1990***	***2000***	***Total***
HS Dropout	4.34	3.92	3.13	14.73	25.59	51.70
HS Grad	5.63	6.06	5.05	2.47	1.78	20.99
Some College	4.07	4.28	3.23	2.08	1.40	15.06
College Grad	3.61	3.04	2.04	0.45	3.10	12.24
Total	17.65	17.31	13.45	19.72	31.88	100

Just as the influence of an observation can be analyzed by dropping it and re-estimating the regression, we look at the effect of dropping each group of the education-year cells (that is, across experience) on the estimated impact of the immigrant share on the wages of the native born. Table 5 shows that eliminating any education-year group *except* for high school dropouts

has modest effect on the estimated coefficients. When all high school dropouts are eliminated the estimated regression coefficient becomes statistically insignificantly. Put simply, the falling wages of high school dropouts over the period is entirely responsible for the precision of the measured negative correlation between the immigrant share and the wages of the native-born. It is also worth noting that removing all college graduates from the regression reduces the estimated effect of immigration by 1/3. The wages of college graduates also play some role in the estimated overall impact of immigration.

Table 5
Estimates of θ After Eliminating Various Year-Education Cells

Unweighted Estimate of θ using all cells: -0.397 (0.059)

	1960	***1970***	***1980***	***1990***	***2000***	***Total***
HS Dropout	-0.431	-0.433	-0.360	-0.320	-0.577	**-0.396**
	(0.063)	(0.069)	(0.057)	(0.055)	(0.102)	**(0.429)**
HS Grad	-0.413	-0.400	-0.405	-0.407	-0.462	-0.483
	(0.062)	(0.061)	(0.059)	(0.065)	(0.065)	(0.076)
Some College	-0.414	-0.407	-0.396	-0.402	-0.468	-0.486
	(0.065)	(0.061)	(0.060)	(0.075)	(0.075)	(0.089)
College Grad	-0.356	-0.380	-0.389	-0.384	-0.310	-0.254
	(0.051)	(0.054)	(0.057)	(0.056)	(0.046)	(0.051)
Total	-0.400	-0.414	-0.386	-0.327	-0.632	
	(0.067)	(0.066)	(0.058)	(0.058)	(0.085)	

Note: standard errors in parenthesis are clustered on education-experience

V.2 Econometric Analysis

V.2.1 Replication and Stability of Baseline Results

Most of the econometric analysis is based on estimating equation (1). A key difference between (1) and (3) is the inclusion of experience by year, experience by education and year by education fixed-effects. These effects are included in the models specifically because the difficulty of interpreting $\hat{\theta}$ as causal in equation (3) in the presence of strong bifurcation in earnings over the last 40 years.

Table 6 presents our replication of Borjas's estimates of equation (1) and as well as several alternatives to check for sensitivity. In rows 2-5 we check for sensitivity of the parameter estimates in equation (1). Within year and level of education, we construct our immigrant share variable in three ways – by 5 year experience groups as in Borjas; as a centered 5-year moving average; and as the share at single years of experience. We also model labor market experience

Table 6: Replication and Sensitivity of Fixed-Effect Results

	Unweighted Estimated θ	***Weighted Estimated θ***
Borjas		
1. X_{ijt}:5-year groups; x_j -5-year groups	-0.546	-0.572
	(0.141)	(0.162)
Panel A: Replication using Full Sample		
2. X_{ijt}:5-year groups; x_j :5-year groups	-0.633	-0.482
	(0.167)	(0.159)
3. X_{ijt}:5-year groups; x_j :1-year groups	-0.633	-0.472
	(0.123)	(0.085)
4. X_{ijt}:5-year MA groups; x_j :1-year groups	-0.668	-0.500
	(0.128)	(0.083)
5. X_{ijt}:1-year groups; x_j -1-year groups	-0.556	-0.432
	(0.110)	(0.070)
Panel B: Replication using State Sample		
6. X_{ijt}:5-year groups; x_j :5-year groups	-0.701	-0.488
	(0.165)	(0.162)
7. X_{ijt}:5-year groups; x_j :1-year groups	-0.701	-0.479
	(0.110)	(0.086)
8. X_{ijt}:5-year MA groups; x_j :1-year groups	-0.748	-0.506
	(0.117)	(0.085)
9. X_{ijt}:1-year groups; x_j -1-year groups	-0.600	-0.436
	(0.104)	(0.071)

Note: standard errors in parentheses, are clustered on education-experience

as 1 of 8 5-year experience groups (as in Borjas) and as 40 single year of experience dummy variables. Row 2 is our replication of Borjas. While the parameter estimates are slightly different, they are qualitatively the same and remain much larger than elsewhere in the literature.

Row 3 shows that approximating the earnings function by 5-year experience groups gives virtually identical estimates to a finer approximation of single years of experience.

One choice that Borjas faced was how to construct the immigrant share, X_{ijt}. Within a skill group, workers are viewed as substitutable, but are not viewed as substitutable across groups. Borjas constructed his measure of the immigrant share as the fraction of immigrants within 5-year experience groups (1-5 years of experience, 6-10 years etc.) within 4 levels of education and in one of five years. One potential issue is that a worker in the middle of the experience cell is assumed to compete with workers 2 years younger and two years older than himself while a worker whose experience is at the end of the cell is assumed to compete with workers 1 to 4 years younger but not with workers 1 year older. Rows 4 and 5 present estimates, when the immigrant share, X_{ijt}, is constructed in two different ways. First, within year and education level, it is constructed as the fraction of immigrants within 5-years of a workers level labor market experience – that is a 5 year moving average of the immigrant share. Second, it is constructed within year and education level as the fraction of immigrants at exactly the workers level of labor market experience. A 5-year moving average might better capture workers who are close substitutes vs. workers who are not; restricting the immigrant share to workers with exactly the same number of years of experience implicitly assumes that there is no effect of the fraction of immigrants one-year more or less experienced which in principle could be problematic. Rows 4 and 5, present the estimated impact of the immigrant share on native-born wages for these two new measures. Empirically, these different measures of the immigrant share matter little because

these measures are highly correlated. Finally, rows 6-9 replicate rows 2-5 on the sub-sample of data which state of residence is recorded.[2] All estimates are unchanged.

When experience by year, experience by education and year by education fixed-effects are not included in the regression, the analysis above clearly indicates that high school dropouts between 1980 and 2000 are whole responsible for the measured negative effect of the immigrant shock on earnings of native born workers. But once f experience by year, experience by education and year by education fixed-effects are included the regression model is no longer driven solely by this group. To see this we construct the "Yulized Residuals" for the regression model in equation (1). Specifically we estimate the "Yulized Residual for Y as

$$Y_{ijt} = s_i + x_j + \pi_t + s_i x_j + s_i \pi_t + x_j \pi_t + \varphi_{ijt} \tag{7}$$

