Immigration and the Effects on the U.S. Labor Market (1960-2000)

George J. Borjas
Harvard University

This report has been funded, either wholly or in part, with Federal funds from the U.S. Department of Labor, Employment and Training Administration under Contract Number AF-12985-000-03-30. The contents of this publication do not necessarily reflect the views or policies of the Department of Labor, nor does mention of trade names, commercial products, or organizations imply endorsement of same by the U.S. Government.

U.S. Department of Labor
Employment and Training Administration Occasional Paper 2005-10

Table of Contents

1.0 Introduction

There has been a resurgence of immigration in the United States and in many other countries. The United Nations estimates that over 175 million people, or roughly 3 percent of the world's population, now reside in a country where they were not born (United Nations 2002). Although most immigrants choose a "traditional" destination (such as the United States, Canada, or Australia), many other countries are also receiving relatively large immigrant flows. Nearly 11 percent of the population in France, 9 percent in Germany, 11 percent in Sweden, and 7 percent in the United Kingdom is foreign born.

Not surprisingly, the impact of immigration on the host country's labor market is now being heatedly debated in many countries. In the U.S. context, this concern has motivated a great deal of research that attempts to document how the U.S. labor market has adjusted to the large-scale immigration in the past few decades. Three central questions have dominated much of the research: What is the contribution of immigration to the skill endowment of the workforce? How do the employment opportunities of native workers respond to immigration? And, who benefits and who loses?

The policy significance of these questions is evident. For example, immigrants who have high levels of productivity and who adapt rapidly to conditions in the host country's labor market can make a significant contribution to economic growth. Conversely, if immigrants lack the skills that employers demand and find it difficult to adapt, immigration may increase the size of the population that requires public assistance and exacerbate ethnic and racial inequality.

Similarly, the debate over immigration policy has long been fueled by the widespread perception that immigration has an adverse effect on the employment opportunities of natives. Which native workers are most adversely affected by immigration and how large is the decline in the native wage?

Finally, a key insight of economic theory is that immigration has distributional impacts, reducing the income of workers who compete with immigrants and raising the income of those who employ immigrants or purchase immigrant-provided services. Any assessment of the costs and benefits of alternative immigration policy proposals will depend directly on the magnitude of this redistribution.

This report summarizes what is known about the impact of immigration on the U.S. labor market. The analysis makes extensive use of the microdata provided by the decennial censuses between 1960 and 2000. In order to more fully understand the source of the labor market trends that will be discussed below, it is useful to begin by providing a brief summary of U.S. immigration policy—as the policy changes have had a direct impact on the size and the skill composition of immigration in the past half century.

The major impetus for the resurgence of large-scale immigration to the United States, particularly immigration from less developed countries, came from the 1965 Amendments to the Immigration and Nationality Act. Before 1965, immigration to the United States was guided by

the national origins quota system. This scheme greatly restricted the annual number of immigrants, and used quotas to allocate visas across countries. The number of visas given to each country was based on the ethnic composition of the U.S. population in 1920. As a result, 60 percent of all available visas were awarded to applicants from only two countries: Germany and the United Kingdom.

The 1965 Amendments repealed the national origins quota system. Along with subsequent minor legislation, the Amendments set a higher worldwide numerical limit for immigration and enshrined a new objective for allocating entry visas among the many applicants: the reunification of families. The United States now grants the bulk of the visas to persons who have relatives already residing in the country. In 2002, for example, 63.3 percent of all legal immigrants used family connections to enter the country.

There has also been a substantial increase in illegal immigration. The latest wave of illegal immigration began in the late 1960s after the end of the Bracero Program, an agricultural guest worker program for Mexicans that was discontinued because of its perceived harm on the economic opportunities of competing native workers. To address the problems created by illegal immigration, Congress enacted the 1986 Immigration Reform and Control Act (IRCA). This legislation gave amnesty to 3 million illegal aliens and introduced a system of employer sanctions designed to stem the flow of additional illegal workers. This legislation obviously did not solve the illegal immigration problem. In its most recent published estimate, the Immigration and Naturalization Service (2003) reported that 7 million illegal aliens resided in the United States in January 2000, with 69 percent originating in Mexico.

The 1965 policy shift had a historic impact on the number of immigrants admitted. Even though only 250,000 legal immigrants entered the country annually during the 1950s, almost 1 million were entering by the 1990s. Figure 1 illustrates the impact of this resurgence of immigration on the immigrant presence in the labor market. In 1970, there were 3.2 million foreign-born workers in the labor market, accounting for 4.9 percent of the workforce. By 2000, there were 15.4 million foreign-born workers, accounting for 13.4 percent of the workforce.[1]

The 1965 Amendments also changed the national origin mix of the immigrant population. Over two-thirds of the legal immigrants admitted during the 1950s originated in Europe or Canada, 25 percent in Latin America, and 6 percent in Asia. By the 1990s, only 16 percent originated in Europe or Canada, 49 percent in Latin America, and 32 percent in Asia.

Historically, immigrants have clustered in a small number of geographic areas. The top panel of figure 2 summarizes the clustering that occurs at the state level. In 2000, for example, 68 percent of immigrants lived in the six main immigrant-receiving states—California, New York, Texas, Florida, Illinois, and New Jersey—and almost 30 percent lived in California alone. As a result of this geographic clustering, the bottom panel of the figure shows that the foreign-born share of the population increased very rapidly in California, from 10 percent in 1970 to 33 percent in 2000, and increased from 9 to 20 percent in the five other major immigrant-receiving states. In contrast, the foreign-born share in the rest of the country rose only slightly, from 3 to 7 percent. The two panels of figure 2 also reveal a trend that will be discussed in greater detail below: the 1990s witnessed a “spreading out” of immigration from the traditional immigrant-

receiving states to other parts of the country. Between 1990 and 2000, for example, the share of foreign-born workers that lived in California declined from 33 percent to 29 percent, while the share of foreign-born workers that lived outside the six main immigrant-receiving states rose correspondingly from 27 to 32 percent.

The labor market impact of immigration depends not only on the size and geographic location of the immigrant population, but also on the skills that immigrants bring to the labor market—and, particularly, on how the skills of immigrants compare with those of natives. The point that it is the relative skills of immigrants that matter can be easily grasped through an example. Suppose that all of the immigrants who entered the United States between 1940 and 2000 had twelve years of schooling. The labor market impact of immigration, however, would differ greatly over time because most natives in 1940 were high school dropouts while most natives in 2000 had some college education. In 1940, the impact of immigration would be generated by an increase in the supply of high-skill workers; in 2000, the impact of immigration would be generated by an increase in the supply of low-skill workers.

Table 1 documents the trend in the distributions of educational attainment for native and immigrant workers. The table shows a significant decline in the relative education of the foreign-born workforce between 1960 and 2000. In 1960, for instance, 59.4 percent of immigrant workers were high school dropouts and 9.7 percent were college graduates. This educational mix was only slightly worse than that of native men, where 49.3 percent were high school dropouts and 9.7 percent were also college graduates. By 2000, however, natives were more likely to have a college degree (28.2 percent versus 25.9 percent) and were far less likely to be high school dropouts (29.4 percent of immigrants lacked a high school diploma, as compared to only 7.2 percent of natives). As a result of the relative increase in the number of immigrants who lack a high school diploma, figure 3 shows that the immigrant share in the population of workers who are high school dropouts rose from 6.1 percent in 1970 to 38.7 percent in 2000. Among college graduates, the increase was much more modest, from 5.7 percent to 12.4 percent.

This report presents an empirical analysis of the labor market consequences of these trends in the number, geographic distribution, and skills of immigrants. The report addresses four central questions in the economics of immigration:

1) What are the long-run trends in the relative performance of immigrants in the labor market?

2) What is the impact of immigration on the labor market opportunities of native workers?

3) How do native workers adjust to the labor market consequences of immigration?

4) How large are the economic benefits accruing from the immigrant-induced increase in labor supply?

2.0 The Skills of Immigrants

The skill composition of the immigrant population—and, particularly, how the skills of immigrant workers compares to those of native workers—is the key determinant of the economic impact of immigration on the United States. As argued above, the skill mix of immigrants determines which native workers are most affected by immigration. Unskilled immigrants will typically harm unskilled natives, while skilled immigrants will harm skilled natives. Skilled immigrants might also assimilate more quickly. They might be more adept at learning the tools and "tricks of the trade" that can increase the chances of economic success. Finally, the relative skills of immigrants determine the economic benefits from immigration. The United States benefits from international trade because it can import goods that are not available or are too expensive to produce in the domestic market. Similarly, the country benefits from immigration because it can import workers with scarce qualifications and abilities. Because of the crucial role that the relative skills of immigrants play in any analysis of the economic consequences of immigration, a great deal of research attempts to measure the level and trend in the relative skills of foreign-born workers in the United States.

The empirical results that will be reported throughout this report are based on an analysis of data drawn from the 1960-2000 Integrated Public Use Microdata Series (IPUMS) of the U.S. census.[2] These data contain information on the skills and labor market outcomes of millions of workers in the United States. In 1960 and 1970, the data provide a 1 percent random sample of the population. In 1980, 1990, and 2000, the data provide a 5 percent sample. All of the available observations in these large surveys are used in the analysis that follows. Throughout the study, persons who are not citizens or who are naturalized citizens are classified as immigrants; all other persons are classified as natives.[3] In this section of the report, where the focus is on documenting trends in relative immigrant skills, the samples are restricted to persons aged 18 to 64 who are not in the military and are not enrolled in school.

Table 2 summarizes the trends in key labor market characteristics for immigrants and natives over the past forty years, reported separately for men and women. The top panel of the table shows that immigrants have only slightly lower employment rates than native men, and that the employment rate of both groups declined at roughly the same rate over the past few decades. By 2000, 88.7 percent of natives and 87.9 percent of immigrant men worked at some point during the year. The table also indicates that immigrant men tend to work slightly fewer hours per year than native men.

The large differences between immigrant and native men tend to show up not in terms of employment, but in terms of wages. Table 2 also reports summary statistics on income earned in the calendar year prior to the census, as well as the log wage differential, which approximately measures the percent wage differential between immigrant and native men.[4] In 1960, immigrants had slightly higher annual earnings: about $25,300 as compared to $25,000 for natives. By 2000, however, immigrants had substantially lower annual earnings: natives earned $36,000 annually as compared to $29,300 for immigrants. In terms of hourly wage rates, the percent wage differential between immigrant and natives stood at +6.5 percent in 1960, declined to -7.3 percent in 1980, and declined further to -19.1 percent by 2000. This decline in relative wages can be partly attributed to the decline in relative educational attainment documented earlier.

The bottom panel of the table reports the respective statistics for immigrant and native women. Immigrant women tend to have much lower employment rates than native women. In 2000, for example, 77.2 percent of native women worked, as compared to only 64.2 percent of immigrant women. These large differences in employment rates imply that the wage trends for immigrant and native women are likely to be contaminated by selection biases arising from differences in the work decision. In fact, the trend in the log wage differential between immigrant and native women resembles that found among men, but the decline is not as steep. In 1960, immigrant women earned 2.8 percent more than native women; by 2000, immigrant women earned 9.8 percent less. Because of the likely importance of the selection that generates the sample of working women, most of the evidence reported below focuses on describing and explaining the trends for working men.

Many studies in the modern literature on the economics of immigration focus on analyzing how the earnings potential of immigrant workers adapts to the host country's labor market.[5] These studies typically estimate a regression model that relates a typical worker's earnings to his labor market experience, years of residence in the United States, and other variables. By tracing out the evolution of earnings over time (as natives accumulate more labor market experience and immigrants accumulate both more labor market experience and more time in the United States), it is possible to determine if the earnings of immigrant and native workers converge over time. The original study by Chiswick (1978) estimated this type of model using the 1970 census cross-section. Chiswick found that immigrants earn about 17 percent less than natives at the time of arrival. Because immigrants experience faster wage growth, immigrant earnings "overtake" native earnings within 15 years after arrival. After 30 years in the United States, the typical immigrant earns about 11 percent more than a comparable native worker.

Two distinct arguments have been used to explain these results. At the time of arrival, immigrants earn less than natives because they lack the U.S.-specific skills that are rewarded in the American labor market (such as English proficiency). As these skills are acquired, the human capital stock of immigrants grows relative to that of natives, and immigrants experience faster wage growth. The human capital investment hypothesis, however, does not by itself generate an overtaking point. After all, why would immigrants accumulate more human capital than natives? The overtaking point was instead interpreted in terms of a selection argument: immigrants are "more able and more highly motivated" than natives (Chiswick, 1978, 900). This assumption was typically justified by arguing that only the most driven and most able persons have the ambition and wherewithal to pack up, move, and start life anew in a foreign country.

This optimistic appraisal of immigrant adjustment was challenged by Borjas (1985), who argued that the positive cross-section correlation between the relative wage of immigrants and years-since-migration need not indicate that the wage of immigrants converges to that of natives. The basic problem with this interpretation of the data is that it draws inferences about how the earnings of immigrant workers evolve over time from a single snapshot of the immigrant population. It might be the case, however, that newly-arrived immigrants are inherently different from those who migrated twenty years ago. Hence, we cannot use the current labor market experiences of those who arrived twenty years ago to forecast the future earnings of newly-arrived immigrants.[6]

In the past two decades, the literature has concentrated on measuring both the "assimilation" and "cohort" effects that lie at the core of these varying interpretations of the cross-section data. To identify these effects separately, we need to track specific immigrant and native workers over time, or use a series of repeated cross-sections (such as the various censuses) to track specific groups of immigrant and native workers. Because large longitudinal samples of foreign-born workers are relatively rare, the literature has focused instead on measuring the various effects using the repeated cross-section method.

To illustrate the nature of the evidence, figure 4 begins by describing the trend in cohort effects over the past 40 years. The line labeled "1-5 years in U.S." describes the trend in the relative wage of immigrants who—as of the time of each census—have been in the United States for 1 to 5 years. More precisely, this line illustrates the trend in the unadjusted log wage differential between the immigrants who arrived in the 5-year period prior to the census and native workers in each census since 1960.

The figure clearly shows that the relative wage of newly arrived immigrants declined precipitously between 1960 and 1990.[7] In 1960, the typical male immigrant who had just arrived in the United States earned -9.1 percent less than his male native counterpart. By 1990, a new arrival was earning -38.0 percent less than his male native counterpart.

The figure indicates, however, that this trend was reversed in the late 1990s. By 2000, the newly arrived immigrant still had a sizable wage disadvantage, but substantially less than the disadvantage observed for the respective cohort 10 years earlier. In particular, the newly arrived immigrant in 2000 had a 32.2 percent wage disadvantage. Figure 4, therefore, summarizes an important trend in the relative skills of successive cohorts of immigrant men: a steep decline up through 1990 and a reversal of this trend in the 1990s.

