Articles

The Economic Consequences of Immigration

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Available research supports several major conclusions about the economic consequences of immigration. (i) The aggregate impacts of foreign workers on the earnings and employment of native workers are quite small, but differ for selected population subgroups and high ethnic density labor markets. (ii) Immigrants who arrived during the 1970s are less skilled than earlier arrivals, and their earnings will remain substantially below those of natives throughout their working lives. (iii) The evidence on immigrants' receipt of public assistance income is inconclusive.

I must needs say, even the present Encouragements are very great and inviting, for Poor People (both Men and Women) of all kinds, can here get three times the Wages for their Labour they can get in England or Wales.—GABRIEL THOMAS, An Account of Pennsylvania, 1698

. . . we condemn the fallacy of protecting American labor under the present system, which opens our ports to the pauper and criminal classes of the world, and crowds out our wage earners . . . and demand the further restriction of undesirable immigration.—People's Party Platform, 1892

THE PROSPECT OF A BETTER LIFE IN THE UNITED STATES continues to draw large numbers of immigrants to our shores, as it has in centuries past (*1*). As the volume and composition of recent (1965 to 1985) immigrant flows change, Congress, the academic community, and the public are reassessing whether the costs of immigration outweigh the benefits. Contemporary concerns hinge on four perceived "facts" about the economic consequences of immigration (*2*): (i) the immigrant volume has increased beyond the absorptive capacity of the U.S. labor market; (ii) new immigrants displace native workers and lower their wages; (iii) new immigrants are less easily assimilated in comparison with earlier arrivals; and (iv) immigrants drain tax revenues through their receipt of transfer income.

Although no one disputes the sovereign right of nations to decide how many immigrants to admit and what criteria to use in doing so, it is fair to ask which diagnoses of the immigration "problem" are supported by rigorous empirical evidence. Accordingly, we survey the evidence bearing on three questions that have fueled contemporary debates about the economic consequences of immigration. What impact do immigrants have on the U.S. labor market? How well do immigrants fare in the U.S. labor market? Do immigrants use transfer income more than natives? We recognize the importance of the social and political dimensions of immigration, but our focus on labor market and welfare issues reflects their prominence in the contemporary debate.

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U.S. Immigration in Historical Perspective

Two distinguishing features of post–World War II immigration are increasing volume and diversity. The size of recent inflows, however, is not historically unprecedented. Between 1901 and 1910, 8.8 million immigrants arrived on U.S. shores—the all-time record for a single decade—and 5.7 million arrived in the following decade (Table 1). Immigration reached its 20th century low ebb during the period of the Great Depression, but has increased by approximately 1 million additional persons per decade since 1950 (*3, 4*).

Immigration currently is not the largest component of U.S. demographic growth. U.S. Census Bureau counts show that the foreign-born population grew from 9.6 million in 1970 to 14 million in 1980 (*5*). As a share of the total U.S. population this represents a rise from 4.7 to 6.2% (*6*). However, in comparison to earlier periods (Table 1), this increase is relatively small. During the last three decades, immigration has contributed a rising share of net population growth, increasing from approximately 11% of growth during the 1950s to 20% during the 1970s (*7*). But even these figures are well below those for the turn of the century when immigration accounted for almost 40% of net population growth.

During the early 1960s immigration became a political issue as national concerns over civil rights highlighted the discriminatory quota system established by the National Quota Acts of 1921 and 1924, and reinforced by the Immigration and Nationality Act of 1952. The criteria for admission set forth by these acts explicitly favored immigration from northern and western Europe. The passage of the 1965 Amendments to the Immigration and Nationality Act abolished the discriminatory national origins quota system, raised the annual ceiling of immigrants admitted from 158,000 to 290,000, and expanded the classes of close relatives exempt from numerical limitations. Changes in exemption criteria have had important consequences both for the size and composition of recent cohorts. The number of immigrants admitted outside of the numerical quota almost tripled in a single decade, rising from 86,043 in 1970 to 104,633 in 1975, and 241,160 in 1980 (*3, 4*), when the numbers nearly equaled the annual ceiling.