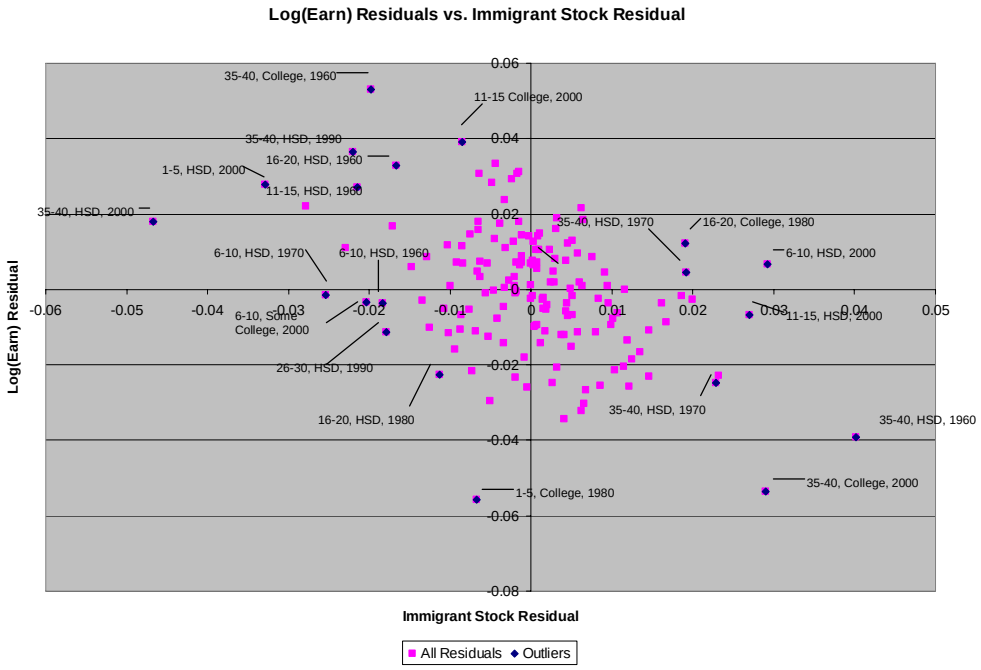
and the "Yulized Residual" for X as

$$X_{ijt} = s_i + x_j + \pi_t + s_i x_j + s_i \pi_t + x_j \pi_t + \eta_{ijt} . \tag{8}$$

Figure 4 plots φ_{ijt} vs. η_{ijt} for the unweighted regression with outliers labeled. What is clear is that both College Graduates and High School Dropouts are now having disproportionate influence on the regression line especially those with very little or a great deal of labor market experience. The next section investigates what is driving the large influence of both the highest and lowest educated workers.

[2] In 1970, only the two 1% "State" samples 1970 record state of residence for all households. Four other 1% samples do not consistently record State. In 1980 and in 1990 the 5% samples record state while the 1% samples do not. All the data samples in 1960 and 2000 record state of residence. Weights are adjusted so as to be consistent with analyzes that use all samples.

Figure 4: Residuals of Log Earnings vs. Immigrant Share



V.2.2 Are Immigrants or Natives Driving the Results

The immigrant share, $X_{ijt} = I_{ijt} / I_{ijt} + N_{ijt}$ can be decomposes into the number of immigrants and natives. The correlation between the immigrant share and wages could be occurring either because there is a negative correlation between wages and the number of immigrants or there is a positive correlation between wages and the number of natives. It would increase confidence in the Borjas (2003) result if the negative correlation between wages and the immigrant share was driven appropriately by the stock of immigrants. However, changes in the number of native born in a skill-group could have independent effects on wages through several channels and these may vary by the level of education. Murphy and Welsh (1992) argue that the rising number

of college graduates depressed the wages of this group. For high-school dropouts, there is a concern that educational selection might be a factor. Between 1960 and 2000 the fraction of native-born workers that were high-school dropouts decreased enormously. In 1960, 51.2% of male workers had not completed high school; by 2000 only 8.5% of workers had not completed high school. The observed negative correlation between wages and the immigrant share variable could be the result of changes in the number of natives rather than the number of immigrants. If high-school dropouts were more negatively selected, as their numbers dwindled, the remainder may have had lower unobserved human capital and lower wages.

To test whether a rise in the number of immigrants or a decline in the number of native-born in a skill-group are correlated with a fall in the wages of native born workers in that group, we estimate

$$Y_{ijt} = \theta_1 I_{ijt} + \theta_2 N_{ijt} + s_i + x_j + \pi_t + s_i x_j + s_i \pi_t + x_j \pi_t + \varphi_{ijt} \quad . \tag{9}$$

To test the restriction implicit in equation 1.1, the null hypothesis $\varepsilon_{yI} = -\varepsilon_{yN}$ simplifies to testing $\theta_2 = -\theta_1\left(\frac{I}{N}\right)$ where $\varepsilon_{yI} = (\partial y/\partial I)(I/y) = -(\partial y/\partial N)(N/y) = -\varepsilon_{yN}$ in equation (1). Notice that one must choose a point of evaluation for I and N to conduct this test. When this test is conducted at the sample mean of $\frac{\overline{I}}{N}$ the model is strongly rejected (F-Statistic of 26.05) but the number of immigrants does appear to reduce wages. A simpler alternative is to redefine $X_{ijt} = \log\left(\frac{I_{ijt}}{N_{ijt}}\right)$ as our measure of the immigrant shock in equation (1) and estimate equation (9) in the $\log(I_{ijt})$ and the $\log(N_{ijt})$. This has the great advantage of θ in equation (1) and θ_1 and

θ_2 all having an elasticity interpretation and making the restriction on equation (1) that $\theta_2 = -\theta_1$ which is easily testable.

Column 1 of Table 7 presents these estimates for the regression model where labor market experience and the immigrant share are measured by single years of experience. Row 1 repeats the coefficient from equation (1) and row 3 presents the same model with the immigrant share measured as $X_{ijt} = \log\left(\frac{I_{ijt}}{N_{ijt}}\right)$.[3] The estimate suggests a 1% increase in the immigrant share decreases wages by 4.7%. Row 4 reports estimates on $\log\left(I_{ijt}\right)$ and the $\log\left(N_{ijt}\right)$ separately. Both the number of natives and the number of immigrants affect wages in the expected direction. Further, under this specification we fail to reject the null hypotheses that $\theta_2 = -\theta_1$ (F(1,159) = 0.27).

As we discussed above, it is not possible to non-parametrically allow the wage function to vary by education, experience and year as this is how the immigrant share is defined. However, it is possible to be somewhat more flexible and allow the return to experience to vary by year and education parametrically. We re-estimate equations (1) and (7) including two interactions: $\pi_t s_i\left(\exp\right)$ and $\pi_t s_i\left(\exp^2\right)$ where exp and $\exp^2$ are a linear and quadratic in labor market experience. These results are reported in Column 2 of Table 7. In all specifications, allowing the wage function to be more flexible greatly reduces the estimated effect of

[3] In row 2 we present the estimates where the immigrant share is constructed as the $\log\left(\frac{I_{ijt}}{I_{ijt}+N_{ijt}}\right)$. This is a direct logarithmic transformation of the original immigrant share immigrant share is the source of the differentially changing returns to experience across

Table 7: Alternative Measures of Immigrant Shock
(X_{ijt} :1-year groups; x_j -1-year groups)

	Weighted Estimated θ	***Weighted Estimated θ With Quadratic Interactions***
Original Measure		
1. Borjas Immigrant Shock (ISS) *ISS=(Number of Immigrants$_{ijt}$/ Number of Immigrants$_{ijt}$ +Number of Natives$_{ijt}$)*	-0.432 (0.070)	-0.116 (0.066)
Alternative Elasticity Measures		
2. Natural Log of Borjas Immigrant Shock *Ln(ISS)*	-0.0482 (0.0084)	-0.0200 (0.0056)
3. Natural Log of Ratio of Immigrants to Natives *Ln(Number of Immigrants$_{ijt}$/ Number of Natives$_{ijt}$)*	-0.0476 (0.0079)	-0.0181 (0.0052)
4. Separate Estimates of Natural Log of Immigrants and Natives		
Ln(Number of Natives)	0.0502 (0.0082)	0.0278 (0.0068)
Ln(Number of Immigrants)	-0.0457 (0.0095)	-0.0095 (0.0060)

immigration. For example, in row 3 suggest that a 1% increase in the number of immigrants relative to native-born workers reduced wages by a 4.7%; when the returns to experience are allowed to vary by education over time the estimated reduction in wages declines to 1.8%. As discussed above, it is not clear whether a more flexible specification is warranted. If the wage function is changing for reasons other than immigration then allowing the function to be more flexible purges these factors which are correlated with the immigrant share. However, if the immigrant share is the source of the differentially changing returns to experience across education groups then allowing the wage function to be more flexible removes part of the effect of immigration. What this specification points out is that the critical issue is to understand what is shifting the wage-experience profile differentially by schooling level over time.