It is worth noting that the "uptick" observed in the late 1990s in the relative wage of newly arrived immigrants seems to be specific to that cohort, and does not indicate an overall improvement in the earnings of other cohorts. Figure 4 also illustrates the trend in the relative wage of two additional immigrant cohorts: those present in the United States for 5 to 10 years and those present in the country for 10 to 15 years.[8] These trend lines clearly indicate that the relative wage of immigrants who have been in the United States either 5 to 10 years or 15 to 20 years did not increase in the 2000 census. Put differently, the increased wage of the cohort of immigrant men that arrived between 1995 and 1999 does not "transfer" to other cohorts, so it does not indicate a general improvement in the economic conditions facing immigrants. Rather, it represents an improvement in the economic opportunities available to that specific cohort.

Recent research by Borjas and Friedberg (2004) have documented that the uptick in cohort quality for immigrants who arrived in the late 1990s can be explained in terms of a simple story that has significant policy relevance. In particular, the entire uptick disappears when the relatively small number of immigrants who are employed as computer scientists and engineers is excluded from the analysis.[9] Figure 5 illustrates this basic result. The figure illustrates two basic trends. The first is simply the replication of the trend line first reported in figure 4 showing the steep decline and then the increase in the relative skills of newly arrived immigrant men. The second is the trend line obtained when the immigrant sample omits all workers who are classified

as computer scientists or engineers in any given census year. Prior to 1990, the two trend lines correspond with each other very closely (with the sample excluding high-tech workers, of course, having relatively lower earnings). There is, however, a significant break in the trend lines between 1990 and 2000.

In particular, the comparison of the actual cohort effects to the counterfactual (i.e., a labor market where no foreign-born computer scientists or engineers had been admitted) indicates that the uptick is completely driven by the admission of a large number of foreign-born computer scientists and engineers in the late 1990s. In both 1980 and 1990, fewer than 5 percent of the newly arrived immigrants worked in these high-tech occupations. By 2000, however, 11.1 percent of the newly-arrived immigrants worked in these occupations.

Although the census data does not provide information on the type of visa immigrants use to enter the country, it is probably not a coincidence that this increase in the relative number of high-tech immigrants occurred at the same time that the size of the H-1B Visa Program grew substantially. This program allows employers to sponsor the entry of temporary workers in "specialty occupations." In fact, most of the workers entering the country with an H-1B visa are employed either in computer-related occupations or in engineering (70 percent in 2000).[10] Between 1990 and 1994, the number of H-1B visas hovered around 100,000 annually. In 1996, this number increased to 144,548, to 240,947 in 1998, and to 302, 326 in 1999.[11] It seems, therefore, that this "importation" of high-tech workers through the H-1B Program reversed the long-standing trend of declining relative skills in successive cohorts of new immigrants.

The 1960-2000 census data can also be used to measure the extent of "economic assimilation," the improvement in the relative wage of a specific immigrant cohort over time.[12] In particular, one can use the decennial censuses: to calculate the wage differential between newly arrived immigrants and natives as of 1970; to recalculate the wage gap between these same two groups ten years later in the 1980 census; and to recalculate it again later in the 1990 and 2000 censuses. Figure 6 summarizes the economic assimilation trends experienced by men who arrived in the United States when they were 25 to 34 years old. Table 3 summarizes the assimilation trends for immigrants who arrived at other points in the life cycle.

Consider first the group of immigrant men who arrived in the late 1960s when they were 25 to 34 years old. Figure 6 shows that these immigrants earned 13 percent less than comparably aged native workers at the time of entry. Move forward in time 10 years to 1980, when both the immigrants and the natives are 35 to 44 years old. The wage gap between the two groups has narrowed to 3 percentage points. Move forward in time again to 1990, when both immigrants and natives are 45 to 54 years old. The wage gap between the same immigrants and natives has disappeared and immigrants now have a slight wage advantage of +1 percent. Finally, move forward in time to 2000, when the two groups are 54 to 65 years old. This immigrant cohort does not achieve any additional wage improvement and is at parity with native workers. Overall, the process of economic assimilation exhibited by this cohort reduced the initial wage disadvantage of these immigrants by about 10 percentage points over a 30-year period—with most of the growth occurring in the first 10 years after immigration. Because this immigrant cohort had a relatively high entry wage, the process of economic assimilation allowed the immigrants to narrow the wage disadvantage and catch up with natives.

With the exception of the immigrant cohort that entered in the late 1990s, the young immigrants who arrived after 1970, however, face a much bleaker future—simply because they start out with a much greater disadvantage. Consider those who arrived in the late 1970s. They entered the country with a 24 percent wage disadvantage. As with the earlier cohort, they too were able to narrow the gap by 10 percentage points in the first decade to 14 percent. But the 2000 census does not reveal any further narrowing. Even after 20 years in the United States, these immigrants still earn 14 percent less than comparably aged natives. The evidence, therefore, suggests that most of the immigrants who arrived in the 1970s and 1980s will not accumulate sufficient human capital to close the wage gap.

Table 3 presents more detailed evidence on the rate of economic assimilation for other cohorts of immigrants. The results suggest that the assimilation experience is significantly slower for immigrants who arrive in the United States at older ages. For example, the entry relative wage of immigrants who arrived in the United States in 1980 when they were 45 to 54 years old was -31.9 percent. This group's relative wage improved to only -27.6 percent by 1990. The table also indicates that immigrants who enter the United States as children have relatively little wage disadvantage. Those immigrants who entered the country when they were 5 to 14 years old in 1970, for example, earned about 4 percent more than natives when they eventually entered the labor market.

Finally, it is well known that there are substantial differences in economic status across national origin groups in the immigrant population. Table 4 summarizes the evidence from the 2000 census. The table reports the average log wage differential between immigrant men in a particular national origin group and native workers for the 15 largest national origin groups (as of 2000).

There are huge differences in economic performance across the national origin groups. The relative log wage of Mexican immigrants, for example, is -0.49, while that of Canadian immigrants is +0.30. Moreover, the last column of the table shows that these large differences remain even in the subsample of immigrants who have been in the United States fewer than 5 years, so that differences in the average number of years that the group has lived in the United States cannot explain the national origin differentials. Finally, as the last two rows of the table document, the differences in economic status across national origin groups are strongly correlated over time. The correlation between the log wage gap (for all national origin groups, not just the 15 groups listed in the table) in 1980 and 1990 is .91, and the correlation is still .88 between the wage gap in 1980 and 2000. The national origin differences documented in table 4, therefore, are numerically very large and remarkably stable.

3.0 The Labor Market Impact of Immigration

What happens when immigration increases the supply of workers in a particular labor market? In his influential introductory textbook, Paul Samuelson (1964, 552) gives the intuitive answer implied by the standard model of the labor market:

> "After World War I, laws were passed severely limiting immigration. Only a trickle of immigrants has been admitted since then… By keeping labor supply

> down, immigration policy tends to keep wages high. Let us underline this basic principle: Limitation of the supply of any grade of labor relative to all other productive factors can be expected to raise its wage rate; an increase in supply will, other things being equal, tend to depress wage rates."

Samuelson was writing just before the enactment of the 1965 Amendments to the Immigration and Nationality Act, the major policy shift that initiated the resurgence of large-scale immigration, leading him to make the point that immigration restrictions tended "to keep wages high." He also stressed the mirror-image implication: as immigrants increase the supply of a particular type of labor (such as low-educated workers), the wage paid to that group falls.

More generally, economic theory implies that immigration should lower the wage of competing workers and increase the wage of complementary workers, of workers whose skills become more valuable because of immigration. For example, an influx of foreign-born laborers reduces the economic opportunities for laborers—all laborers now face stiffer competition in the labor market. At the same time, high-skill natives may gain substantially. They pay less for the services that laborers provide, such as painting the house and mowing the lawn, and natives who hire these laborers can now specialize in producing the goods and services that better suit their skills.

Similarly, an immigrant influx of high-skill workers, such as the high-tech workers who entered the United States through the H-1B Visa Program would be expected to lower the wage of competing high-skill workers already employed in the United States. This influx could benefit low-skill workers, as the pace of scientific discovery allows quicker (and cheaper) dissemination of technology products, and may increase the productivity of low-skill workers through the introduction of technology products that are more complementary with the types of skills and services that low-skill workers offer to employers.

Because of the policy significance associated with determining the impact of immigration on the employment opportunities of native workers, a large literature developed in the past two decades attempting to measure this impact. The starting point for much of this literature is the fact that immigrants in the United States cluster in a small number of geographic areas. In 2000, for example, 38.4 percent of immigrants lived in four metropolitan areas (New York, Los Angeles, Chicago, and San Francisco), but only 12.2 percent of natives lived in the four metropolitan areas with the largest native-born populations (New York, Chicago, Los Angeles, and Philadelphia).

Practically all empirical studies in the academic literature exploit this geographic clustering to define the empirical exercise that purports to measure the labor market impact of immigration.[13] The typical study defines a metropolitan area (or state) as the labor market that is penetrated by immigrants. The study then goes on to calculate a cross-city correlation measuring the relation between the native wage in a locality and the relative number of immigrants in that locality. A negative correlation, indicating that native wages are lower in markets with many immigrants, would suggest that immigrants worsen the employment opportunities of competing native workers.

There is a great deal of dispersion in the findings reported by the various studies in this empirical literature. Nevertheless, there is a tendency for the estimated cross-city correlations to cluster around zero, helping to create the conventional wisdom that immigrants have little impact on the labor market opportunities of native workers, perhaps because "immigrants do jobs that natives do not want to do." It would seem, therefore, that a fundamental implication of the standard textbook model of the labor market—that an increase in supply lowers wages—is soundly rejected by the data.

Recent research, however, raises two questions about the validity of interpreting near-zero cross-city correlations as evidence that immigration has no labor market impact. First, immigrants may not be randomly distributed across labor markets. If immigrants tend to cluster in cities with thriving economies (and high wages), there would be a built-in positive correlation between immigration and wages.[14] This positive correlation would certainly attenuate, and perhaps even reverse, whatever negative impact immigration might have had on wages in local labor markets.

Second, natives may respond to the wage impact of immigration by moving their labor or capital to other cities. For example, native-owned firms see that cities in Southern California flooded by low-skill immigrants pay lower wages to laborers. Employers who hire laborers will want to relocate to those cities. The flow of jobs to the immigrant-hit areas cushions the adverse effect of immigration on the wage of competing workers in those localities. Similarly, laborers living in Michigan were perhaps thinking about moving to California before the immigrants entered that state. These laborers learn that immigration reduced their potential wages in California and may instead decide to remain where they are or move elsewhere. Moreover, some Californians might leave the state to search for better opportunities.

The flows of capital and labor tend to equalize economic conditions across cities. As a result, inter-city comparisons of native wage rates will not be very revealing: capital flows and native migration diffuse the impact of immigration across the national economy. In the end all laborers, regardless of where they live, are worse off because there are now many more of them.

Because local labor markets adjust to immigration, a number of recent studies have emphasized that the labor market impact of immigration may be measurable only at the national level.[15] Borjas (2003) used this insight to examine the link between immigration and the evolution of wages for specific skill groups in the past few decades. His study indicates that by analyzing national trends in the labor market and by defining skill groups in terms of both educational attainment and work experience, one can make substantial progress in determining how immigration alters the employment and earnings opportunities of native workers.

To see the usefulness of the empirical tactic of using both educational attainment and work experience to define skill groups, consider the following example. As we have seen, recent immigration increased the relative supply of high school dropouts substantially. The labor market implications of this increase clearly depend on how the distribution of work experience in the immigrant population contrasts with that of natives. After all, one particular set of native high school dropouts would likely be affected if all the new low-skill immigrants were very young, and a very different set would be affected if all the immigrants were near retirement age. In

essence, the methodological approach introduced by Borjas (2003) exploits the fact that similarly educated workers with very different levels of work experience are unlikely to be perfect substitutes (Welch 1979; Card and Lemieux 2001).

The empirical analysis reported in this section again uses data drawn from the 1960, 1970, 1980, 1990, and 2000 Public Use Microdata Samples (PUMS) of the decennial census. The men are classified into four distinct education groups: persons who are high school dropouts; high school graduates; persons who have some college; and college graduates. Work experience is defined as the number of years that have elapsed since the person completed school.[16] The analysis is restricted to workers with 1 to 40 years of experience. Workers are then grouped into eight different experience groups, indicating if the worker has 1-5 years of experience, 6-10 years, 11-15 years, and so on. There are, therefore, a total of 32 skill groups in the labor market (four education and eight experience groups).

As suggested above, there is a great deal of variation in the relative penetration of immigrants across the various skill groups. Figure 7 reports the trends in the immigrant share over the period, where the immigrant share gives the fraction of the skill group that is foreign born at a particular point in time.

It is well known that immigration greatly increased the supply of high school dropouts in recent decades. What is less well known, however, is that this supply shift did not affect equally all experience groups within the population of high school dropouts. As panel A of figure 7 shows, immigrants made up about half of all high school dropouts with 10 to 20 years of experience in 2000, but only 30 percent of those with less than 5 years. In 1960, however, the immigration of high school dropouts increased the supply of the most experienced workers the most. Similarly, panel D shows that the immigrant supply shock for college graduates in 1990 was reasonably balanced across all experience groups, generally increasing supply by around 10 percent. But the supply shock for college graduates in 1960 was larger for the most experienced groups, while in 2000 it was largest for workers with 5 to 20 years of experience.

It is instructive to illustrate the link that exists between the mean weekly earnings of workers in a particular skill group and the respective immigrant. In particular, the data allow the calculation of the wage growth experienced by each skill group in each decade and the corresponding change in the immigrant share. Figure 8 presents a scatter diagram relating these changes.[17] The plot clearly suggests a negative relation between wage growth and immigration: weekly wages grew fastest for workers in those skill groups that were least affected by immigration.

It is easy to use the data summarized in this scatter diagram to estimate a statistical model that relates changes in labor market outcomes for a particular group to the change in the immigrant share for that skill group (Borjas 2003, 1347-1351). In particular, let y_{ijt} denote the mean value of a particular labor market outcome for native men who have education i, experience j, and are observed at time t. Consider the regression model:

$$(1) \qquad y_{ijt} = \gamma\, p_{ijt} + s_i + x_j + \pi_t + (s_i \times x_j) + (s_i \times \pi_t) + (x_j \times \pi_t) + \varphi_{ijt},$$

where s_i is a vector of fixed effects indicating the group's educational attainment, x_j is a vector of fixed effects indicating the group's work experience, and π_t is a vector of fixed effects indicating the time period. The linear fixed effects in equation (1) control for differences in labor market outcomes across schooling groups, experience groups, and over time. The interactions ($s_i \times \pi_t$) and ($x_j \times \pi_t$) control for the possibility that the impact of education and experience changed over time, and the interaction ($s_i \times x_j$) controls for the fact that the experience profile for a particular labor market outcome differs across schooling groups. The presence of these education-experience interactions further implies that the impact of immigration on labor market outcomes is identified from changes that occur within education-experience cells over time. The analysis uses three alternative dependent variables: the mean of log annual earnings; the mean of log weekly earnings; and the mean of log weeks worked in the calendar year prior to the census.[18]

Table 5 reports the regression coefficients obtained from the statistical analysis. To easily summarize the implications of the evidence, the table also reports what happens to various labor market outcomes when immigration increases the number of workers in a particular skill group by 10 percent.[19] The table shows that immigration has a very strong effect on annual earnings. A 10 percent increase in the size of the skill group reduces annual earnings by 7.1 percent among salaried workers. This change in annual earnings arises because immigration reduces both weekly earnings and annual hours worked. Weekly earnings fall by 3.7 percent among salaried workers and by 4.5 percent if one includes the self-employed. Further, annual hours of work fall by about 3.5 percent. In sum, immigration has an adverse effect on both the wages and employment of competing native workers.