Owing largely to the provisions of the 1965 Amendments and coupled with the fall of U.S.-supported governments in Cuba and Southeast Asia, the socioeconomic and regional composition of immigrants changed markedly. Whereas Europeans made up 53% of all persons admitted between 1951 and 1960, during the 1970s Europeans made up less than 20% of new arrivals. Meanwhile, persons from Asia and the Americas increased their shares of immigrant flows, respectively, from 6 and 40% during the 1950s to 35 and 44% during the 1970s (*8*). Since the volume of immigration accelerated after 1950 (Table 1), the absolute numbers of Asian and Latin American immigrants admitted were larger than the numbers of Europeans admitted in the recent past.

Refugee adjustments also are exempt from the numerical limitations placed on immigration. Although the 1965 Amendments provided for the annual admission of approximately 18,000 refu-

gees, the vast majority admitted since that time have entered either through special legislation or under the parole authority granted the U.S. attorney general. The predominance of Asians and Latin Americans among refugee and asylee adjustments since the early 1970s also has contributed to the changed country of origin composition of recent immigrants. In both 1984 and 1985, refugee and asylee adjustments exceeded 90,000, with more than two-thirds of these originating in Vietnam, Kampuchea, Laos, and Cuba (*4*, table 2).

Just as striking as the changes in the national origins of recent immigrants are the selection effects of the 1965 Amendments on the skill level of new arrivals. In comparison with previous cohorts, the arrivals after 1965 are more diverse in terms of social, economic, and demographic characteristics (*7, 9*). Many scholars have attributed this outcome to the 1965 Amendments, arguing that the emphasis on family reunification as a basis for legal admission has compromised our ability to monitor the socioeconomic composition and impact on the labor market of the flow (*7, 9*). The changed entry requirements, notably the emphasis on family reunification, resulted in a bimodal skill distribution, with clusters in both white- and blue-collar occupations. This aggregate bimodality reflects the preponderance of Asians in white-collar occupations and Hispanics in blue-collar jobs (*10*). Immigrants from Mexico, El Salvador, Guatemala, and the Dominican Republic predominated among the least skilled entrants compared with migrants from other regions of the Western Hemisphere.

Assessing the economic consequences of immigration is complicated because the calculation of gains and losses depends on both the conditions of the U.S. economy and our ability to trace changes in the stock and flow of the foreign-born persons (*5*). The latter is problematic because of the persisting uncertainty about the number and residential location of undocumented migrants residing in the United States at any point in time. Despite the growing number of studies estimating the volume of illegal immigration (*11*), there is no consensus about the net economic impact of undocumented workers on domestic employment conditions and wage levels. This is partly because conclusions rest on the differing estimates of the number of undocumented aliens and partly because it is impossible to generalize to the national level from the growing proliferation of studies based on local areas (*12*). Thus, available empirical evidence on the economic impacts of undocumented immigration is inconclusive.

Low rates of economic growth and high rates of unemployment in the 1970s generated fears that immigrants were displacing domestic workers, depressing wages, and lowering the quality of working conditions (*13*). Nevertheless, aggregate statistics show that the rate of employment growth was faster than the increase in the rate of immigration. Between 1951 and 1980, the U.S. labor force grew by 7.6 million, 12.3 million, and 22.5 million during each successive decade (*14*). On the basis of immigrant flows for each of these periods and assuming that all those admitted entered the labor force, recent immigrants could have accounted for at most 33% of this increase in employment during the 1950s, 27% during the 1960s, and 20% during the 1970s. In fact, only about half of all immigrants admitted entered the labor force upon arrival (*6*). During this period aggregate unemployment fluctuated from a low of 3.2% in 1951 to a high of 7% in 1980, with average rates at 6.5 and 5.8% in 1961 and 1971, respectively (*14*).