---

education groups then allowing the wage function to be more flexible removes part of the effect variable. Without exception estimates of θ are similar to using $\log\left(\frac{I_{ijt}}{N_{ijt}}\right)$.

The remaining analysis uses $\log\left(\frac{I_{ijt}}{N_{ijt}}\right)$ as the immigrant shock to more easily investigate separately the effects of immigrants from natives. Table 8 presents estimates of the effect of the immigrant shock (column 1) as well as separate effects for the number of native (column 2) and the number of immigrants (column 3) by level of schooling under the regression model (1). Column 1 shows that the three lower education groups have a statistically significant negative effect of the immigrant share with the effect being particularly large for high school dropouts and high school graduates. Notice that the affect of immigration on college graduates appears to be positive rather than negative. Columns 2 and 3 show that the number of immigrants is strongly negatively related to the wages of native born workers for high school dropouts and high school graduates. It appears to be insignificant and small in magnitude for workers with some college or who are college graduates. Interestingly, the estimated effect of the number of native born among college graduates is strongly negative and significant. That the number of immigrants in a skill-group has an independent effect on the wages of the native-born for high school dropouts and high school graduates is consistent with the Borjas hypothesis. However, at the top of the education distribution the evidence is more consistent with Murphy and Welsh's emphasis on changing cohort size.

Table 8: Measures of Immigrant Shock by Education
(X_{ijt} :1-year groups; x_j -1-year groups)

	Weighted Estimated of θ *Ln(Number of Immigrants$_{ijt}$/ Number of Natives$_{ijt}$)*	***Weighted Estimated of θ*** *Ln(Number of Natives$_{ijt}$)*	***Weighted Estimated of θ*** *Ln(Number of Immigrants$_{ijt}$)*
Overall Effects			
1. All Levels of Education	-0.0476	0.0502	-0.0457
	(0.0079)	(0.0082)	(0.0095)
Effects by Education			
2. High School Dropouts	-0.0611	0.1398	-0.0610
	(0.0078)	(0.0121)	(0.0073)
3. High School Graduates	-0.0616	0.0755	-0.0360
	(0.0070)	(0.0089)	(0.0090)
4. Some College	-0.0336	0.0207	-0.0071
	(0.0100)	(0.0097)	(0.0119)
5. College Graduate	0.0298	-0.0510	0.0063
	(0.0112)	(0.0096)	(0.0158)

V.2.2 Is The Immigrant Shock Measuring Labor Supply of Labor Demand?

The central question remains whether there are other factors that might be correlated with the immigrant shock that are responsible for the measured effect among the low skilled. The most common alternative explanation for changes in the wages of this group is de-industrialization. Under the Borjas model, the effect of immigration should affect all regions equally. Murphy and Welsh (1992) suggest that deindustrialization differentially affected the wage profile of men with low levels of education. The key to the strategy of investigating whether the immigrant shock is correlated with these shifts in the demand for a low-skilled worker is the high geographic concentration of manufacturing jobs particularly durable goods manufacturing.

After a period of relative stability, beginning with the 1979 recession manufacturing employment began a step decline. As a percentage of total employment, employment in durable goods manufacturing

was 20% in 1960, 21% in 1970, 19% in 1980, 15% in 1990 and 13% in 2000.[4] Further, durable goods manufacturing has historically been geographically concentrated. The seven States with the highest fraction of native-born men employed in durable goods manufacturing in 1960 were Michigan (40%), Connecticut (36%), Ohio (33%), Indiana (33%), Pennsylvania (28%), Wisconsin (27%) and Illinois (25%). Together these 7 states accounted for 45% of employment in durable goods manufacturing and nearly 40% of employment in all manufacturing. Since Borjas's hypothesis is that the effect of immigration is equal across regions then regressing the average wages of a skill group in a region against the national immigrant share should have equal effects across regions. Table 9 presents estimates from a regression that includes an interaction between a dummy variable that equals 1 if the worker resides in one of the 7 manufacturing states and is zero otherwise (*M7*) and the immigrant shock measure. Specifically in Column 1 of Table 9 we report estimates on δ_0 and δ_1 from the regression

$$Y_{ijt} = \delta_0 X_{ijt}(1-M7) + \delta_1 X_{ijt}(M7) + \gamma * M7 + s_i + x_j + \pi_t + s_i x_j + s_i \pi_t + x_j \pi_t + \varphi_{ijt} \qquad (10)$$

as well as estimates of δ_{0i} and δ_{1i} for the immigrant share interacted with both *M7* and the level of education from the regression

$$Y_{ijt} = \delta_{0i} X_{ijt} s_i (1-M7) + \delta_{1i} X_{ijt} s_i (M7) + \gamma * M7 + s_i + x_j + \pi_t + s_i x_j + s_i \pi_t + x_j \pi_t + \varphi_{ijt}. \qquad (11)$$

In Columns 2 and 3 we present parallel estimates when the immigrant share is disaggregated into $\log(I_{ijt})$ and $\log(N_{ijt})$.

[4] The fraction in durable goods manufacturing is slightly lower in the CPS data.

In general, Table 9 suggests a large role for the immigrant share variable partly reflecting changes in the demand for low skilled labor. Comparing rows 1 and 5 of column 1 we see that the estimated "effect of immigration" is larger in our 7 heavy manufacturing states as it is outside these states. The apparent effect on high school graduates in heavy manufacturing states suggests

Table 9: Measures of Immigrant Shock by Education and Manufacturing States
(X_{ijt} :1-year groups; x_j -1-year groups)

	Weighted Estimated of θ *Ln(Number of Immigrants$_{ijt}$/ Number of Natives$_{ijt}$)*	***Weighted Estimated of*** θ *Ln(Number of Natives$_{ijt}$)*	***Weighted Estimated of*** θ *Ln(Number of Immigrants$_{ijt}$)*
Not Top 7 Manufacturing States			
1. Overall Effects	-0.0412	0.0534	-0.0323
	(0.0097)	(0.0125)	(.0108)
2. High School Dropouts	-0.0733	0.0790	-0.0194
	(0.0234)	(0.0197)	(0.0349)
3. High School Graduates	-0.0438	0.0481	-0.0406
	(0.0152)	(0.0153)	(0.0175)
4. Some College	-0.0180	0.0256	-0.0115
	(0.0132)	(0.0173)	(0.0132)
5. College Graduate	-0.0332	0.0028	-0.0354
	(0.0202)	(0.0200)	(0.0206)
Top 7 Manufacturing States			
5. Overall Effects	-0.0560	0.0263	-0.0736
	(0.0131)	(0.0193)	(0.0134)
6. High School Dropouts	-0.0299	0.0172	-0.0781
	(0.0354)	(0.0351)	(0.0303)
7. High School Graduates	-0.0948	0.0256	-0.1392
	(0.0201)	(0.0318)	(0.0215)
8. Some College	-0.0540	0.0892	-0.0362
	(0.0147)	(0.0210)	(0.0201)
9. College Graduate	-0.0327	-0.0114	-0.0360
	(0.0264)	(0.0329)	(0.0263)

a 1 percent change in the ratio of immigrants to native born workers would lower wages by 9.5%. This is double the estimated effect outside of this seven state area. When separate estimates of the effects of immigrants are considered, the estimated effects are much smaller

outside of the heavy manufacturing region. Formal tests of the equality of the effects overall across regions is strongly rejected (F-Statistic 457.7) while pair-wise tests of equality across regions within education group are rejected for all groups.