It is worth stressing that the strong negative effects of immigration on the employment opportunities of native workers found at the national level differ substantially from the near-zero correlations that are typically found when comparing wages across local labor markets differentially penetrated by immigrants. As we will see in the next section, the difference in the results between the two approaches may be partly attributed to the fact that immigration alters native migration decisions. In particular, native net migration rates fall in those areas most penetrated by immigrants, effectively spreading the impact of immigration on local labor markets to other areas.

The approach of examining how immigration affects labor market opportunities for specific schooling-experience groups can be expanded in one important way. The regression results presented in table 5 focus on estimating the "own-effect" of immigration—the impact of immigration on the wages of comparable native workers. The influx of immigrants into a particular skill group, however, will likely affect the earnings of workers in other skill groups. For example, the large immigrant influx of high school dropouts may well have a beneficial effect on earnings of native college graduates.

The problem with estimating these "cross-effects" is that there are over 500 cross-effects that need to be estimated across the 32 skill groups in the analysis. As a result, any study of these cross-effects must narrow the scope of the problem by relying on a specific model derived from economic theory. The typical approach used in the labor demand literature (Hamermesh 1993) specifies a production function that delineates how various types of labor and capital interact in

the production process, and estimates the implied parameters by assuming that workers are paid the value of their contribution to the firm's revenue (a standard result in labor markets that are competitive).

The mathematical appendix A of this report describes the technical model used to estimate both the own-effects and cross-effects of immigration on wages. In general terms, the model assumes that the economy-wide production function can be represented in terms of a three-level CES technology, a specification that aggregates across different levels of work experience and education groups in order to form the national workforce (Borjas 2003, 1359-1368). In this framework, similarly educated workers with different levels of work experience are aggregated to form the effective supply of an education group and workers across education groups are then aggregated to form the national workforce.

The assumption that the aggregate economy can be represented in terms of a three-level CES production function greatly reduces the number of parameters that need to be estimated. In particular, there are now three different responses of interest: how immigration in a particular skill group (say high school graduates with 20 years of experience) affects the earnings of native high school graduates with 20 years of experience; how these immigrants affect the wage of younger and older high school graduates; and how these immigrants affect the wage of workers in different education groups.

The evidence suggests an immigration-induced 10 percent increase in the number of workers in each skill group has the following effects: it reduces the wage of native workers in that same skill group by 3.5 percent; it reduces the wage of native workers who have the same education but who differ in their experience by 0.7 percent; and it increases the wage of native workers with different educational attainment by 0.5 percent. The implications of these estimated own- and cross-wage effects for the wage structure are best illustrated by using a particular example. In particular, consider what happened to the earnings opportunities of native workers as a result of the immigrant influx that entered the United States between 1980 and 2000.

Table 6 summarizes the results of this simulation. As indicated by the last row of the table, the immigrant influx of the 1980s and 1990s lowered the wage of native workers, particularly of those workers at the bottom and top of the education distribution. The wage fell by 7.4 percent for high school dropouts and by 3.6 percent for college graduates. In contrast, the wage of high school graduates and workers with some college fell by around 2 percent. Overall, the immigrant influx reduced the wage of the typical native worker by 3.7 percent.

It is worth pointing out that these wage impacts imply sizable reductions in annual earnings. In 2000, for example, the typical native man without a high school diploma earned $22,000 annually. This implies that immigration reduced this worker's earnings by around $1,600. Similarly, the typical male college graduate earned $70,000, implying that immigration reduced this worker's wage by over $2,500.

4.0 Labor Market Adjustments

The evidence reported in the previous section indicates that immigration seems to have a substantial adverse impact on wages at the national level. This finding stands in stark contrast to

the near-zero correlations that are typically estimated between wages and immigration across local labor markets. The difference between the two sets of findings could be explained in terms of a model of regional labor market adjustments. In particular, native workers or native-owned firms may respond to the impact of immigration on a particular labor market by moving their resources elsewhere, thereby spreading the impact of immigration away from the immigrant-targeted areas and towards the entire economy. This section of the report focuses on a particular adjustment mechanism—native migration decisions—and attempts to determine the extent to which the location decisions of native workers are influenced by immigration.[20]

The empirical analysis is begun by describing how the immigrant supply shock affected different labor markets in the past few decades. As shown in the introductory section, much of the immigration influx over the past 40 years affected a relatively small number of states. The possible link between the immigrant supply shock and the native location decision can be shown in a number of different ways. For example, consider the trend in the relative number of native workers who choose to reside in different parts of the country. Borjas, Freeman, and Katz (1997) first documented that the fraction of the native population that had chosen to live in California stopped growing around 1970, at the same time that large-scale immigration began. This important trend is illustrated in the top panel of figure 9. The data clearly indicate the relative numbers of native workers living in California first stalling, and eventually declining, as the scale of the immigrant supply shock increased rapidly.[21]

The middle panel of figure 9 illustrates a roughly similar trend for the other immigrant states. As immigration increased in these states (the immigrant share rose from about 9 percent in 1970 to 22 percent in 2000), the fraction of natives who chose to live in those states declined from 26.3 to 24.5 percent.

Finally, the bottom panel of the figure illustrates the trend in the relatively nonimmigrant areas that form the rest of the country. Although immigration also increased over time in this region, the increase has been relatively small (the immigrant share rose from 3.1 percent in 1970 to 7.5 percent in 2000). At the same time, the share of natives living in this region experienced an upward drift, from 64.5 percent in 1970 to 66.5 percent in 2000. Overall, therefore, the evidence summarized in figure 9 suggests a link between native location decisions and the immigrant supply shock.

The link that may potentially exist between the location decision of native workers and the immigrant share within schooling-experience cells is also evident at more disaggregated levels of geography. All of the census data available between 1960 and 2000 can be used to calculate for each schooling-experience-region group the growth rate of the native workforce during each decade (defined as the log of the ratio of the native workforce at the decade's two endpoints) and the decadal change in the immigrant share. The top panel of figure 10 presents the scatter diagram relating these decadal changes at the state level after removing decade effects. The plot clearly suggests a negative relation between the growth rate of a particular class of native workers in a particular state and immigration. The bottom panel of the figure illustrates the same pattern when the decadal changes are calculated at the metropolitan area level. In sum, the raw data clearly reveal that the native population grew fastest in those labor markets that were least affected by immigration.

Finally, table 7 provides an alternative way of looking at the data that seems to directly link native migration decisions and immigrant supply shocks. Beginning in 1970, the census contains information not only on the state of residence as of the census date, but also on the state of residence five years prior to the census. These data can be used to construct net-migration rates for each of the skill groups in each geographic market. To easily summarize the basic trends linking migration rates and immigrant supply shocks, consider breaking up the United States into three regions: California; the other immigrant-receiving states; and the rest of the country. A native worker is then defined to be an internal migrant if he moves across these three regions in the five-year period prior to the census.

The differential trends in the net-migration rate across the three regions are revealing. Within each education group, there is usually a steep decline in the net migration rate into California, a slower decline in the net migration rate into the other immigrant states, and a slight rise in the net migration rate into the rest of the country. In other words, the net migration of natives fell most in those parts of the country most heavily hit by immigration.

The other panels of table 7 show that the relative decline in net migration rates in the immigrant-targeted states arises both because of a relative decline in the in-migration rate and a relative increase in the out-migration rate. For example, the in-migration rate of natives into California fell from 9.5 to 7.1 percent between 1970 and 2000, as compared to a respective increase from 3.0 to 3.4 percent in the rest of the country. Similarly, the out-migration rates of natives from California rose from 8.3 to 9.1 percent in California, but fell from 3.2 to 2.8 percent in those states least hit by immigration.

To more fully evaluate the link between native location decisions and immigration, consider the following regression model:

$$(2) \qquad \log N_{ijt} = X_{ijt}\beta + \theta\, p_{ijt} + s_i + r_j + \pi_t + (s_i \times \pi_t) + (r_j \times \pi_t) + (s_i \times r_j) + \varepsilon_{ijt},$$

where N_{ijt} gives the number of native workers belonging to skill group i (a particular combination of schooling-experience) and residing in region j at time t, p_{ijt} gives the immigrant share for that cell, s_i gives a vector of fixed effects indicating the skill group, r_j is a vector of fixed effects indicating the region, π_t is a vector of fixed effects indicating the time period, and X is a vector of control variables. The various vectors of fixed effects absorb any region-specific, skill-specific, and time-specific factors that affect the evolution of the size of the native workforce in a particular labor market. Similarly, the interactions allow for decade-specific changes in the number of workers in particular skill groups or in particular regions caused by shifts in aggregate demand. Finally, the interaction between the skill and region fixed effects implies that the coefficient of the immigrant supply shock is being identified from changes that occur within a specific labor market.

The coefficient θ in this regression model can be used to calculate the derivative $\partial N/\partial M$, or the change in the number of native workers in a particular labor market for each additional immigrant worker.[22] The regression model was also estimated using the net migration, in-migration, and out-migration rates as alternative dependent variables. The regression models were estimated both at the state and metropolitan area levels. The regression coefficients, as well

as the derivative of interest, are summarized in table 8. The data indicate that, at the state level, each additional immigrant worker reduces the number of native workers by 0.2 persons, with half of this impact being due to a reduction in in-migration and the other half due to an increase in out-migration. At the metropolitan area level, the effects are larger, with each additional immigrant reducing the size of the native workforce by between 0.3 and 0.6 persons.

This statistical evidence suggests that there is an important link between native migration decisions and immigration that requires much further study. The native migration response helps to equalize conditions across local labor markets and diffuses the impact of immigration across the entire economy. These internal labor flows may help to explain some of the difference in the results obtained between national and local studies of the labor market impact of immigration.

It is also important to emphasize that not only does immigration alter the location decision of native workers, but it may also alter the location decision of immigrants as well. As noted earlier, immigrants have traditionally clustered geographically in a very small number of states and cities. As a result, there has been little study of the factors that determine the location decisions of immigrants. An important exception is the study by Bartel (1989), which suggests that the internal migration decisions of immigrant workers (perhaps because of the importance of ethnic enclaves in determining the geographic sorting of the immigrant population) are less responsive to regional wage differences than those of native workers.

Some of the evidence presented earlier in this report suggests that the geographic clustering of immigrants weakened somewhat during the 1990s, as immigrants chose to settle in nontraditional destinations. Figure 11 illustrates the nature of this important trend in the settlement decisions made by new immigrant workers—immigrants who have been in the United States 1 to 5 years as of the census date. The fraction of newly arrived immigrants who chose to live outside the main six immigrant-receiving states steadily declined from 31.9 percent in 1960 to 24.0 percent in 1990. This fraction, however, rose by a remarkable 16 percentage points (to 40.4 percent) in the 1990s. The immigrant gain to the “rest of the country” was entirely due to the reduction in the fraction of newly arrived immigrants who chose to reside in California.

Moreover, the spreading out of immigration into nontraditional states occurred not only among the newly arrived immigrants, but also among the immigrants who were already residing in the country. Table 9 reports the trends in the net-migration rates of immigrants who have been in the country for at least 5 years (as of the census date). The net migration rate of immigrants out of California fell from +4.1 percent in 1970 to -4.0 percent by 2000. In contrast, the net migration rate of immigrants into the nontraditional immigrant states rose from -2.2 percent in 1970 to +6.5 percent by 2000, with much of the increase occurring between 1990 and 2000.

As noted above, there has been very little study of the factors that determine internal migration rates of immigrants in the United States and of the factors that might account for the differential location decisions that many immigrants began to make in the 1990s. It is clear that this aspect of immigrant behavior has important consequences for labor markets. These consequences will likely receive much greater study in the next few years.

5.0 The Economic Benefits from Immigration

The influx of immigrants in the labor market changes the "terms of trade" between workers and firms, and affects the incomes accruing to workers, to firms, and to the native population in total. Does the net impact of all these changes benefit the native population of the United States?[23]

To measure accurately these economic gains, one needs to list all the possible channels through which immigration transforms the economy: immigration changes the prices of goods and services, the employment opportunities of workers, the number of jobs in native-owned firms, and the number of jobs in immigrant-owned firms. This exhaustive list can then be used to estimate what GDP (Gross Domestic Product) would have been if the country had not admitted any immigrants. The comparison of this counterfactual GDP with the actual GDP yields the increase in national income directly attributable to immigration. This calculation can also determine how much of the increase in national income accrues to natives as opposed to being paid directly to immigrants in return for their services.

Given the complexity of conducting such calculations, it should not be surprising that any estimate of the economic benefits from immigration requires a detailed model of the U.S. economy describing how the various sectors of the economy operate and are linked together. In this section, the simplest "textbook model" of the labor market is used to calculate the economic benefits that accrue from the employment of immigrants and to illustrate how these benefits have changed over the past few decades. In this particular model of the U.S. labor market, the immigrant influx increases the number of workers available. In the short run, the rest of the economy is unaffected by immigration. In particular, the capital stock of the United States—in terms of its land, machines, and other physical productive resources—remains as it was before the immigrants arrived.

We begin by specifying the aggregate production technology in the United States. Suppose that the technology can be summarized in terms of an aggregate production function with two inputs, capital (K) and labor (L), so that output $Q = f(K, L)$. The workforce is composed of N native workers and M immigrant workers. Suppose that all capital is owned by natives, so that we ignore the possibility that immigrants might augment the host country's capital stock. We will also ignore skill differentials among immigrant and native workers and assume that all workers are perfect substitutes in production (hence $L = N + M$). Finally, we will assume that the supplies of capital and of both native- and foreign-born labor are perfectly inelastic.

The aggregate production function exhibits constant returns to scale. As a result, the entire output is distributed to the owners of capital and to workers. The equilibrium in this economy prior to the admission of M immigrants requires that each factor price equals the respective value of marginal product. Suppose that the price of capital is initially r_0 and the price of labor is w_0. The price of the output is the numeraire (so that the input prices are measured in units of output). Before the admission of immigrants, therefore, the national income accruing to natives, Q_N, is the price of capital times the quantity used, plus the price of labor times the number of workers hired, or $Q_N = r_0 K + w_0 N$.

Figure 12 illustrates this initial equilibrium in the labor market. Because the supply of capital is inelastic, the area under the demand curve (which represents the marginal product of labor curve) gives the economy's total output. Prior to the entry of immigrants, therefore, the national income accruing to natives Q_N is given by the trapezoid *ABN0*.

What happens to national income when immigrants enter the country? The supply curve shifts and the market wage falls to w_1. National income is now given by the area in the trapezoid *ACL0*. Part of the increase in national income, however, is distributed directly to immigrants (who get w_1M in labor earnings). Inspection of figure 12 thus reveals that the increase in national income accruing to natives, or the immigration surplus, is given by the triangle *BCD*. Because the market wage equals the productivity of the last immigrant hired, immigrants increase national income by more than what it costs to employ them.