Understanding how and why the current economic impacts of immigration may differ from those prior to 1960 requires some acknowledgment of changes in U.S. labor supply and demand. Since 1960 unprecedented numbers of women secured paid jobs, and after 1970 the large baby-boom cohorts entered the labor market (*15*). These changes in the supply of native workers coincided with changes in labor demand resulting from the restructuring of employment away from goods production and a moderately labor-intensive agricultural system toward service industries and a more highly mechanized agricultural production system (*16*). Both of these major structural changes influence the contemporary economic impact of immigration, not only because labor market effects depend on the industrial distribution of foreign-born workers, but also because the supply of native workers of varying skill levels determines the extent of competition for jobs. These issues are addressed in the following sections.

Table 1. Immigration to the United States, 1901–1985 (*3*).

Period	Mid-period population ($\times 10^3$)	Immigrants admitted*		Foreign born†
		Number ($\times 10^3$)	Percentage of mid-period population	Percentage of mid-period population
1901–1910	83,822	8,795	10.5	14.2
1911–1920	100,546	5,736	5.7	13.6
1921–1930	115,829	4,107	3.5	12.1
1931–1940	127,250	528	0.4	10.1
1941–1950	133,434	1,035	0.8	8.2
1951–1960	165,931	2,515	1.5	6.0
1961–1970	194,303	3,322	1.7	5.0
1971–1980	215,973	4,493	2.1	5.5
1981–1985	234,538‡	2,864	1.2	6.0

*Gross numbers unadjusted for mortality. †All persons born abroad residing in the United States at the mid-period (based on a linear approximation to mid-decade foreign population). Foreign born differs from immigrants in that the former is a stock measure, and the latter is a flow measure based on the cumulative number admitted net of emigration and mortality. ‡Mid-period estimates are based on 1983 data (*3*).

The Impact of Immigrants on the U.S. Labor Market

Do immigrants compete with and displace native workers? One argument is that for every immigrant who finds employment, a native-born worker is displaced (*17*). Two demonstrably false assumptions are built into this argument. The first is that the number of jobs is fixed (*18*). The second is that displacement occurs because native and foreign workers are perfect substitutes in the production process. In other words, employers see incoming immigrants as persons who can carry out the jobs currently performed by the domestic labor force. Since immigrants presumably are willing to accept lower wages, employers set on maximizing profits respond by laying off native workers and replacing them with immigrants.

An alternative argument is that the entry of foreign workers into the labor market does not result in significant displacement because immigrants "take a distinct set of jobs, jobs that the native labor force refuses to accept" (*19*). The operational assumption in this position is that the American labor market is segmented such that "good" jobs can be clearly distinguished from "bad" jobs. The native labor force, for the most part, works in the good jobs available in the primary sector, whereas immigrants, at least those who are unskilled, are relegated to the low-paying jobs in the secondary sector.

This argument, too, is flawed. First, the breakdown of the economy into two types of jobs is fundamentally arbitrary, and the existence (and demarcation) of the two sectors has been difficult to establish empirically (*20*). Second, if workers refuse jobs in the "secondary" sector, economic competition would raise the wages in these jobs, thereby making them more attractive to native workers. Finally, the Cuban enclave in Miami and Asian immigrant enterprises on the West Coast illustrate that labor market dynamics between native and immigrant workers are more complex than can be portrayed by a dual economy model (*21*).

Table 2. Impact of immigrants on earnings—a summary of empirical evidence.

Study	Wage or income	Effect of 10% increase in immigration (%)	Reference
Comparison of earnings across Standard Metropolitan Statistical Areas in 1980 Census, as a function of the size of male immigrant population	Native-born white male Native-born black male Immigrant	−0.08 +0.2 −9.2	(*23*)
Comparison of shares of incomes accruing to demographic groups across Standard Metropolitan Statistical Areas in 1970 Census as a function of the size of immigrant population	Native-born Immigrant	−0.2 −2.3	(*24*)
Comparison of 1972–1977 wage growth in manufacturing across Standard Metropolitan Statistical Areas as a function of number of immigrants employed in the manufacturing sector	Manufacturing	−0.04	(*25*)
Comparison of black family income across Standard Metropolitan Statistical Areas in 1980 Census as a function of size of Mexican immigrant population	Black family Black family in Southwest	−0.1 +0.1	(*26*)