Column 3 of Table 9 presents even stronger evidence of differences in the impact of immigration across these regions. Relaxing the restriction that $\theta_2 = -\theta_1$, the estimated impacts of immigration on wages is markedly different across areas. The effect of immigrants for each education group is double or triple in manufacturing areas relative to other areas. The estimated impact on high school graduates suggests an implausibly large effect – a 1% increase in the number of immigrants in an experience cell reduces wages by 14%.

Table 9 cast doubt on a central hypothesis of the Borjas hypothesis, the equality of the impact of immigration across areas. Further it cast doubt in a way that suggests that the immigrant share is measuring labor demand rather than labor supply. The effects are largest in manufacturing areas and for the low skilled; this is where changes in labor demand are affecting the wage structure.

Table 10 tries to answer the question "In the absence of manufacturing, what would be the measured effect of immigration on wages?" To do this the fraction of native born workers employed in manufacturing in 1960 in each state is calculated and is used to model how the presence of manufacturing changes the effect of the immigrant share. Under the model, the counterfactual experiment can be done, evaluating the model for a hypothetical area which is not subject to changes in demand occurring in manufacturing. Specifically we run the regression,

$$Y_{ijt} = \delta_0 X_{ijt} + \delta_1 X_{ijt}(Fraction\_1960) + \gamma * (Fraction\_1960) + s_i + x_j + \pi_t + s_i x_j + s_i \pi_t + x_j \pi_t + \varphi_{ijt} \quad (12)$$

Column 2 of Panel A reports the coefficients from this specification. The interaction between the immigrant share and the fraction of the State employment in 1960 that is in manufacturing is strongly negative and statistically significant consistent with the more negative effects found in the top 7 durable manufacturing states in Table 9. For the hypothetical area which has no manufacturing in 1960, the impact of the immigrant share variable is approximately half as large as at the mean level of manufacturing. In Panel B the interaction between the immigrant share variable and the fraction manufacturing in the State is interacted with the level of education in Rows 2-5 of Panel B. There is a clear pattern. The effect of the immigrant share for high school

Table 10: Measures of Immigrant Shock by Level of Manufacturing
(X_{ijt} :1-year groups; x_j -1-year groups)

	Without % Manufacturing Interactions	***With % Manufacturing Interactions***
Panel A: Interactions with Fraction of Manufacturing in a State in 1960 -Log*(I_{ijt}/ N_{ijt})*		
1. Log(I_{ijt}/ N_{ijt}) θ (col 1) or δ_0 (col 2)	-0.0476 (0.0079)	-0.0240 (0.0094)
2. Log(I_{ijt}/ N_{ijt})*(Fraction Manufacturing in State in 1960) δ_1	-	-0.0637 (0.0154)
3. Fraction Manufacturing in State in 1960 γ	-	0.4021 (0.0439)
Panel B: Interactions with Fraction of Manufacturing in a State in 1960 an Education -Log*(I_{ijt}/ N_{ijt})*		
1. Log(I_{ijt}/ N_{ijt})	-0.0476 (0.0079)	-0.0088 (0. 0071)
2. Log(I_{ijt}/ N_{ijt})*(Fraction Manufacturing in State in 1960)*(High School Dropout=1)		-0.2070 (0.0112)
3. Log(I_{ijt}/ N_{ijt})*(Fraction Manufacturing in State in 1960) *(High School Graduate=1)		-0.1174 (0.0114)
4. Log(I_{ijt}/ N_{ijt})*(Fraction Manufacturing in State in 1960) *(Some College=1)		-0.0663 (0.0209)
5. Log(I_{ijt}/ N_{ijt})*(Fraction Manufacturing in State in 1960) *(College Graduate=1)		0.0867 (0.0240)

dropouts rises sharply with the historical dependence of a state in manufacturing; however as education rises, the effect of the immigrant share rises less sharply with the areas historical dependence on manufacturing. Under this model, an area with no dependence on manufacturing would have no effect of the immigrant share on wages.

An alternative test of the equality of effects across regions is to allow the effect of the national level of immigration to vary by State. That is,

$$Y_{ijt} = \theta_u X_{ijt} S_u + \gamma_u * S_u + s_i + x_j + \pi_t + s_i x_j + s_i \pi_t + x_j \pi_t + \varphi_{ijt} . \quad (13)$$

Then a test of equal effects of immigration across states is that $\theta_k = \theta_{k'}$ for all pairs of states *k* and *k'*. Formal tests of the equality of the effects overall across regions is strongly rejected (F(49,159) = 60.95). Similarly, when decomposing X_{ijt} into the log of then number of immigrants and the log of the number of native born, and allowing the effects on each to vary by state, the effect of the log of the number of immigrants should also be equal across state. That is when running the regression

$$Y_{ijt} = \theta_{1u} I_{ijt} S_u + \theta_{2u} N_{ijt} S_u + \gamma_u * S_u + s_i + x_j + \pi_t + s_i x_j + s_i \pi_t + x_j \pi_t + \varphi_{ijt} . \quad (14)$$

a nationally integrated labor market would imply $\theta_{1k} = \theta_{1k'}$ for all pairs of states *k* and *k'*. This is similarly rejected (F(49,159)=52.21).