The immigration surplus is given approximately by the area of the triangle *BCD*, which can be calculated as $\frac{1}{2} \times (w_0 - w_1) \times M$. By manipulating this formula, it is easy to show that the immigration surplus, as a fraction of national income, equals:[24]

$$\frac{\text{Immigration surplus}}{GDP} = -\frac{1}{2} s\, e\, p^2, \tag{3}$$

where s is labor's share of national income; e is the elasticity of factor price for labor (that is, the percentage change in the wage resulting from a one percent change in the size of the labor force); and p is the immigration share, the fraction of the workforce that is foreign born.

In addition to creating an immigration surplus, immigration also causes a redistribution of wealth from labor to capital. In terms of figure 12, native workers lose the area in the rectangle w_0BDw_1, and this quantity plus the immigration surplus accrues to employers. Expressed as a fraction of GDP, the net change in the incomes of native workers and employers is given by:

$$\frac{\text{Change in native labor earnings}}{GDP} = s\, e\, p(1-p), \tag{4}$$

$$\frac{\text{Change in income of employers}}{GDP} = -s\, e\, p\left(1 - \frac{1}{2} p\right). \tag{5}$$

Table 10 uses the data available from 1960 through 2000 to calculate the immigration surplus and the redistribution of wealth in each of those years. The simulation assumes that labor's share of national income is 0.7 and that the factor price elasticity is -0.35 (as suggested by the evidence presented earlier). The table clearly shows that the resurgence of large-scale immigration has increased the size of the immigration surplus in recent decades, from about $1 billion annually in 1960 to around $21.5 billion annually in 2000.

Although the immigration surplus is small, immigration causes substantial wealth redistribution. By 2000, the model predicts that immigration reduced the total earnings accruing to native workers by about 2.8 percent of GDP and increased the income accruing to native

employers by 3.1 percent of GDP. In 2002 dollars, workers lose around $278 billion, while employers gain $300 billion.

6.0 Conclusion and Recommendations

This report documents how immigration altered the U.S. labor market in the past four decades. The evidence suggests a number of important empirical findings:

- The relative wage of successive waves of immigrants declined from 1960 through 1990, but increased during the late 1990s. This increase is mainly attributable to the large influx of immigrants who worked in the high-tech industry in the late 1990s, probably due to the expansion of the H-1B Temporary Worker Program.

- The wage gap between immigrants and natives narrows as immigrants accumulate experience in the U.S. labor market. This type of "economic assimilation" narrows the wage gap at the time of entry by about 10 percentage points during an immigrant's working life, with most of the narrowing occurring in the first 10 years after immigration.

- There are substantial differences in economic performance across national origin groups in the immigrant population, and these differences are remarkably stable over time.

- Immigration has an adverse impact on the labor market opportunities of native workers at the national level. A 10 percent immigrant-induced increase in the number of workers in a particular skill group reduces the wage of native workers in that group by between 3 and 4 percent.

- Native workers in local labor markets penetrated by immigrants respond by adjusting their location decisions. About 2 fewer native workers choose to live in a particular state for every additional 10 immigrant workers who move to that state. This native migration response diffuses the adverse impact of immigration on wages across the national economy.

- The 1990s witnessed a dramatic change in the geographic settlement pattern of immigrants, with more immigrants (both new arrivals and earlier immigrants) choosing to reside in areas that have not traditionally received many immigrants.

- The net economic benefits from immigration are relatively small, around $20 billion per year. This small net benefit, however, conceals a substantial redistribution of wealth that takes place as immigration lowers wages and increases the income of persons who use or employ immigrant services.

Although our understanding of how immigration alters labor market opportunities in a host country has increased substantially in the past 25 years, many questions remain unanswered. Some of the key questions that deserve much greater attention in future research include:

- There is a sizable wage gap between immigrants and natives, and this wage gap has been increasing over time. An important part of this wage gap can be attributed to differences in educational attainment between the two groups. Does the educational wage gap found between adult immigrants and adult natives persist among the children of these groups? If so, what factors determine the educational wage disadvantage of the children of immigrants?

- The immigrant cohort that arrived in the late 1990s had higher relative wages than the cohort that arrived in the late 1980s, probably due to the expansion of the H-1B Visa Program, a program that allows the importation of large numbers of temporary high-skill workers. Does the entry of the H-1B visa holders represent only a temporary increase in the relative wage of newly arrived immigrants, or will most of these visa holders be able to adjust status and obtain a permanent residence visa to remain in the United States?

- The process of economic assimilation observed over the past four decades suggests that most immigrant cohorts can narrow the wage gap between immigrants and natives by around 10 percentage points. What factors, including English language proficiency or internal migration, are responsible for the relatively faster earnings growth experienced by immigrant workers? What policies can encourage faster accumulation of human capital by immigrant workers? What is the role of ethnic enclaves in promotion or hindering the assimilation process?

- There is a great deal of variability in the labor market performance of different national origin groups, both in terms of wage levels and in terms of wage growth. What factors account for this variability in economic performance and assimilation rates?

- Immigration has a substantial effect on the earnings and employment opportunities of native workers at the national level. What exactly is the nature of this adverse effect? Do native workers move to lower-paying jobs as immigrants “take over” particular labor markets? What government policies can be used to best offset the adverse impact of immigration?

- Does the national impact of immigration differ across industries? In particular, is the impact of immigration stronger if natives work in nontradeable industries than in tradeable industries? What would a differential impact imply for the possible effectiveness of government policies in offsetting any adverse impact of immigration?

- Immigrants began to settle in nontraditional geographic areas in the 1990s. What factors motivated immigrants to spread out across the country in the 1990s? What has been the impact of this geographic diffusion on the labor markets most affected by the new immigration?

- Immigration generates a net gain at the national level on the order of around $20 billion annually. How much of this immigration surplus and of the wage savings that

initially accrue to employers gets passed down to consumers in the form of lower prices?

- Immigration has increased the supply of workers particularly at the lower and upper ends of the education distribution. Has this unbalanced supply shock altered the educational decisions of native workers?

- There is very little current information on the return migration decisions of immigrants. How many immigrants choose to leave the United States after they arrive? What is the selection mechanism generating this outflow?

- A number of current policy proposals wish to regularize the status of current illegal immigrants and establish a guest worker program to match U.S. employers with foreign workers. What will be the labor market impact of this expansion in the number of workers legally entitled to work in the U.S. labor market?

In addition to these research topics, the growing importance of immigration in the U.S. labor market suggests a number of pilot projects that the ETA could carry out that would substantially increase our understanding of the labor market impact of immigration. These projects include:

- Becoming proficient in the English language is an important step in the path of assimilation faced by the immigrant workforce. The ETA is already involved in conducting pilot projects to determine the value of English as a Second Language (ESL) training classes for immigrant workers. It would be useful to extend these types of projects to analyze the more general issue of the value and impact of training and various forms of human capital acquisition in the immigrant population. Some of the skills that immigrants bring to the United States may be specific to the labor market of the country of origin. As a result, many immigrants may require some on-the-job training to retool their skills in order to be more easily matched with the types of jobs available in the U.S. labor market. Similarly, many of the immigrants who lack a high school education (perhaps because of insufficient educational opportunities in the source country) may benefit greatly from completing a General Equivalency Diploma (GED) program in the United States. Pilot studies that would carefully document the costs and benefits of such training programs in the immigrant workforce would provide evidence that may be extremely valuable in any future discussion of the economic consequences of immigration.

- The presence of an immigrant enclave is likely to have a strong impact on the assimilation process, potentially affecting immigrant assimilation in both positive and negative ways. On the one hand, the enclave may provide a “warming embrace” to the incoming immigrants. On the other hand, the enclave may discourage immigrants from investing in the types of skills that may be useful in the labor market that lies outside the enclave’s geographic borders. The influence of the enclave on the process of assimilation would be much better understood if there was a strong documentation of the training and occupation decisions made by immigrants who choose to locate

outside of ethnic enclaves. A pilot study of such immigrants would provide valuable information about the costs and benefits of ethnic enclaves. Such a pilot study may also determine whether the value of providing training programs or ESL classes to the immigrant population depends on the labor market setting where such training will eventually be used.

- There is probably a great deal of back-and-forth migration between the United States and the country of origin for some immigrant groups—for example, Mexican immigrants living in Southern California or Texas. The persistence of this link to the source country may affect the economic performance of immigrants in the United States, not simply because of the discontinuity in U.S. labor market participation that such migration inevitably implies, but also because this type of migration may weaken the immigrants' incentives to fully "invest" in the types of skills that American employers find useful (e.g., becoming English language proficient). Little is known about the extent and labor market consequences of these back-and-forth flows. A pilot study of immigrants belonging to a particular national origin group who reside in a city where such type of migration is likely to occur frequently may substantially increase our understanding of how such type of migration affects economic performance and assimilation incentives.

- Immigrants often cluster in particular occupations (e.g., the overwhelming majority of taxi drivers in New York City are foreign born). Before these occupations were penetrated by immigrants, however, the jobs were held by native-born workers. A pilot study of an occupation that is in the process of becoming "foreignized" would provide extremely useful information and insights into the labor market consequences of immigration. Such a study could track the native-born workers currently employed in this occupation as the immigrant influx is occurring, and investigate the labor market activities and earnings of the native workers as their jobs are exposed to a sizable increase in the supply of competing workers.

Endnotes

[1] All of the statistics reported in this section are calculated using data drawn from 1960–2000 Integrated Public Use Microdata Series of the U.S. census. The data is described in more detail below.

[2] These data are available at the University of Minnesota's IPUMS website: http://www.ipums.umn.edu/usa/index.html.

[3] This definition implies that persons born abroad of American parents or persons born in American territories are classified as natives. Some of the variables reported in the census (such as annual earnings) refer to the year prior to the survey. To avoid confusion, the data are always referred to in terms of the census year. It is important to note that the census data used in this report contain all foreign-born persons enumerated by the census, which implies that it contain a large number of illegal immigrants. Due to the difficulty of identifying legal (and even visa) status in the foreign-born population, the census does not make any attempt at collecting information that would allow a researcher to identify the various groups. The analysis presented here does not attempt any type of differentiation between legal and illegal immigrants. One could also plausibly argue that it is the increase in the stock of workers—regardless of legal status—that is the first-order determinant of the labor market impact of immigration.

[4] Income earned in the past year includes both earnings from salaried jobs and income from self-employment.

[5] Representative studies include Carliner (1980), Duleep and Regets (1996), LaLonde and Topel (1992), and Yuengert (1994). Borjas (1999) and Smith and Edmonston (1997) survey this extensive literature.

[6] The cross-section correlation may also be contaminated by cohort effects if there is selective out-migration of immigrants, so that the trend in the earnings of "survivors" over time will not measure the actual earnings growth experienced by a particular immigrant cohort.

[7] To interpret the trend in the relative wage of immigrants (both within and across cohorts) as a measure of relative changes in skills, one must assume that period effects influence the wages of immigrants and natives by the same relative amount. It is well known that there were historic changes in the U.S. wage structure during the 1980s and that these changes did not affect all skill groups equally (Katz and Murphy 1992). Borjas (1995a) shows that detailed controls for period effects do not explain the downward trend in the relative wage of successive immigrant cohorts; see also Lubotsky (2001).

[8] The data reported in the 1960 census do not allow for the identification of specific immigrant cohorts (except for the immigrants who arrived between 1955 and 1960).

[9] The occupation codes used to define the sample of computer scientists and engineers in each census are: 80-93 in 1960; 3, 4, 6-23, in 1970; 44-59, 64, 229 in 1970 and 1980; 100-111, 132-153 in 2000.

[10] U.S. Immigration and Naturalization Service (2002).

[11] U.S. Immigration and Naturalization Service (various issues).

[12] It is believed that as many as one-third of the immigrants in the United States eventually return to their origin countries. Suppose that the return migrants are disproportionately composed of workers with lower than average wages. The inter-censal tracking of a particular immigrant cohort would then indicate an improvement in relative wages even if no wage convergence is taking place. Alternatively, if the return migrants are the "successes," the rate of wage convergence would be underestimated. Because of data limitations, the selection mechanism generating the return migration flow is not well understood. An important exception is the work of Ramos (1992), who analyzes the return migration decisions of Puerto Ricans living in the United States.

[13] Representative studies include Altonji and Card (1991), Borjas (1987), Card (1990), Grossman (1982), LaLonde and Topel (1991), and Schoeni (1997). Friedberg and Hunt (1995) survey the literature.

[14] Borjas (2001) finds that new immigrants belonging to a particular schooling group tend to settle in those regions that offer the highest return for their skills.

[15] Borjas, Freeman, and Katz (1997) proposed the hypothesis that the labor market impact of immigration may only be measurable at the national level.

[16] The analysis assumes that the age of entry into the labor market is 17 for the typical high school dropout, 19 for the typical high school graduate, 21 for the typical person with some college, and 23 for the typical college graduate, and restrict the analysis to persons who have between 1 and 40 years of experience.

[17] The data summarized in the plot adjusts for decade effects as well as for interactions between the decade effects and education or experience.

[18] The regressions are weighted by the sample size used to calculate y_{ijt}. The standard errors are clustered by education-experience cells to adjust for possible serial correlation. The evidence presented in table 5 differs from that reported in Borjas (2003) in two important ways. First, the results presented here include data from the newly released 2000 census. Second, the regressions were estimated not only in the sample of wage and salary workers, but also in a sample that includes all persons who worked in the past calendar year are included in the calculation of the skill groups mean log annual earned income, log weekly earnings, and log annual hours worked. The measure of annual earned income, therefore, includes both income from salaried sources as well as self-employment income.

[19] It is easier to interpret the coefficient γ by converting it to an elasticity that gives the percent change in wages associated with a percent change in labor supply. In particular, let m give the relative number of immigrants (the ratio of the number of immigrants to the number of natives). One can show that the wage elasticity $\partial \log w/\partial m = \gamma(1-p)^2$. In 2000, the immigrant share for working men was 14.7 percent. Note that this elasticity gives the percentage change in the wage attributable to an immigrant-induced percent increase in labor supply. The wage elasticity—evaluated at the mean value of the relative number of immigrants—can be calculated by multiplying γ by approximately 0.7.

[20] A number of studies examine if native migration decisions respond to immigrant supply shocks. These studies offer a cornucopia of findings, with some studies finding strong effects (e.g., Frey 1995; Borjas, Freeman, and Katz 1997), and other studies finding little connection (Card 2001; Wright, Ellis, and Reibel 1997). See also Card and DiNardo (2000) and Filer (1992).

[21] Obviously, other factors also account for California's demographic trends during the last 20 years, such as the impact of the defense cutbacks of the late 1980s and the high-tech boom of the late 1990s.

[22] It is easy to show that $\partial N/\partial M = \theta(1-p)^2$. Evaluated at the mean value of the immigrant share, the derivative of interest can be calculated by multiplying θ by approximately 0.7.

[23] Borjas (1995b, 2001) and Johnson (1997) present a variety of models that can be used to calculate the economic benefits from immigration. Regardless of the model's complexity, these studies typically find that the net gains from immigration to the native population are relatively small.