Recent economic analysis has focused on the interactions between foreign and native labor with the use of the basic theory of labor demand by profit-maximizing firms as a point of departure (*22*). Employers combine inputs in the production process—such as capital and different types of labor—to produce an output valued by consumers, and the various inputs in the production process are paid the value of their marginal contribution to the firm. With this approach, the relevant question becomes, What happens to the productivity of native workers when the supply of immigrants increases? The answer to this question is ambiguous. On the one hand, foreign and native workers may be substitutes in the production process in that they perform the same types of jobs and have the same kinds of skills. Under these circumstances an increase in the supply of immigrants would lower the native wage rate (and level of employment). On the other hand, foreign and native workers may be complements in production—that is, they perform complementary but interdependent jobs and have complementary skills. As the supply of immigrants rises, native workers can gain by specializing in those industries and occupations in which they have a comparative advantage. As a result, their wages (and employment levels) rise.

The question of whether immigrants and native workers are substitutes or complements in production is fundamental if the labor market consequences of immigration are to be ascertained. Several recent studies (Table 2) provide some empirical evidence on the nature of this relation (*23–26*). The methodology in these studies involves a comparison of the earnings of native workers across labor markets. If immigrants and natives are substitutes (complements), economic theory predicts that the earnings of native workers would be lower (higher) in those labor markets in which the supply of immigrants is relatively high, holding constant other variables that determine worker productivity and wage levels.

The consensus from the studies shown in Table 2 is that the native labor force as a whole and foreign workers are substitutes in production but that the correlation is weak. That is, an increase in the size of the immigrant work force lowers the wage rate of native workers, but only by a small amount. Available estimates suggest that a 10% increase in the number of immigrants reduces the native wage rate by at most two-tenths of one percentage point (Table 2). These studies also suggest that when the native labor force is disaggregated by race, the same weak correlations tend to recur. The one group of workers that is strongly and negatively affected by an increased supply of new immigrants is the stock of foreign workers already in the United States. Specifically, a 10% increase in the number of new immigrants reduces the average wage of resident foreign workers by 2 to 9%.

Available evidence, therefore, is inconsistent with claims that immigrants impose a major cost on the United States because they reduce the earnings of native workers. There are, however, three important qualifications to this generalization. First, available studies have aggregated data for large and diverse groups of native workers. It may well be that immigrants have relatively large impacts on the earnings of only a few, small (and as yet empirically unidentified) subgroups of the native labor force. Second, even though a 10% increase in the number of immigrants has a small impact on the average native worker, this conceptual experiment does not truly represent what actually happens in the labor market. Immigrants tend to concentrate in a small number of geographic areas (over half of all immigrants, for example, reside in New York, California, Florida, and Texas) (*6, 10*). A 10% increase in the number of immigrants will, therefore, have a significantly larger impact on native workers in the few labor markets where foreign workers are disproportionately concentrated. Finally, most of the studies summarized here use the 1970 and 1980 Census data and thus measure the impact of the "typical" immigrant who arrived in the 1950s or 1960s on the earnings of native workers. Because of the changes in the skills of immigrants arriving during the last 10 to 15 years, the empirical results based on past immigration cannot be used to infer the extent and nature of labor market competition between foreign and native workers in the future.

The Assimilation of Immigrants

Perhaps no single aspect of the immigration process has received more attention than the process of adaptation and integration into the U.S. society. So voluminous are the writings on this subject (*10, 27*) that we limit our discussion to a small part of the literature, namely that concerned with labor market "assimilation," or adaptation (*28*). In very general terms, assimilation refers to a process whereby immigrants acquire skills, including English proficiency and knowledge about the U.S. labor market and other social institutions which ultimately will enhance their socioeconomic success and their earnings in particular.

Assimilation has two economic implications that can be measured. First, the contributions of an immigrant cohort to the U.S. economy grow over time, as the initial costs associated with the disruptive effects of immigration are offset by increased productivi-

Table 3. Assimilation and cohort effects (*36*) on immigrant earnings in comparison with native earnings (*37, 38*).