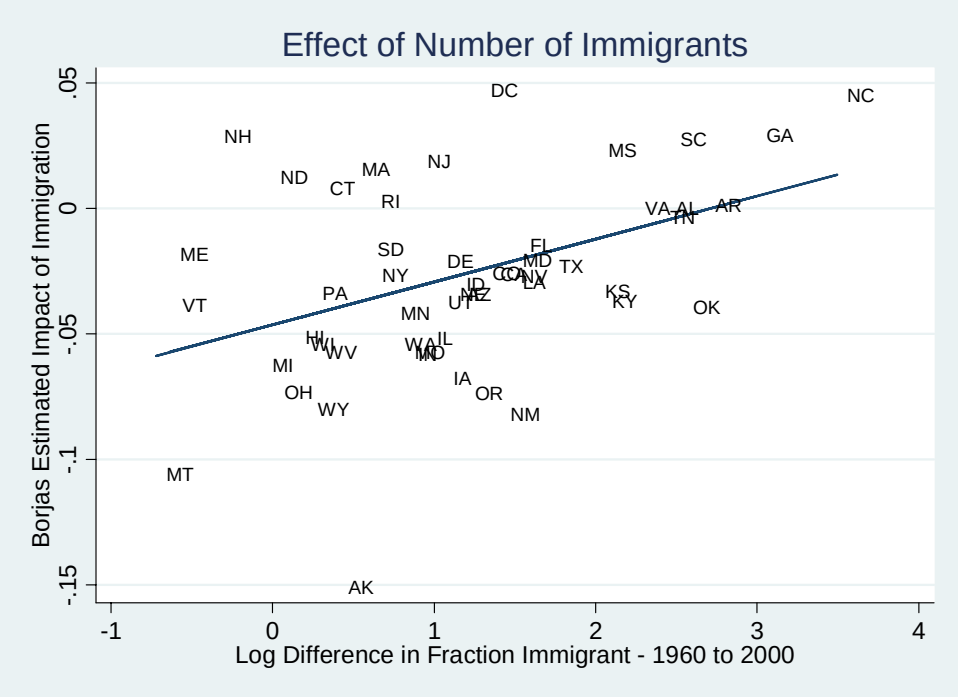
One final analysis cast doubt on the hypothesis that the flow of immigrants in a skill group is shift in the supply of labor of that skill group nationally. It is often argued that immigrants are attracted to regions that have increasing labor demand. If this is true then one test of whether the immigrant shock is measuring labor supply or labor demand can be seen by examining the correlation between θ_{1u} in equation 14 and the growth in the fraction of immigrants in a state between 1960 and 2000. Under the national labor market hypothesis these

should be unrelated. However, under the hypothesis that θ_{1u} is measuring the effect of labor demand rather than labor supply, θ_{1u} should be larger in states that are attracting immigrants and smaller in states that have not attracted immigrants if immigrants are flowing to states with increasing labor demand.

Figure 5 plots θ_{1u} for 50 States and the District of Columbia against the log difference in the fraction of immigrants in each State in 1960 and 2000. The results are clear – the faster the immigrant population grew relative to the native population, the ***smaller*** the measured impact of national immigration on local wages. Most of the manufacturing states had very little new immigration over the past 40 years; these states also had wages falling with the rise in immigrants nationally. States such as North Carolina and Georgia have gone from virtually no immigrants in 1960 to 8.5% and 10.8% of their population of immigrant background in 2000. As these states expanded, immigrants were attracted to these states where the demand for labor was rising (especially in the construction industry for men). This was a period in which wages rose for low skilled men generally. And this is correlated with the national level of immigrants in a skill group.

When we regress θ_{1u} against the log difference in the fraction of immigrants across our 50 states and DC in 2000 vs. 1960, we find a strong positive correlatation with the measured impact of immigration. The slope of the regression line in Figure 5 is 0.017 with a t-statistics of (3.24).

Table 5:
The Measured Effect of Immigration on Earnings by State vs. the Log Growth in the State's Immigrant Share



V.3 Time Trend Results

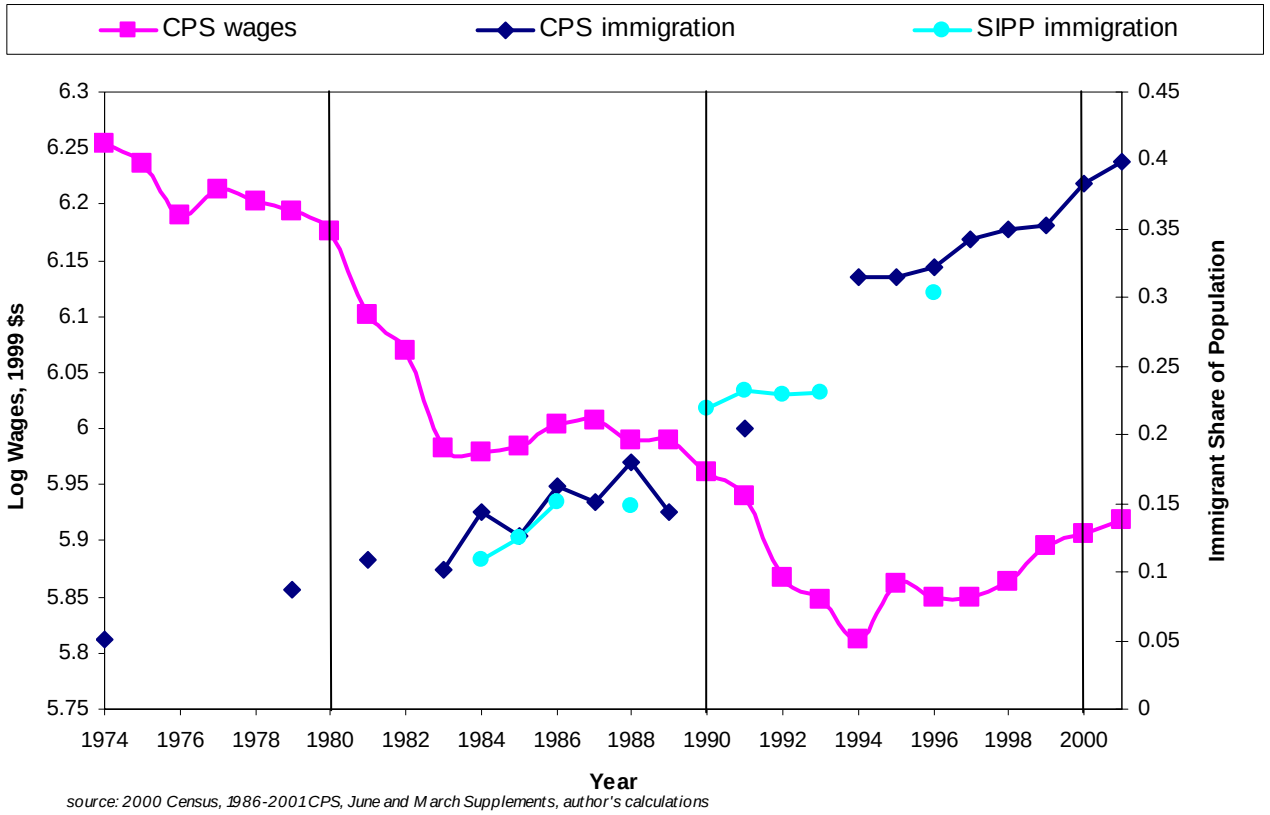
Thus far our analysis has relied on data from five points in time (the decennial censuses). We now look more closely at what happened *between* these points. Consistent with the differences between wages and immigrant share across decade, we find that in general the wages of high school dropouts fell while the fraction of immigrants rose. However, there is little evidence that year-to-year variation in immigrant share is correlated with year-to-year changes in wages and there are several periods over the 1980s and 1990s where immigrant share and wages are positively correlated.

We use data from the Current Population Survey and the Survey of Program Participation (SIPP) to analyze the inter-census periods. Questions regarding immigration were asked in the March supplements in 1994-2001 and in the June supplements in 1986, 1988, 1991, and 1994-2001. Not only is current citizenship and nativity available, but also the year of immigration. To measure immigration share in the years not listed above, we use the year of immigration variable from the nearest survey. For example, our CPS measure of the immigrant stock in 1984 is estimated as the stock of immigrants in 1986 *less* those who in the June 1986 supplement indicated they immigrated between 1984 and 1986. We believe this is a more reliable technique than to, for instance, use the year of immigration variable from the 1991 or 1994 survey, since fewer immigrants will have emigrated or died as of 1986. The year of immigration variable is coded in intervals of varying length, so we cannot construct the immigrant stock for every year between 1974 and 2001. The SIPP data, however, recorded information on immigrant status since its inception in 1984. While we are unable to construct the immigrant stock for every year, we believe we have enough information to give a clear picture of the trend in immigration.