[24] See Borjas (1995b) for details.

Appendix A: The Model

This appendix summarizes the model used to measure the own-wage and cross-wage effects of immigration (Borjas 2003 presents additional details). Suppose the aggregate production function for the national economy at time *t* is:

$$(1) \qquad Q_t = \left[\lambda_{Kt} K_t^{\nu} + \lambda_{Lt} L_t^{\nu} \right]^{1/\nu},$$

where Q is output, K is capital, L denotes the aggregate labor input; and $\nu = 1 - 1/\sigma_{KL}$, with σ_{KL} being the elasticity of substitution between capital and labor ($-\infty < \nu \leq 1$). The vector λ gives technology parameters that shift the production frontier, with $\lambda_{Kt} + \lambda_{Lt} = 1$. The aggregate L_t incorporates the contributions of workers who differ in both education and experience. Let:

$$(2) \qquad L_t = \left[\sum_i \theta_{it} L_{it}^{\rho} \right]^{1/\rho},$$

where L_{it} gives the number of workers with education i at time t, and $\rho = 1 - 1/\sigma_E$, with σ_E being the elasticity of substitution across these education aggregates ($-\infty < \rho \leq 1$). The θ_{it} give time-variant technology parameters that shift the relative productivity of education groups, with $\Sigma_i \theta_{it} = 1$. Finally, the supply of workers in each education group is itself given by an aggregation of the contribution of similarly educated workers with different experience. In particular:

$$(3) \qquad L_{it} = \left[\sum_j \alpha_{ij} L_{ijt}^{\eta} \right]^{1/\eta},$$

where L_{ijt} gives the number of workers in education group i and experience group j at time t (given by the sum of N_{ijt} native and M_{ijt} immigrant workers); and $\eta = 1 - 1/\sigma_X$, with σ_X being the elasticity of substitution across experience classes within an education group ($-\infty < \eta \leq 1$). Equation (3) assumes that the technology coefficients α_{ij} are constant over time, with $\Sigma_j \alpha_{ij} = 1$.

The marginal productivity condition implies that the wage for skill group (i, j, t) is:

$$(4) \qquad \log w_{ijt} = \log \lambda_{Lt} + (1 - \nu) \log Q_t + (\nu - \rho) \log L_t + \log \theta_{it} + (\rho - \eta) \log L_{it} + \log \alpha_{ij} + (\eta - 1) \log L_{ijt}.$$

The marginal productivity condition in (4) can be rewritten as:

$$\log w_{ijt} = \delta_t + \delta_{it} + \delta_{ij} - \frac{1}{\sigma_X} \log L_{ijt}\,, \tag{5}$$

where $\delta_t = \log \lambda_{Lt} + (1 - \nu) \log Q_t + (\nu - \rho) \log L_t$, and is absorbed by period fixed effects; $\delta_{it} = \log \theta_{it} + (\rho - \eta) \log L_{it}$, and is absorbed by interactions between the education fixed effects and the period fixed effects; and $\delta_{ij} = \log \alpha_{ij}$, and is absorbed by interactions between education fixed effects and experience fixed effects.

The coefficients of the education-experience interactions in (5) identify the parameters $\log \alpha_{ij}$. The estimates of α_{ij} and σ_X permit the calculation of L_{it}, the CES-weighted labor aggregate for education group *i*. Let $\log w_{it}$ be the mean log wage paid to the average worker in education group *i* at time *t*. The marginal productivity condition is:

$$\log w_{it} = \delta_t + \log \theta_{it} - \frac{1}{\sigma_E} \log L_{it}\,. \tag{6}$$

Note that σ_E cannot be identified if the regression included interactions of education-period fixed effects to absorb $\log \theta_{it}$. To identify σ_E, one can use the Katz and Murphy (1992) assumption that the technology shifters can be approximated by a linear trend that varies across education groups.

The empirical implementation of the three-level CES technology described above does not use any data on the aggregate capital stock. Hamermesh (1993, 92) concludes that the aggregate U.S. economy can be reasonably described by a Cobb-Douglas production function, suggesting that σ_{KL} equals one. This restriction is used in the simulation reported in table 6.

The first step in the empirical application of the model is to estimate equation (5) using the sample of 160 education-experience-time cells. The IV estimate of this equation is:[*]

$$\log w_{ijt} = \delta_t + \delta_{it} + \delta_{ij} - \underset{(0.135)}{0.341} \log L_{ijt}\,. \tag{7}$$

The implied elasticity of substitution across experience groups is 2.9. This implied estimate of the elasticity of substitution and the (transformed) coefficients of the education-experience fixed effects is used to calculate the size of the CES-weighted labor aggregate for each education group. The IV regression estimate of the marginal productivity condition in (6) is:[†]

$$\log w_{it} = \delta_t + \text{linear trend interacted with education fixed effects} - \underset{(0.362)}{0.425} \log L_{it}\,. \tag{8}$$

The implied σ_E is 2.3.

The factor price elasticity giving the impact on the wage of factor y of an increase in the supply of factor z is defined by:

$$\varepsilon_{yz} = \frac{d \log w_y}{d \log L_z} = s_z \frac{Q_{yz} Q}{Q_y Q_z}, \tag{9}$$

where s_z is the share of income accruing to factor z; and $Q_y = \partial Q/\partial L_y$, $Q_z = \partial Q/\partial L_z$, and $Q_{yz} = \partial^2 Q/\partial L_y \partial L_z$.

The three-level CES technology implies that the own factor price elasticity giving the wage impact of an increase in the supply of workers with education i and experience j is:

$$\varepsilon_{ij,ij} = -\frac{1}{\sigma_X} + \left(\frac{1}{\sigma_X} - \frac{1}{\sigma_E}\right)\frac{s_{ij}}{s_i} + \left(\frac{1}{\sigma_E} - \frac{1}{\sigma_{KL}}\right)\frac{s_{ij}}{s_L} + \frac{1}{\sigma_{KL}} s_{ij}, \tag{10}$$

where s_{ij} gives the share of income accruing to group (i, j); s_i gives the share of income accruing to education group i; and s_L gives labor's share of income. Similarly, the (within-branch) cross factor price elasticity giving the impact on the wage of group (i, j) of an increase in the supply of group (i, j'), with $j \neq j'$, is:

$$\varepsilon_{ij,ij'} = \left(\frac{1}{\sigma_X} - \frac{1}{\sigma_E}\right)\frac{s_{ij'}}{s_i} + \left(\frac{1}{\sigma_E} - \frac{1}{\sigma_{KL}}\right)\frac{s_{ij'}}{s_L} + \frac{1}{\sigma_{KL}} s_{ij'}. \tag{11}$$

Finally, the (across-branch) cross factor price elasticity giving the impact on the wage of group (i, j) of an increase in the supply of group (i', j'), with $i \neq i'$ is:

$$\varepsilon_{ij,i'j'} = \left(\frac{1}{\sigma_E} - \frac{1}{\sigma_{KL}}\right)\frac{s_{i'j'}}{s_L} + \frac{1}{\sigma_{KL}} s_{i'j'}. \tag{12}$$

The calculations of the factor price elasticities require information on the factor shares. Assuming that labor's share of income is 0.7, one can use the 2000 census to calculate the share of total annual earnings accruing to each education-experience cell. These total annual earnings were then used to apportion the labor shares accruing to the various groups.

Table 6 uses the estimated elasticities to calculate the wage impact of the immigrant influx that entered the United States between 1980 and 2000. The marginal productivity condition for the typical worker in education group s and experience group x can be written as $w_{sx} = D(K, L_{11}, \ldots, L_{18}, \ldots, L_{41}, \ldots, L_{48})$. Assuming that the capital stock is constant, the net impact of immigration on the log wage of group (s, x) is:[‡]

(13) $$\Delta \log w_{sx} = \varepsilon_{sx,sx}\, m_{sx} + \sum_{j \neq x} \varepsilon_{sx,sj}\, m_{sj} + \sum_{i \neq s} \sum_{j} \varepsilon_{sx,ij}\, m_{ij} ,$$

where m_{ij} gives the percentage change in labor supply due to immigration in cell (i, j). Because the size of the native labor force in each skill group is shifting over time, define m_{ij} as:

(14) $$m_{ij} = \frac{M_{ij,2000} - M_{ij,1980}}{0.5(N_{ij,1980} + N_{ij,2000}) + M_{ij,1980}},$$

so that the baseline population used to calculate the percent increase in labor supply averages out the size of the native workforce in the skill cell and treats the preexisting immigrant population as part of the "native" stock.

Endnotes, Appendix A

[*] The instrument is log M_{ijt} and the standard errors are clustered by education-experience group.

[†] The instrument is the immigrant share in cell (i, j, t).

[‡] The assumption of a constant capital stock implies that the resulting wage consequences should be interpreted as short-run impacts.

Appendix B: Tables

Table 1. Education Distributions of Native and Immigrant Workers

	Year				
	1960	1970	1980	1990	2000
Natives					
High school dropouts	49.3%	35.3%	20.6%	10.5%	7.2%
High school graduates	31.2	39.9	42.7	36.8	32.9
Some college	9.7	11.9	17.6	28.7	31.7
College graduates	9.7	12.9	19.1	24.0	28.2
Immigrants					
High school dropouts	59.4%	44.6%	37.0%	30.6%	29.4%
High school graduates	21.2	28.1	27.9	26.1	25.9
Some college	9.7	12.1	14.5	19.7	18.7
College graduates	9.7	15.2	20.6	23.6	25.9

Notes: The statistics are calculated in the sample of persons aged 18-64 who worked at least 1 week in the year prior to the census and are not enrolled in school.

Table 2. Labor Market Characteristics of Natives and Immigrants

	Natives					Immigrants				
	1960	1970	1980	1990	2000	1960	1970	1980	1990	2000
Men										
Employment rate (%)	95.3	94.1	90.8	90.2	88.7	93.9	93.8	89.8	89.1	87.9
Annual hrs. worked (1,000s)	2.17	2.19	2.10	2.12	2.18	2.089	2.11	2.02	2.03	2.05
Self-employment rate (%)	14.9	12.0	11.9	12.0	11.7	17.2	12.8	11.7	12.3	11.0
Unemployment rate (%)	4.7	3.5	6.2	5.8	4.6	4.6	3.2	5.8	6.7	5.4
Annual earnings ($1,000)	25.0	33.3	33.1	32.9	36.0	25.3	33.2	30.9	29.1	29.3
Hourly wage rate	12.5	16.4	16.7	16.0	16.9	13.2	17.0	16.2	14.7	15.0
Log wage differential	---	---	---	---	---	.065	.016	-.073	-.138	-.191
Women										
Employment rate (%)	48.4	57.3	65.0	74.5	77.2	44.0	54.2	59.5	64.5	64.2
Annual hrs. worked (1,000s)	1.60	1.61	1.55	1.68	1.77	1.61	1.60	1.56	1.68	1.72
Self-employment rate (%)	4.0	3.5	4.1	6.2	6.4	4.7	4.0	4.0	6.7	6.9
Unemployment rate (%)	5.3	5.0	6.2	5.5	4.5	6.2	5.5	7.4	8.2	7.7
Annual earnings ($1,000)	11.7	15.1	14.7	17.4	20.8	11.7	15.1	14.6	16.9	19.1
Hourly wage rate	8.6	10.7	10.4	10.7	12.2	8.7	10.9	10.4	10.6	11.9
Log wage differential	---	---	---	---	---	.028	.030	-.015	-.038	-.098

Notes: The statistics are calculated in the sample of persons not enrolled in school aged 18-64 as of the census year. The employment rate gives the percent of persons who worked at least 1 week in the year prior to the census; annual hours worked and the self-employment rate are calculated in the sample of workers; the unemployment rate is calculated in terms of the labor force participant's status in the survey week. The means of the earnings variables are calculated in the sample of workers aged 25-64 who are not enrolled in school and are employed in the civilian sector.

Table 3. Tracking Age Cohorts of Male Immigrants Across Censuses (Log Wage Differential Between Immigrants and Comparably Aged Natives)

	Year				
	1960	1970	1980	1990	2000
1955-1959 arrivals					
15-24 in 1960	---	.056	---	---	---
25-34 in 1960	-.060	.066	---	---	---
35-44 in 1960	-.094	.016	---	---	---
45-54 in 1960	-.111	-.054	---	---	---
1965-1969 arrivals					
5-14 in 1970	---	---	---	.048	.040
15-24 in 1970	---	---	-.058	-.059	-.096
25-34 in 1970	---	-.128	-.030	.011	.006
35-44 in 1970	---	-.192	-.145	-.082	---
45-54 in 1970	---	-.267	-.235	---	---
1975-1979 arrivals					
5-14 in 1980	---	---	---	---	-.001
15-24 in 1980	---	---	---	-.106	-.135
25-34 in 1980	---	---	-.236	-.141	-.138
35-44 in 1980	---	---	-.255	-.229	-.172
45-54 in 1980	---	---	-.319	-.276	---
1985-1989 arrivals					
15-24 in 1990	---	---	---	---	-.186
25-34 in 1990	---	---	---	-.269	-.192
35-44 in 1990	---	---	---	-.326	-.309
45-54 in 1990	---	---	---	-.414	-.409
1995-1999 arrivals					
25-34 in 2000	---	---	---	---	-.167
35-44 in 2000	---	---	---	---	-.254
45-54 in 2000	---	---	---	---	-.392

Notes: The relative wage is calculated in the sample of working men aged 25-64 who are not enrolled in school and who worked in the civilian sector. The hourly wage rate is defined as the ratio of total income earned annually to annual hours worked in the calendar year prior to the census.

Table 4. Hourly Wage Differentials Across National Origin Groups, 2000

Country of origin	Percent of immigrant workforce belonging to national origin group	Log wage differential	
		All immigrants	New arrivals
Mexico	31.9	-0.485	-0.686
China	4.7	0.008	-0.180
India	4.4	0.303	0.226
Philippines	3.8	-0.010	-0.242
Vietnam	3.4	-0.194	-0.486
El Salvador	2.9	-0.420	-0.633
Cuba	2.8	-0.201	-0.525
United Kingdom	2.7	0.326	0.369
Canada	2.3	0.300	0.348
Korea	2.2	-0.006	-0.093
Russia	1.9	-0.007	-0.212
Dominican Republic	1.9	-0.376	-0.470
Guatemala	1.7	-0.461	-0.654
Germany	1.6	0.202	0.249
Jamaica	1.6	-0.130	-0.357
Correlation between 1980 and 1990 relative wage	---	0.914	0.754
Correlation between 1980 and 2000 relative wage	---	0.883	0.833

Notes: The relative wages are calculated in the sample of working men aged 25-64 who are not enrolled in school and who worked in the civilian sector. The “new arrivals” arrived in the United States between 1995 and 1999. The hourly wage rate is defined as the ratio of total income earned annually to annual hours worked in the calendar year prior to the census.