To construct the trend of wages, we use men of age 18-64 who are employed, not in

school, not self-employed, with positive earnings, hours, and weeks worked, just as we did in the previous section. Unlike before, we use the wages of all workers, not just native workers because we cannot distinguish natives from immigrants in *all* years. Where we can distinguish the two, we find that including or excluding immigrants does not affect the trend.

Figure 5:
Trends in Wages and Immigration, for High School Dropouts in the U.S.

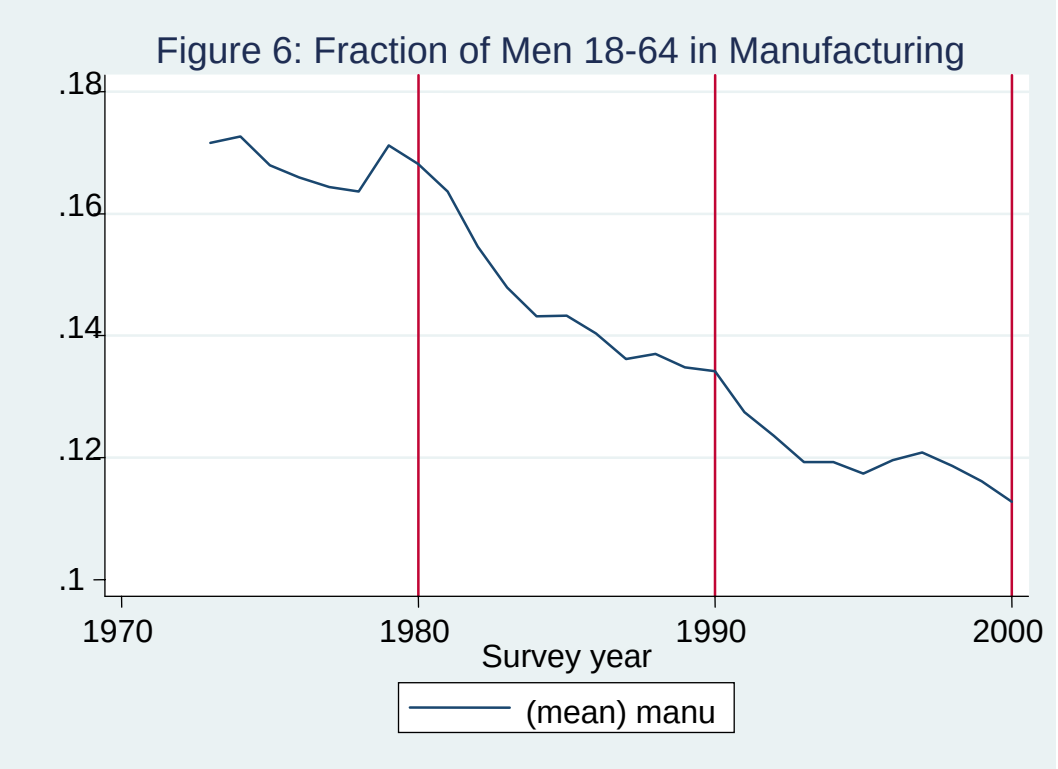


source: 2000 Census, 1986-2001 CPS, June and March Supplements, author's calculations

Figure 5 shows plots the wages of high school dropouts from 1974 to 2000. When we compare the trend in wages to the trend in immigrant share, we first note how the changes between 1980, 1990, and 2000 would predict the negative relationship between immigration and wages estimated in Table 6. Between 1980 and 1990, Figure 5 shows a large decrease in wages and a modest increase in immigration. Then between 1990 and 2000, we see a more modest decrease in wage and a large increase in immigration. Estimation off of these three points would

clearly give a negative correlation in wages and immigration. However, Figure 5 shows that there is much more going on than the three points would suggest. Between 1979 and 1983 as wages dropped precipitously, immigration was almost flat. Then as immigration began to rise from about 1983 to 1988, wages were almost flat. Finally, beginning around 1994, the immigrant share rose as the wages of high school dropouts rose. This pattern is the opposite of what the simple supply and demand theory, and indeed the Borjas (2003) result, would suggest. During the critical post-1980 period it is only the period between 1989 and 1994 where immigration rose while wages fell.

Figure 6 plots the fraction of Men 18-64 employed in durable goods manufacturing. After a period of some stability in the late 1970s, there is a steep decline between 1979 and 1984, a leveling off until 1990 and then another decline to 1995. This tracks to a large degree the wages of high school dropouts in Figure 5. However, comparing the immigrant share in Figure 4 to the fraction of men in manufacturing in Figure 6, the issue becomes clear; the immigrant share trends largely upwards while the fraction in manufacturing trends largely downwards. And both plausible affect the wages of less experienced workers relative to more experience workers. Breaks from trend in manufacturing employment occurred between 1990 and 1995, the same period in which immigrant inflows into the working population began surging.



To summarize, we find that year-to-year changes in the share of immigrants are not especially strongly correlated with the change in the wages of high school dropouts for much of the time period between 1980 and 2000. The largest decline in wages occurs *prior* to the largest increases in the immigrant stock, occurring during the period where de-industrialization is thought to be important. However, for one period of time, between 1989 and 1994 there appears to be large increases in the immigrant share coincident with large declines in the wages of high school dropouts. Unfortunately, this is clouded by a large drop in manufacturing employment during these same years.

VII. Conclusion

This paper argues that a central test of the Borjas model is that the response to immigration should be equal across regions. There is considerable evidence that this equality is strongly rejected and is rejected in a way that suggests that the immigrant share may be

measuring labor demand at the low end of the education distribution; among college graduates it appears that the size of the native-born college graduate workforce is playing a role. In their 1992 paper "The Structure of Wages," Murphy and Welsh suggest that the two primary factors shifting the wage profile in the U.S. are deindustrialization for low skilled workers and cohort size for college graduates. Borjas' econometric specification is identified by changes in wages over time in experience-education groups that differ from the predictions of a model which restricts the wage-experience profile to shift over time in the same way across education groups. It is only changes in the wage-experience structure of low vs. high education workers that identify the Borjas model and that these changes are correlated with the immigrant share suggests a new hypothesis for the changing structure of wages in the U.S.

The Borjas' model has a strong feature which is equality of the impacts of immigration across regions. The evidence in this paper suggests that the measured impact is much larger in areas that are historically manufacturing based. These are areas that themselves received few immigrants. The most plausible explanation for this high correlation between wages and the immigrant share in manufacturing regions is that the immigrant share of a skill group is measuring labor demand not labor supply. Evidence consistent with this is that the effects of the immigrant share fall with education and fall differentially between manufacturing areas and non-manufacturing areas. In addition we show that in areas that have had rapid rises in the demand for labor in recent years, such as the South Atlantic region, the measured "effects of immigration" are positive not negative. This all suggests that the low skilled labor market is not national in scope and that the national immigrant share of a skill group is on net measuring labor demand shifts rather than labor supply shifts.

What our work points out is the difficulty in measuring the effects of immigration at the national level as other trends such as de-industrialization and increasing college cohort size have changed at the same time. The difficulty stems from the fact that most shocks to the economy differentially affect young workers, steepening the wage-experience profile. Since many shocks happened at the same time it is very difficult to sort these out with national data. Regional data lend some hope for tests; comparing impacts in the manufacturing region, a region know to have had demand shocks during the time period, to the rest of the U.S. suggests that the results of national changes in immigrant skill-group on wages are inconsistent with a national labor market affected by immigration.

APPENDIX A

Issues in Data Construction

Both in replicating the Borjas analysis and in comparing U.S. and Canada Censuses, we had to make a number of judgment calls with the data. These are outlined below.

1) United States Censuses:
   a) Definition of Immigrant: Individual is defined as an immigrant if:
      i) Born outside the U.S. and U.S. territories, and
      ii) Either:
         (1) Naturalized or Non-Citizen, or
         (2) Neither parent born in U.S. and U.S. territories (this applies to the 1970 Form 2 only, where citizenship status is not available)
2) Canadian Census:
   a) Reconciliation of Education Groups with the U.S.:

	United States	Canada
High School Dropout	Did not finish 12th Grade	No degree or certificate
High School Graduate	Completed 12th Grade, including did or did not receive diploma and including GED	Secondary/High School graduate certificate or equivalent
Some College	1,2, or 3 years of college	Trade certificate/diploma, other non-university certificate, or university certificate < B.A.
College Graduate	4+ years of college, B.A./M.A./Professional degree/Ph.D.	B.A., >B.A., /Medical/Dental/Veterinary degree, M.A., Ph.D.

Both censuses have education definitions which vary over the period of analysis; some provide an individual's highest degree attained, others provide the number of years of schooling, and some provide both. The IPUMS data provides a variable which bridges these two and is comparable across years, and that is what is used above ("educrec" variable, and scheme suggested by Jaeger (1997)). We attempt to construct a similar variable for the Canadian Censuses, both to make the education definition comparable across years and comparable with the U.S. definition. One difficulty arises from differences in the countries' education systems. In the U.S. a high school education is completed in 12 years, and this is standard across the country. However in Canada, high school may be considered complete in anywhere from 11 to 13 years depending on the province.

b) Wage topcoding: Borjas adjusts the topcoded salaries in the U.S. between 1960 and 1980 by multiplying the top values by 1.5 (which amounts to $25,000*1.5 in 1960, $50,000*1.5 in 1970, and $75,000*1.5 in 1980). These adjusted values are still lower than the top values in

the Canadian census (after adjusting for the exchange rate), so we do not make a topcoding adjustment in Canada.

c) Exchange rate and inflation adjusting: Following Borjas, we deflate U.S. dollars to 1999 dollars using the CPI-U series. For Canadian dollars, we first adjust to U.S. dollars using the Federal Reserve H.10 release and then convert to 1999 dollars again using the CPI-U.

APPENDIX B

Year-Education-Experience Cell Sizes

Education	*Years of Experience*	*Raw # of Observations for US*				
		1960 (US)	**1970**	**1980**	**1990**	**2000**
HS Dropout	1-5	427	3484	10432	15323	21514
	6-10	644	4405	11623	18551	26015
	11-15	845	5849	11025	18043	25617
	16-20	1137	6818	9738	16264	23881
	21-25	1235	7381	9347	13549	20468
	26-30	1577	7815	8946	10632	17029
	31-35	2425	7747	8327	8891	13453
	36-40	3423	8384	8288	7967	9372
HS Grad	1-5	208	3326	7887	12720	18317
	6-10	282	3591	7761	14148	20004
	11-15	336	3667	7315	12607	20057
	16-20	568	3335	5900	10603	18607
	21-25	487	3425	5568	8770	15530
	26-30	559	4274	4778	7033	12396
	31-35	555	3213	4439	5871	9793
	36-40	592	3577	4398	4807	6471
Some College	1-5	153	2553	6477	10618	12273
	6-10	233	2464	6684	12257	13774
	11-15	240	2132	5456	11599	14850
	16-20	290	1902	3890	9647	15033
	21-25	253	1764	3191	7510	12550
	26-30	234	1926	2557	5446	10027
	31-35	313	1375	2271	4169	7025
	36-40	248	1406	1906	2941	4420
College Grad	1-5	222	2971	5930	9031	14504
	6-10	373	4447	10433	13848	20755
	11-15	410	3766	9291	14600	22973
	16-20	319	3385	8027	14447	21117
	21-25	306	3103	5573	10879	18250
	26-30	314	2148	4492	8706	16185
	31-35	303	1996	3575	5535	10660
	36-40	246	1743	2198	3891	7163
Min		*153*	*1375*	*1906*	*2941*	*6471*
Max		*3423*	*7815*	*11623*	*18551*	*25617*

References

Abbott, Michael and Charles Beach (1993). "Immigrant Earnings Differentials and Birth-Year Effects for Men in Canada: Post-War-1972", *The Canadian Journal of Economics* vol. 26 no. 3, pp. 505-524.

Altonji, Joseph and David Card (1991). "The Effects of Immigration on the Labor Market Outcomes of Less-skilled Natives", in Abowd, J. and R. Freeman, eds., *Immigration, Trade and the Labor Market,.* Chicago: University of Chicago Press, pp. 201-234.

Baker, Michael and Dwayne Benjamin (1994). "The Performance of Immigrants in the Canadian Labor Market", *Journal of Labor Economics* vol. 12 no. 3, pp. 369-405.

Baker, Michael and Dwayne Benjamin (1995). "The Receipt of Transfer Payments by Immigrants to Canada", *The Journal of Human Resources* vol. 30 no. 4, pp. 650-676.

Belsley, D.A., Kuh, E., and Welsch, R.E (1980). *Regression Diagnostics,* New York: John Wiley & Sons.

Berman, Eli, John Bound, and Zvi Griliches (1994). "Changes in the Demand for Skilled Labor within U.S. Manufacturing: Evidence from the Annual Survey of Manufacturers", *Quarterly Journal of Economics* 109, pp. 367-397.

Bloom, David and Morley Gunderson (1991). "An Analysis of the Earnings of Canadian Immigrants", in Abowd, J., and R. Freeman, eds., *Immigration, Trade and the Labor Market.* Chicago: University of Chicago Press, pp. 321-342.

Borjas, George (2004). "Increasing the Supply of Labor Through Immigration Measuring the Impact on Native-born Workers," Center for Immigration Studies paper, May 2004.

Borjas, George (2003). "The Labor Demand Curve *Is* Downward Sloping: Reexamining the Impact of Immigration on the Labor Market," *Quarterly Journal of Economics*, pp.1335-1374.

Borjas, George (1993). "Immigration Policy, National Origin, and Immigrant Skills: A Comparison of Canada and the United States", in Card, David and Richard Freemen, eds, *Small Differences that Matter: Labor Markets and Income Maintenance in Canada and the United States.* Chicago: University of Chicago Press, pp. 21-44.

Borjas, George (1991). "Immigration and Self-Selection", In Abowd, J., and R. Freeman, eds., *Immigration, Trade and the Labor Market.* Chicago: University of Chicago Press, pp. 29-76.

Borjas, George, Richard Freeman, and Lawrence Katz (1997). "How Much Do Immigration and Trade Affect Labor Market Outcomes?", *Brookings Papers on Economic Activity* 1, pp. 1-67.

Borjas, George, Richard Freeman, and Kevin Lang (1991). "Undocumented Mexican-born Workers in the United States: How Many, How Permanent", in Abowd, J., and R. Freeman, eds., *Immigration, Trade and the Labor Market.* Chicago: University of Chicago Press, pp. 77-100.