Table 5. The Impact of Immigration on the Earnings and Labor Supply of Native Workers

	Regression coefficients		Predicted impact of an immigrant influx that increases the number of workers in a skill group by 10 percent	
Dependent variable	Salaried workers	All workers	Salaried workers	All workers
Log annual earnings	-1.008	-1.143	-7.1%	-8.0%
	(.457)	(.506)		
Log weekly earnings	-.532	-.648	-3.7%	-4.5%
	(.202)	(.223)		
Log weeks worked	-.475	-.495	-3.4%	-3.5%
	(.393)	(.359)		

Notes: The standard errors of the regression coefficients are reported in parentheses and are clustered by schooling-experience group. The regressions have 160 observations. The last two columns are obtained from the regression coefficients by multiplying by 0.7.

Table 6. Wage Consequences of Immigration in the 1980s and 1990s, Allowing for Cross-Effects (Predicted Percent Change in the Weekly Wage)

	Education			
Years of experience	High school dropouts	High school graduates	Some college	College graduates
1-5	-6.1%	-1.4%	-1.2%	-2.9%
6-10	-10.3	-2.6	-1.8	-2.9
11-15	-12.7	-3.1	-2.9	-4.2
16-20	-12.4	-2.9	-3.7	-4.6
21-25	-9.5	-2.4	-3.2	-4.3
26-30	-7.3	-2.1	-2.7	-3.9
31-35	-4.4	-1.7	-2.1	-3.3
36-40	-1.8	-0.5	-1.5	-4.1
All workers	-7.4	-2.1	-2.3	-3.6

Notes: The averages reported in the bottom row are weighted averages of the within-education effects using the 1980 native population as weights. The calculations assume that the capital stock is constant.

Table 7. Trends in Migration Rates of Native Workers

Education group	Region	Year 1970	1980	1990	2000
Net migration rates					
All workers	California	1.2%	-0.2%	1.1%	-2.0%
	Other immigrant states	0.1	-0.2	-0.9	-0.8
	Rest of country	-0.2	0.1	0.2	0.6
High school dropouts	California	-0.2	-2.2	-2.3	-5.4
	Other immigrant states	0.3	-0.2	-1.6	-1.4
	Rest of country	-0.1	0.3	0.8	1.0
High school graduates	California	0.3	-1.4	-0.8	-4.5
	Other immigrant states	0.0	-0.1	-0.8	-0.9
	Rest of country	0.0	0.2	0.4	0.7
Some college	California	1.3	-1.0	0.3	-3.4
	Other immigrant states	-0.4	-0.3	-0.9	-0.8
	Rest of country	-0.2	0.4	0.3	0.9
College graduates	California	4.4	3.3	4.5	1.9
	Other immigrant states	0.3	-0.3	-0.8	-0.4
	Rest of country	-1.0	-0.4	-0.5	-0.1
In-migration rates					
All workers	California	9.5	9.7	9.3	7.1
	Other immigrant states	6.1	7.5	6.8	6.4
	Rest of country	3.0	3.7	3.6	3.4
Out-migration rates					
All workers	California	8.3	9.9	8.2	9.1
	Other immigrant states	6.0	7.7	7.8	7.2
	Rest of country	3.2	3.6	3.4	2.8

Notes: This table breaks up the country into three distinct regions: California, the other immigrant states, and the rest of the country. The “other immigrant states” include Florida, Illinois, New Jersey, New York, and Texas. A native worker is defined to migrate if he moves from one of these regions to another in the 5-year period prior to the census.

Table 8. Regression Coefficients from Migration Analysis

	Regression coefficient		Predicted change in number of natives per additional immigrant	
Dependent variable	State	Metropolitan area	State	Metropolitan area
Log of native workforce	-.278	-.836	-0.195	-0.585
	(.081)	(.090)		
Native net migration rate	-.282	-.404	-0.197	-0.283
	(.064)	(.084)		
Native in-migration rate	-.150	-.116	-0.105	-0.081
	(.042)	(.055)		
Native out-migration rate	.132	.288	0.092	0.202
	(.049)	(.062)		

Notes: The standard errors of the regression coefficients are reported in parentheses and are clustered by skill-region cells. The regressions have 160 observations. The last two columns are obtained from the regression coefficients by multiplying by 0.7. The regressions also control for the skill-region cell's unemployment rate and mean log weekly wage, and the regressions on the native workforce include the lagged value of the log of the native workforce, while the migration regressions include the lagged value of the growth rate of the native workforce.

Table 9. Migration Rates of Immigrants Who Have Been in Country More Than 5 Years

Education group	Region	Year 1970	1980	1990	2000
Net migration rates					
All workers	California	4.1%	2.3%	0.7%	-4.0%
	Other immigrant states	-0.2	-1.1	-1.2	-1.3
	Rest of country	-2.2	-0.3	1.2	6.5
High school dropouts	California	3.2	0.0	-0.9	-6.7
	Other immigrant states	-0.3	-0.6	-1.5	-1.6
	Rest of country	-1.6	1.1	5.8	12.6
High school graduates	California	2.9	2.5	-0.1	-6.0
	Other immigrant states	-0.4	-1.4	-0.9	-1.4
	Rest of country	-1.1	0.4	1.7	8.4
Some college	California	6.1	1.1	1.5	-2.9
	Other immigrant states	-1.8	-1.4	-1.1	-1.1
	Rest of country	-2.6	0.9	-0.2	4.7
College graduates	California	7.0	7.9	4.2	2.2
	Other immigrant states	1.5	-1.4	-1.4	-1.1
	Rest of country	-4.3	-2.9	-1.7	-0.3
In-migration rates					
All workers	California	7.8	6.2	4.7	3.2
	Other immigrant states	4.5	4.1	4.2	4.5
	Rest of country	5.4	7.4	9.6	12.7
Out-migration rates					
All workers	California	3.7	4.0	3.9	7.2
	Other immigrant states	4.7	5.2	5.5	5.8
	Rest of country	7.5	7.7	8.3	6.2

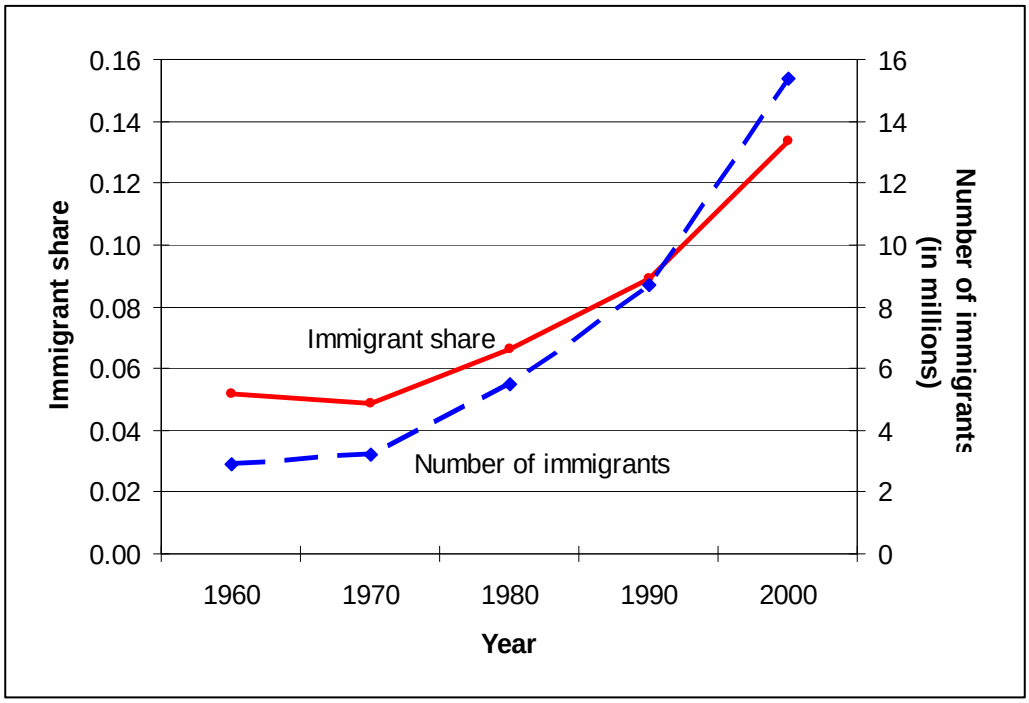
Notes: This table breaks up the country into three distinct regions: California, the other immigrant states, and the rest of the country. The “other immigrant states” include Florida, Illinois, New Jersey, New York, and Texas. A native worker is defined to migrate if he moves from one of these regions to another in the 5-year period prior to the census.

Table 10. The Economic Benefits from Immigration, 1960–2000

	Year				
	1960	1970	1980	1990	2000
Labor's share of income	0.7	0.7	0.7	0.7	0.7
Factor price elasticity	-0.35	-0.35	-0.35	-0.35	-0.35
Immigrant share	0.052	0.049	0.066	0.089	0.134
As percent of GDP					
Change in labor earnings	-1.20%	-1.14%	-1.52%	-1.99%	-2.84%
Change in firm's profits	1.23%	1.17%	1.57%	2.09%	3.05%
Immigration surplus	0.03%	0.03%	0.05%	0.10%	0.22%
In billions of 2002 dollars					
Change in labor earnings	-$30.05	-$42.98	-$78.26	-$141.63	-$278.37
Change in firm's profits	$30.87	$44.08	$81.03	$148.57	$299.82
Immigration surplus	$0.82	$1.10	$2.78	$6.94	$21.46

Appendix C: Figures

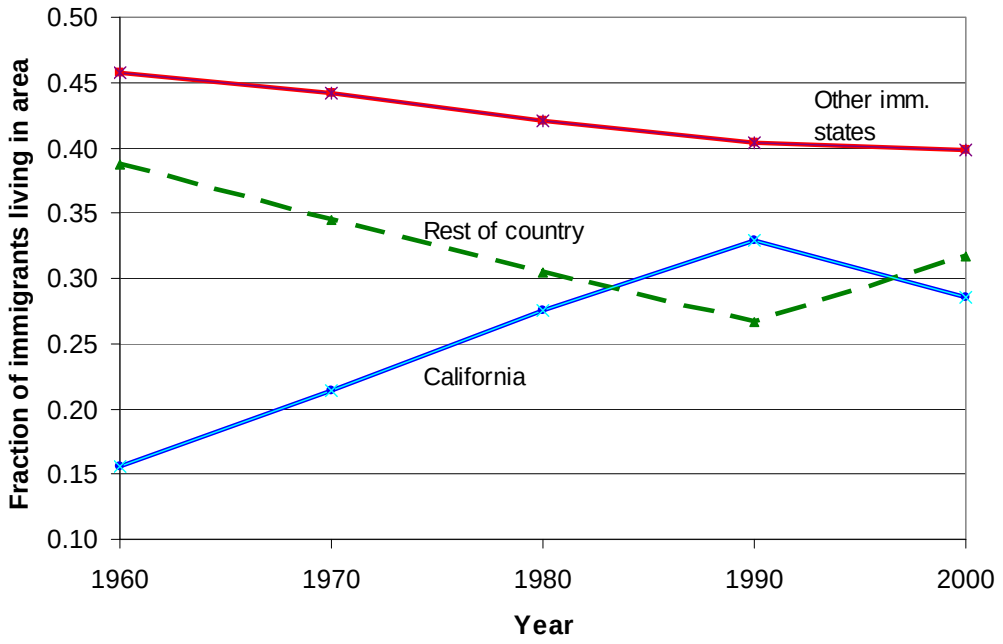
Figure 1. Immigration and the Workforce, 1960–2000



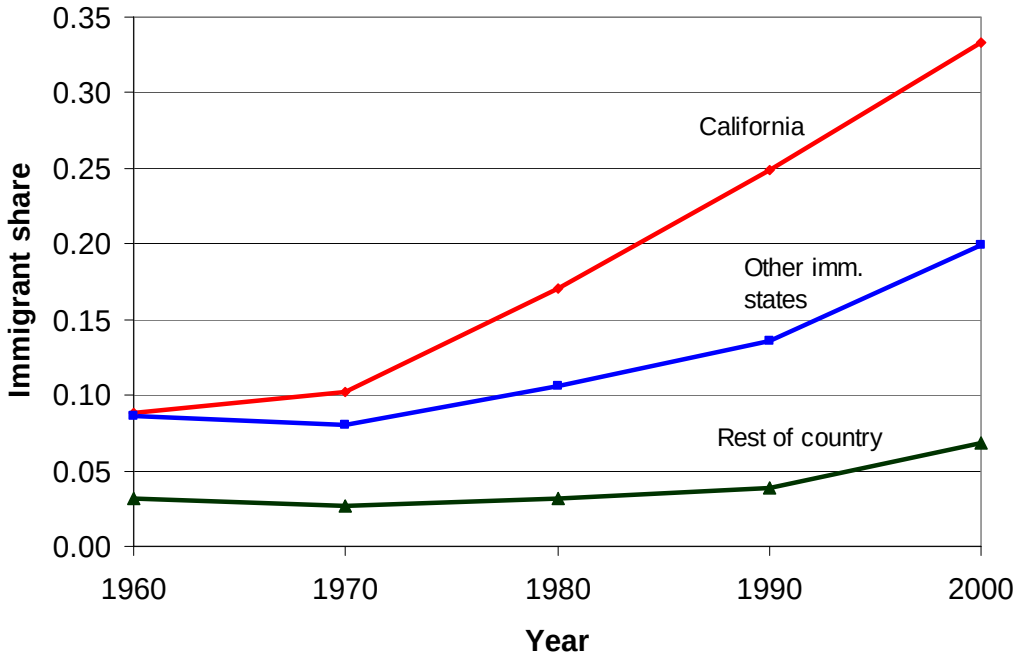
Notes: The workforce is defined as the group of persons aged 18 to 64 who are not enrolled in school and who worked in the civilian sector at least 1 week in the year prior to each decennial census.