Bound, John and George Johnson (1992). "Changes in the Structure of Wages in the 1980's: An Evaluation of Alternative Explanations", *American Economic Review* 82, pp. 371-392.

Bowlus, Audra (1998). "U.S.-Canadian Unemployment Rate and Wage Differences among Young, Low-Skilled Males in the 1980s", *The Canadian Journal of Economics* vol. 31 no. 2, pp. 437-464.

Card, David (2001). "Immigrant Inflows, Native Outflows, and the Local Market Impacts of Higher Immigration", *Journal of Labor Economics* 19, pp. 22-64.

Card, David (1990). "The Impact of the Mariel Boatlift on the Miami Labor Market", *Industrial and Labor Relations Review* XLIII, pp. 245-257.

Card, David and John Dinardo (2002). "Skill Biased Technological Change and Rising Wage Inequality: Some Problems and Puzzles", NBER Working Paper 8769.

Card, David, Francis Kramarz, and Thomas Lemieux (1999). "Changes in the Relative Structure of Wages and Employment: A Comparison of the United States, Canada, and France", *The Canadian Journal of Economics* vol. 32 no. 4, pp. 843-877.

Dinardo, John and Thomas Lemieux (1997). "Diverging Male Wage Inequality in the United States and Canada, 1981-1988: Do Institutions Explain the Difference?", *Industrial and Labor Relations Review* vol. 50 no. 4, pp. 629-651.

Douglas, Paul Howard (1930). *Real Wages in the United States, 1890-1926.* Boston: Houghton Mifflin.

Freeman, Richard and Karen Needels (1993). "Skill Differentials in Canada in an Era of Rising Labor Market Inequality", in Card, David and Richard Freemen, eds, *Small Differences that Matter: Labor Markets and Income Maintenance in Canada and the United States.* Chicago: University of Chicago Press, pp. 45-68.

Freidberg, Rachel and Jennifer Hunt (1995). "The Impact of Immigrants on Host Country Wages, Employment and Growth", *Journal of Economic Perspecitves* 9, pp. 23-44.

Goldin, Claudia (1994). "The Political Economy of Immigration Restriction in the United States, 1890 to 1921", in Goldin, Claudia and Gary Libecap, eds, *The Regulated Economy: A Historical Approach to Political Economy.* Chicago: University of Chicago Press, pp. 223-258.

Gottschalk, Peter (1993). "Changes in Inequality of Family Income in Seven Industrialized Countries", *The American Economic Review* vol. 83 no. 2, pp. 136-142.

Grant, Mary (1999). "Evidence of New Immigrant Assimilation in Canada", *The Canadian Journal of Economics* vol. 32 no. 4, pp. 930-955.

Green, Alan and David Green (1995). "Canadian Immigration Policy: The Effectiveness of the Point System and Other Instruments", *The Canadian Journal of Economics* vol. 28 no. 4b, pp. 1006-1041.

Green, David (1999). "Immigrant Occupational Attainment: Assimilation and Mobility over Time", *Journal of Labor Economics* vol. 17 no. 1, pp. 49-79.

Greenwood, Michael and John McDowell (1991). "Differential Economic Opportunity, Transferability of Skills, and Immigration to the United States and Canada", *The Review of Economics and Statistics* vol 73 no 4, pp. 612-623.

Griliches, Zvi and Jerry Hausman (1986). "Errors in Variables in Panel Data", *Journal of Econometrics* vol. 31, pp. 93-118.

Grossman, Jean Baldwin (1982). "The Substitutability of Natives and Immigrants in Production", *Review of Economics and Statistics* LIV, pp. 596-603.

Hansen, Gordon and Matthew Slaughter (2002). "Labor Market Adjustments in Open Economies: Evidence from US States" *Journal of International Economics* vol. 57 no. 1, p. 3-29.

Johnson, George (1997). "Changes in Earnings Inequality: The Role of Demand Shifts", *Journal of EconomicPerspectives* 11, pp. 41-54.

Juhn, Chinhui, Kevin Murphy, and Brooks Pierce (1993). "Wage Inequality and the Rise in Returns to Skill," *Journal of Political Economy* 101, pp. 410-42.

Katz, L. and D. Autor (1999). “Changes in the Wage Structure and Earnings Inequality,” in O. Ashenfelter and D. Card, *Handbook of Labor Economics*, Vol 3a, pp. 1463-1555.

Katz, Lawrence and Kevin Murphy (1992). "Changes in Relative Wages, 1963-1987: Supply and Demand Factors," *Quarterly Journal of Economics* 107, pp.35-78.

Krueger, Alan (1993). "How Computers Have Changed the Wage Structure: Evidence from Microdata, 1984-1989," *Quarterly Journal of Economics* 108, pp. 33-60.

LaLonde, Robert and Robert Topel (1991). “Labor Market Adjustments to Increase Immigration.” In Abowd, J., and R. Freeman, eds., *Immigration, Trade and the Labor Market.* Chicago: University of Chicago Press, pp. 167-200.

Lewis, Ethan (2003). “Local, Open Economies Within the US: How Do Industries Respond to Immigration?”, Federal Reserve Bank of Philadelphia Working Paper No. 04-1.

McKinnish, Terra (2000). “Model Sensitivity in Panel Data Analysis: Some Caveats About the Interpretation of Fixed Effects and Difference Estimators”, unpublished work in progress, http://spot.colorado.edu/~mckinnis/.

Murphy, Kevin and Finis Welsh (1992). “The Structure of Wages,” *The Quarterly Journal of Economics.* Vol 107, No. 1, pp 285-326.

National Research Council (1997). *The New Americans: Economic, Demographic and Fiscal Effects of Immigration*. Washington, DC: National Academy Press.

Nickell, Stephen and Brian Bell (1996). “Changes in the Distribution of Wages and Unemployment in OECD Countries”, *The American Economic Review* vol. 86, no. 2, pp. 302-308.

Richardson, David (1997). “Changes in the Distribution of Wages in Canada, 1981-1992”, *The Canadian Journal of Economics* vol. 30 no. 3, pp. 622-643.

Roback, Jennifer (1982). “Wages, Rents, and the Quality of Life”, *Journal of Political Economy* vol. 90, no. 6, pp.1257-1278.

	Weighted Estimated of θ *Ln(Number of Immigrants$_{ijt}$/ Number of Natives$_{ijt}$)*	***Weighted Estimated of θ*** *Ln(Number of Natives$_{ijt}$)*	***Weighted Estimated of θ*** *Ln(Number of Immigrants$_{ijt}$)*
Not Top 7 Manufacturing States			
1. Overall Effects	-0.0412	0.0534	-0.0323
	(0.0097)	(0.0125)	(.0108)
2. High School Dropouts	-0.0733	0.0790	-0.0194
	(0.0234)	(0.0197)	(0.0349)
3. High School Graduates	-0.0438	0.0481	-0.0406
	(0.0152)	(0.0153)	(0.0175)
Top 7 Manufacturing States			
5. Overall Effects	-0.0560	0.0263	-0.0736
	(0.0131)	(0.0193)	(0.0134)
6. High School Dropouts	-0.0299	0.0172	-0.0781
	(0.0354)	(0.0351)	(0.0303)
7. High School Graduates	-0.0948	0.0256	-0.1392
	(0.0201)	(0.0318)	(0.0215)