Figure 2. The Geographic Settlement of Immigrants

A. Trends in Clustering

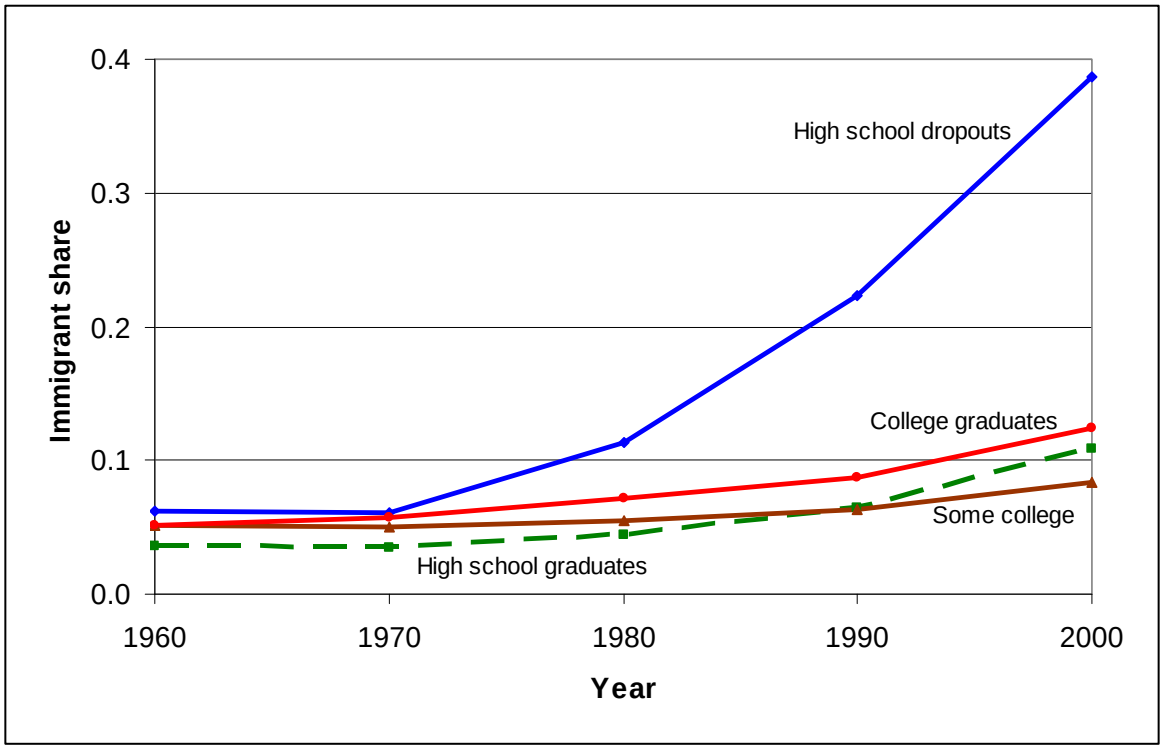


B. Trends in the Immigrant Share



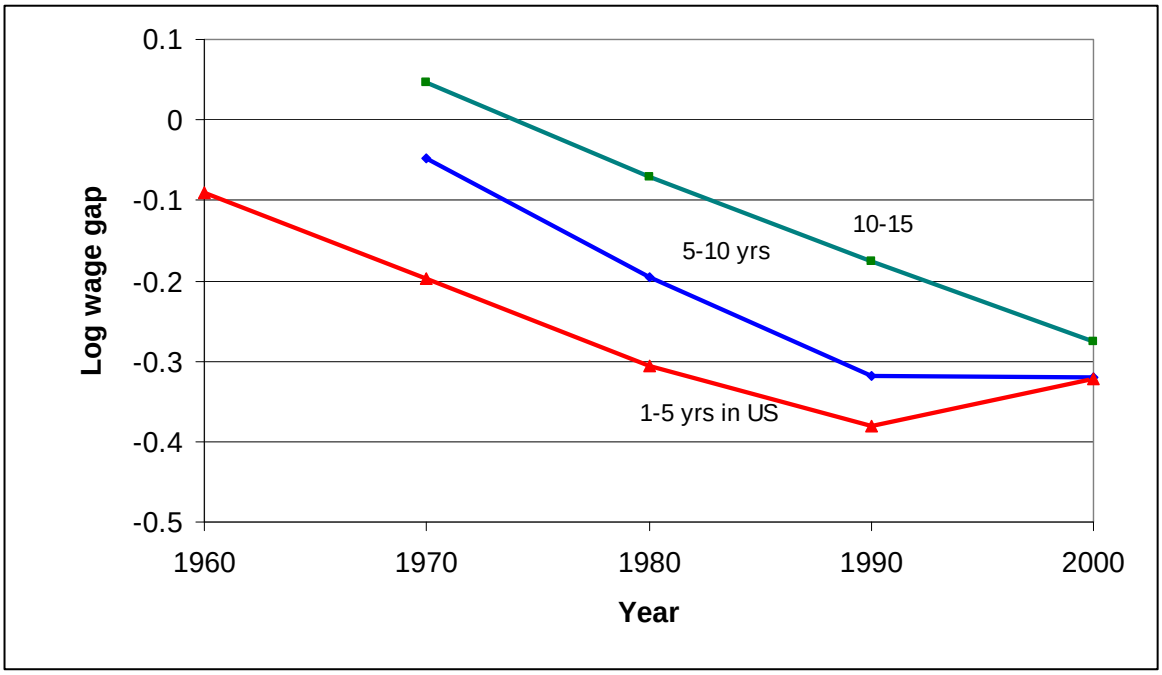
Notes: The workforce is defined as the group of persons aged 18 to 64 who are not enrolled in school and who worked in the civilian sector at least 1 week in the year prior to each decennial census. The "other immigrant states" include Florida, Illinois, New Jersey, New York, and Texas.

Figure 3. The Immigrant Share in the Workforce, By Educational Attainment



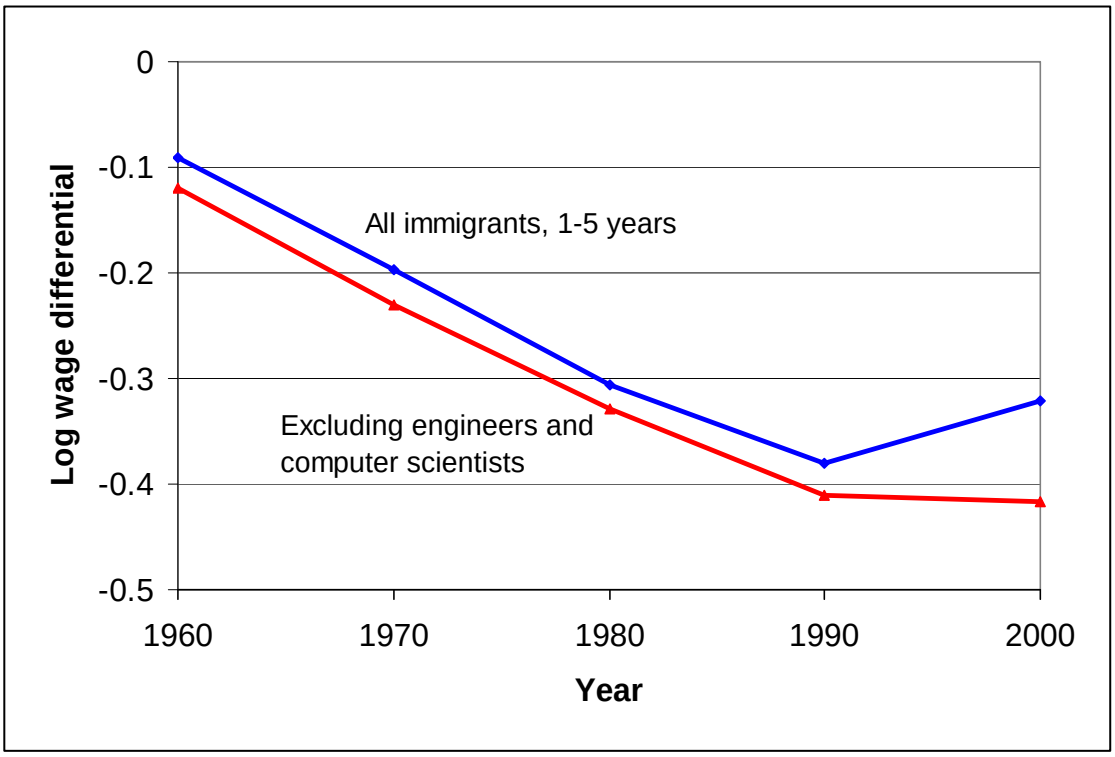
Notes: The workforce is defined as the group of persons aged 18 to 64 who are not enrolled in school and who worked in the civilian sector at least 1 week in the year prior to each decennial census.

Figure 4. Trends in the Relative Wage of Male Immigrant Cohorts



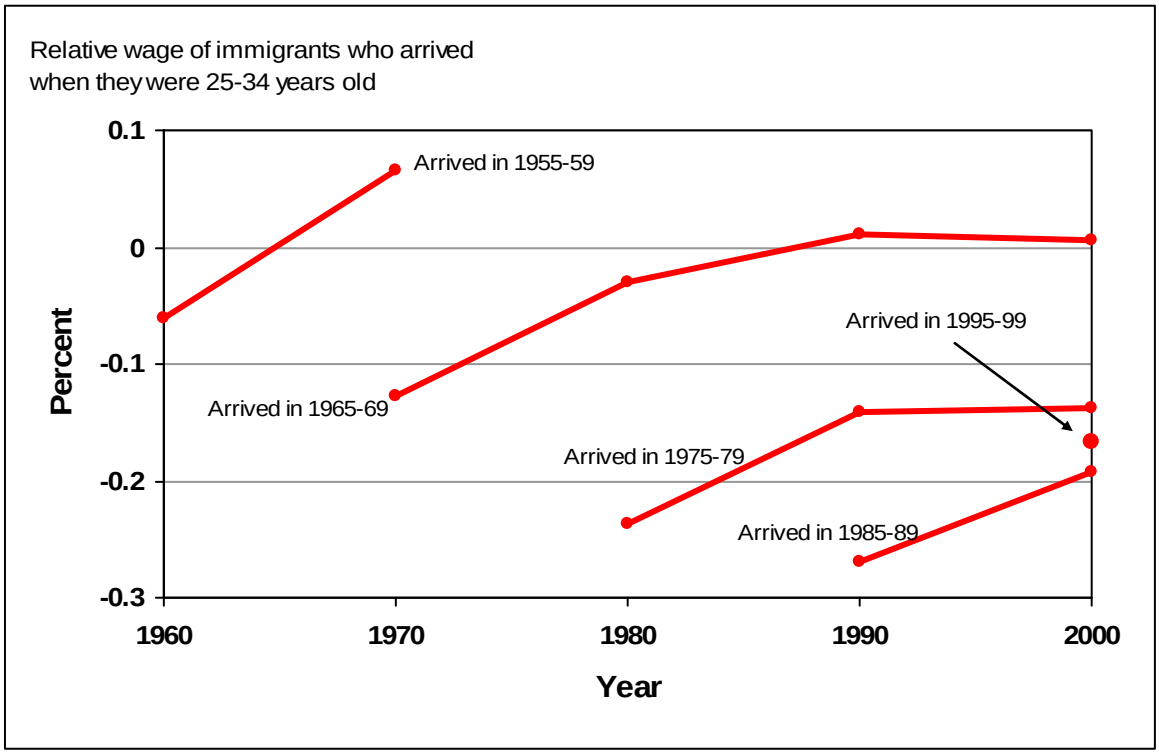
Notes: The relative wage is calculated in the sample of working men aged 25-64 who are not enrolled in school and who worked in the civilian sector. The hourly wage rate is defined as the ratio of total income earned annually to annual hours worked in the calendar year prior to the census.

Figure 5. The Effect of High-Tech Immigration on the Relative Wage of Newly Arrived Immigrant Men



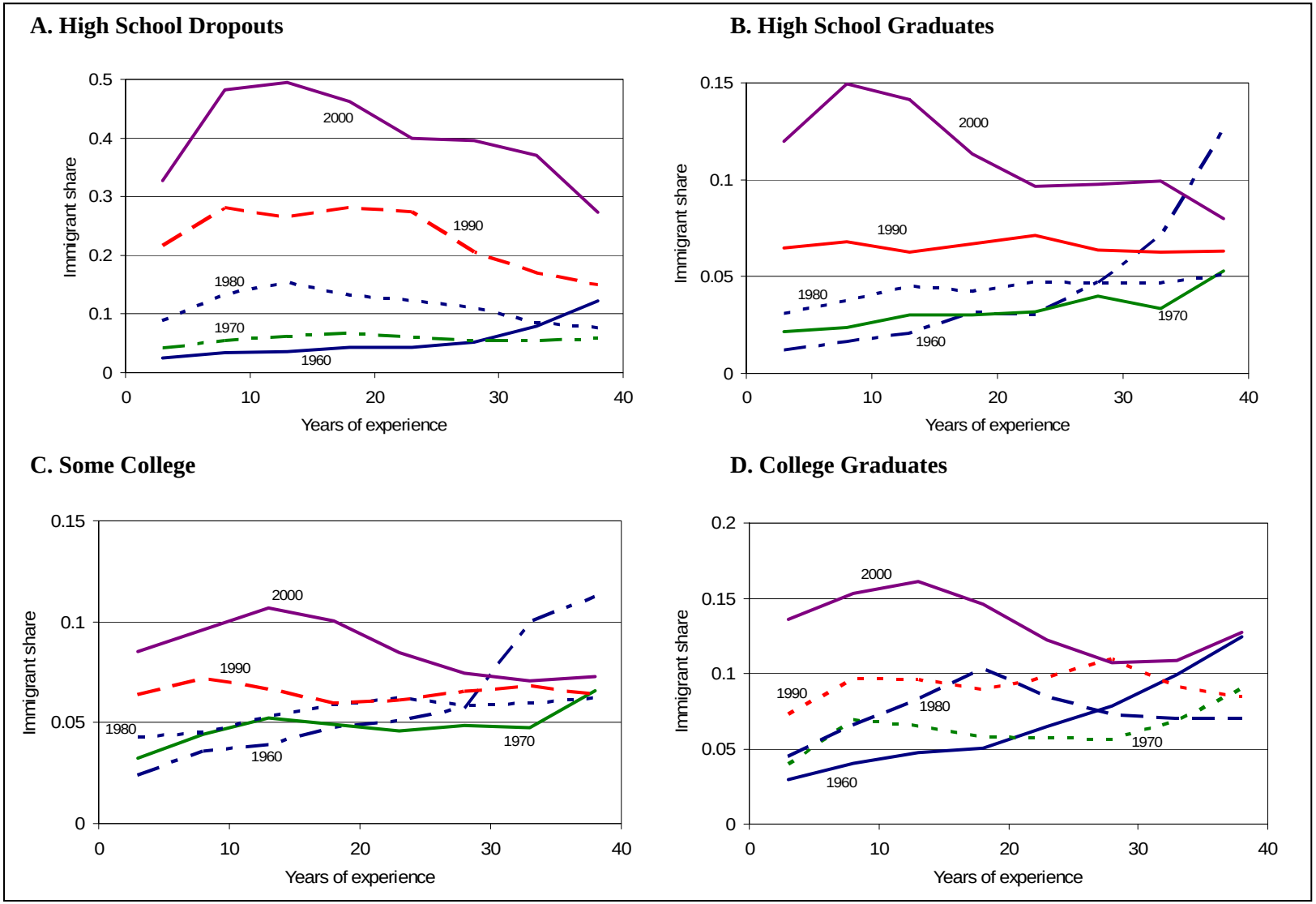
Notes: The relative wage is calculated in the sample of working men aged 25-64 who are not enrolled in school and who worked in the civilian sector. The hourly wage rate is defined as the ratio of total income earned annually to annual hours worked in the calendar year prior to the census.

Figure 6. Economic Assimilation Experienced by Immigrant Men



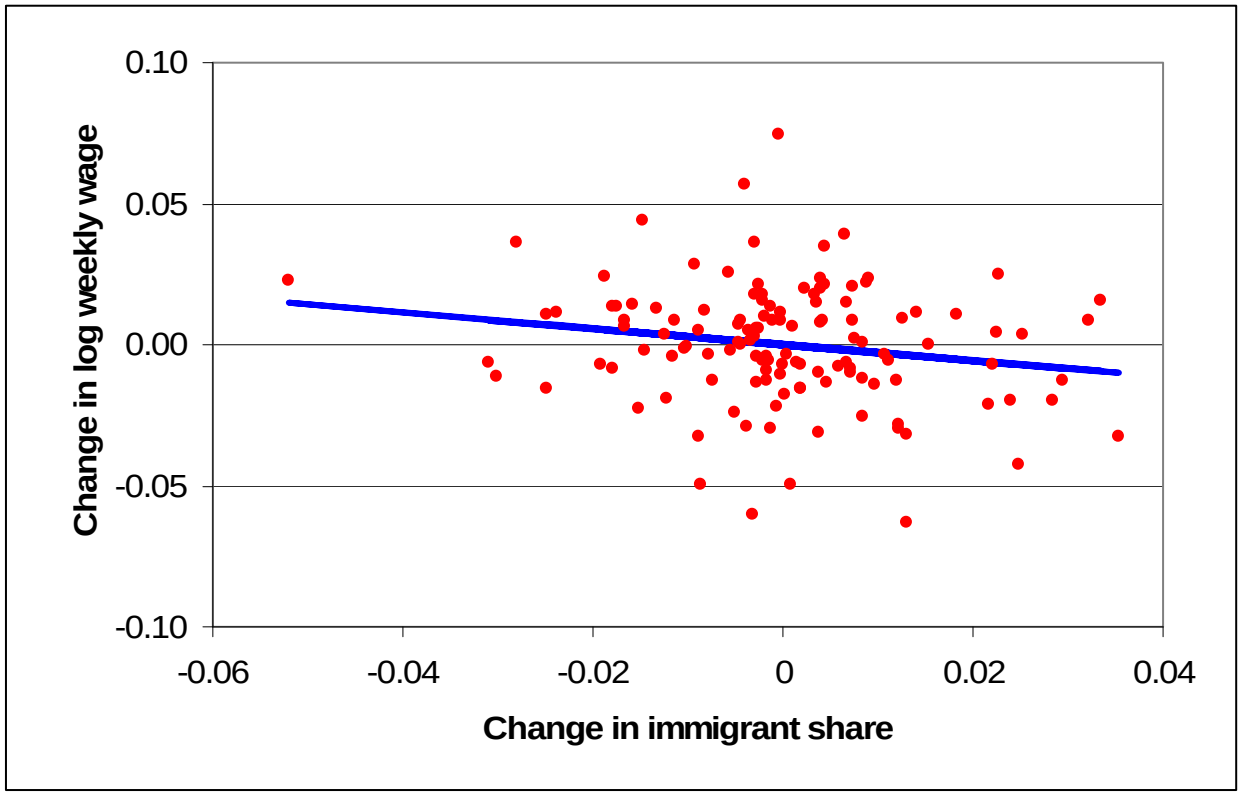
Notes: The relative wage is calculated in the sample of working men who are not enrolled in school and who worked in the civilian sector. The hourly wage rate is defined as the ratio of total income earned annually to annual hours worked in the calendar year prior to the census.

Figure 7. Immigration By Skill Group, 1960–2000



Notes: Within each education group, workers are aggregated into experience groups defined in 5-year intervals. The immigrant shares are calculated in the sample of men aged 18-64 who are not enrolled in school and who worked in the civilian sector at least 1 week in the calendar year preceding the census.

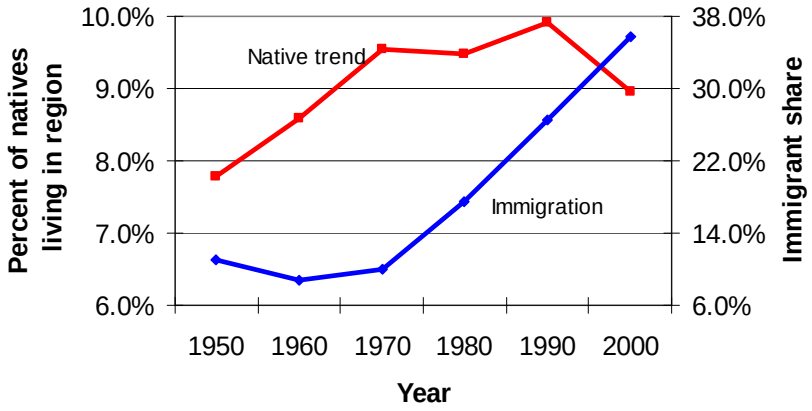
Figure 8. Scatter Diagram Relating Wages and Immigration, 1960–2000



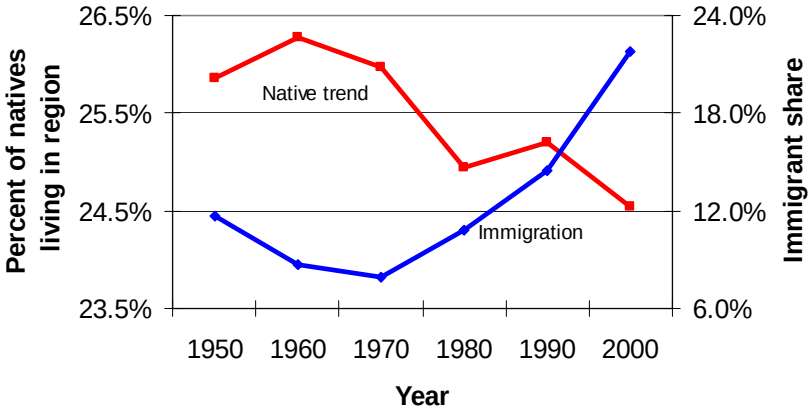
Note: Each point in the scatter represents the adjusted decadal change in the log weekly wage and the immigrant share for a native education-experience group. The statistics are calculated in the sample of men aged 18-64 who are not enrolled in school and who worked in the civilian sector at least 1 week in the calendar year preceding the census.

Figure 9. Immigration and the Geographic Sorting of the Native Population

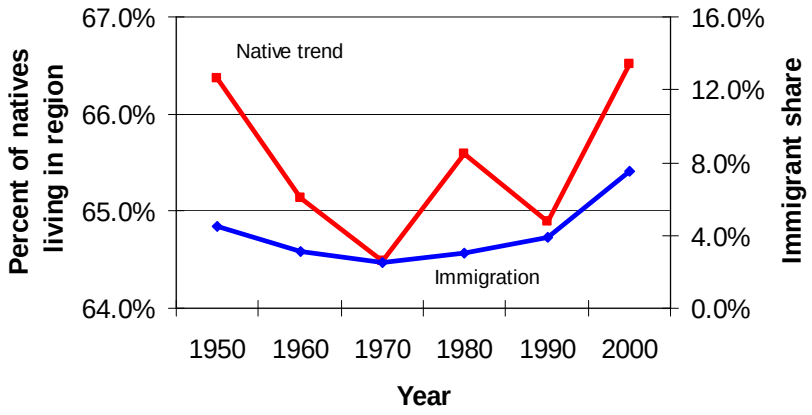
A. California



B. Other Immigrant States



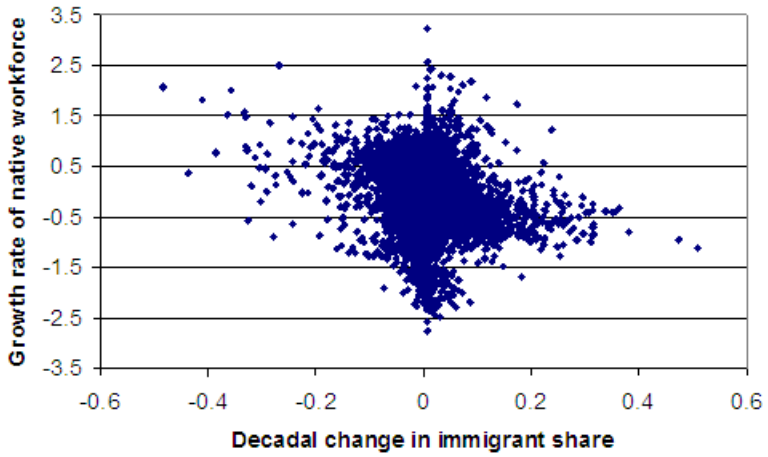
C. Rest of the Country



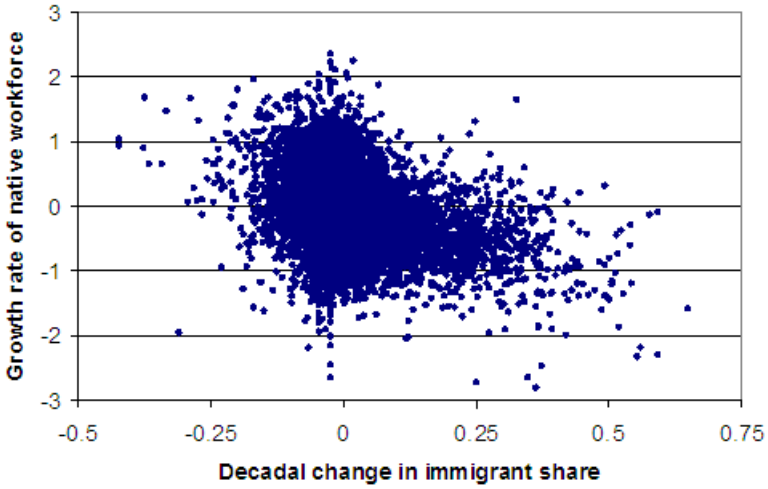
Note: The statistics refer to men aged 18-64 who are not enrolled in school and who worked in the civilian sector at least one week in the calendar year preceding the census. The "other immigrant states" are Florida, Illinois, New Jersey, New York, and Texas.

Figure 10. Scatter Diagram Relating the Growth Rate of the Native Workforce and Immigration

A. State Level Data

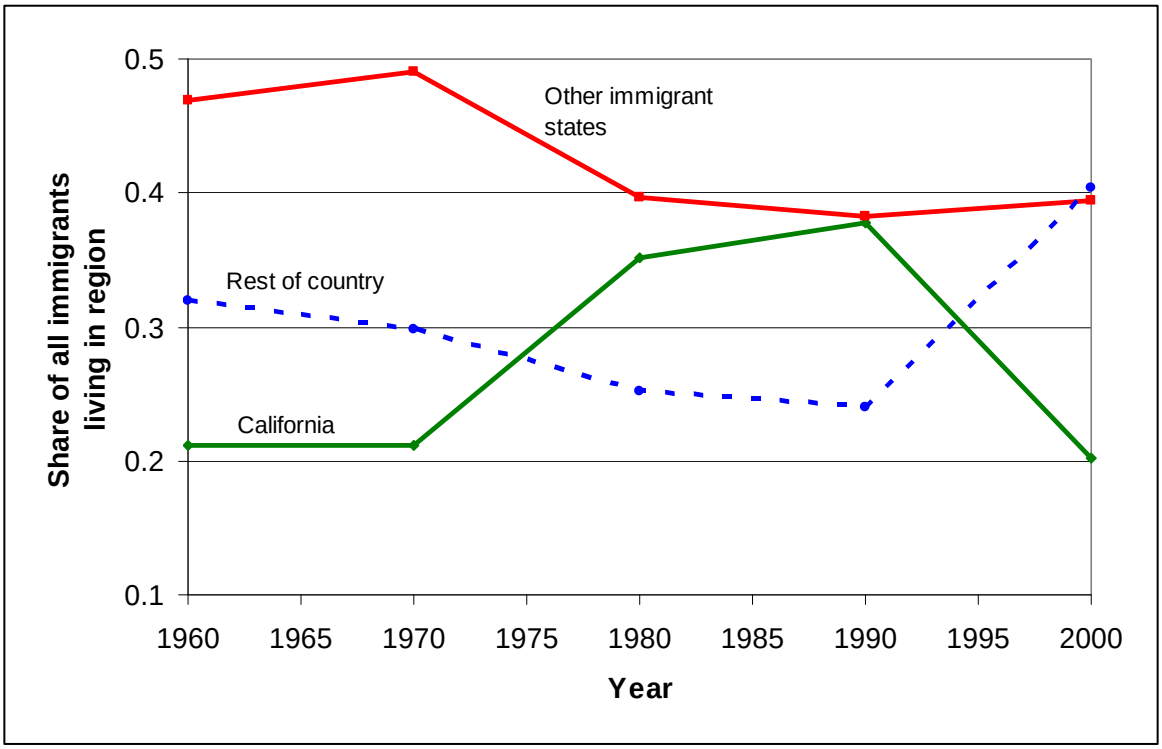


B. Metropolitan Area Level Data



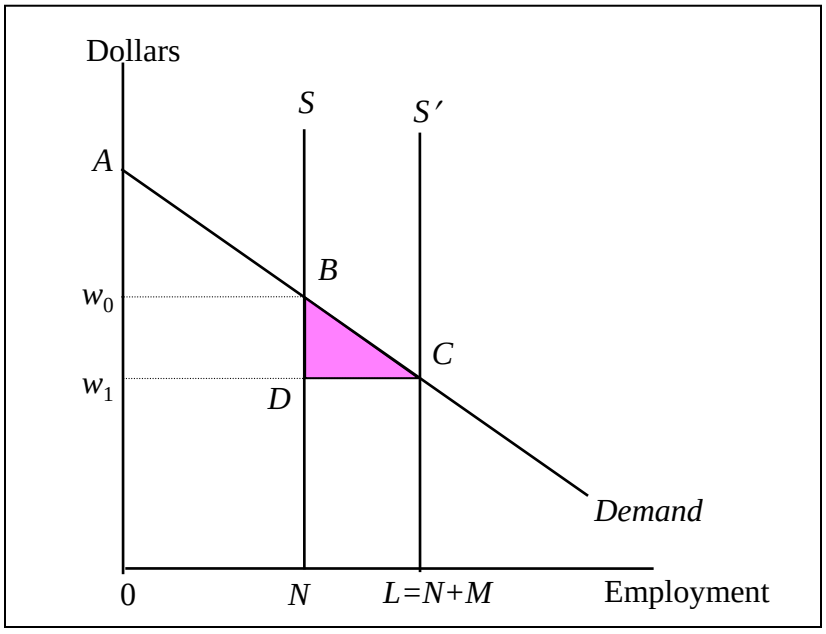
Notes: Each data point represents the decadal change (between 1960 and 2000) observed in the log size of the native workforce and the change in the immigrant share for a particular skill group in a particular geographic area. Both plots remove decade effects from the data. The statistics are calculated in the sample of men aged 18-64 who are not enrolled in school and who worked in the civilian sector at least 1 week in the calendar year preceding the census.

Figure 11. Location Decisions of Newly Arrived Immigrants



Note: The statistics are calculated in the sample of men aged 18-64 who are not enrolled in school and who worked in the civilian sector at least 1 week in the calendar year preceding the census. The "other immigrant states" include Florida, Illinois, New Jersey, New York, and Texas.

Figure 12. The Economic Benefits from Immigration



Notes: Prior to immigration, there are *N* native workers in the economy and national income is given by the trapezoid *ABN0*. Immigration increases the labor supply to *L* workers and national income is given by the trapezoid *ACL0*. Immigrants are paid a total of *DCLN* dollars as salary. The immigration surplus gives the increase in national income that accrues to natives and is given by the area in the triangle *BCD*.