Group	Wage growth (1969–1979) for 1960s immigrants (%)	Wage advantage of 1960s immigrants over 1970s immigrants (%)	Wage differential between immigrants (1975–1979) and natives in 1979 (%)
Asian	4.1	6.5	−30.3
Black	−2.3	29.8	−22.3
Mexican	5.8	12.3	−25.7
Other Hispanic	−11.8	28.7	−29.2
White (non-Hispanic)	10.0	3.6	−8.4

ty. Second, because immigrant earnings may grow rapidly as they age, the likelihood of immigrants becoming permanent "public charges" diminishes over time.

To what extent do immigrant earnings rise as U.S. labor market experience is accumulated? Initial research on this question involved a comparison from Census data of the earnings of immigrants and native men (*29*). The analysis of these cross-sectional data sets (that is, data sets consisting of observations of many individuals at a given point in time) led to three fundamental discoveries: (i) the earnings of immigrants upon arrival in the United States were substantially lower than the earnings of native men with similar demographic and social characteristics; (ii) the earnings of immigrants who have resided in the United States for many years were substantially greater than the earnings of recent immigrants; and (iii) the earnings of immigrants who have resided in the United States for 10 to 15 years or longer exceed the earnings of comparable native workers (*30*).

In interpreting these results, researchers argued that because recent immigrants lacked a variety of skills valued by U.S. employers, they were motivated to recover migration costs partly through intensive training or human capital investments (for example, learning a new language), thereby acquiring the needed skills. The initial lack and subsequent acquisition of this human capital presumably explained why immigrant earnings were relatively low upon arrival and subsequently grew faster than those of comparable native workers. This hypothesis fails to explain why, in the long run, immigrant earnings surpass those of similar native workers. To address the anomaly of immigrant earnings "overtaking" the earnings of native workers, researchers assumed that immigrants are a select group of individuals who, on average, are "more able and more highly motivated" (*29*) than the native U.S. population. In other words immigrants were assumed to be a nonrandom, positively selected sample from the population of their respective origin countries.

Three inferences were drawn from these cross-sectional studies of immigrant earnings. First, assimilation was an inevitable aspect of the immigration process, and its outcomes were uniformly favorable, if somewhat uneven among groups. Second, the assimilation process occurred in such a relatively short period of time that gains for the receiving communities could be considerable. Third, the relatively low economic status of recent immigrants provides no basis for concern, since their earnings inevitably would rise as they gained experience relevant to the U.S. market.

There is, however, a serious logical flaw in these inferences made from cross-sectional studies. A single cross section of data cannot separate aging (or assimilation) and cohort effects, where the cohort effect captures earnings differences between immigrant waves that partly reflect differences in the skills of the cohorts (*31*). The fact that immigrant earnings and length of U.S. residence are strongly and positively correlated in a cross section may result either from an assimilation or a cohort effect, or both.

Two empirically important factors can generate sizable skill differentials across immigrant cohorts. The first is selective return migration, whereby as many as 30% of a specific immigrant cohort returns to the country of origin within 10 years (*32*). Since emigration propensities are nonrandomly distributed, immigrants from early waves surviving to the observation date (for example, the Census week) represent a nonrandom sample of the original cohort. If, for example, persons who "fail" in the U.S. labor market return to their countries of origin, earlier waves will overrepresent successful immigrants, and comparisons to the more recent immigrants (who presumably form a more representative sample) lead researchers to conclude that immigrant earnings grow as U.S. labor market experience is accumulated even if no assimilation effect truly exists.

Second, changes in immigration policy and in economic and political conditions in the sending countries have led to a shift in the skill-composition of immigrants toward less-skilled workers (*33*). As discussed above, the 1965 Amendments to the Immigration and Nationality Act practically ensure that pre-1965 and post-1965 cohorts vary in average skill. This compositional shift has two major implications for the economic status of foreign workers in the United States. First, since recent immigrants are disproportionately from less industrialized countries, they may be less skilled than prior cohorts (*34*). Second, the shift of emphasis for immigrant admission away from occupation or skill qualifications to a "family preference" system altered the selection rules from higher to lower skill levels (*35*).

Since a single cross-sectional data set cannot resolve the question of whether assimilation will take place, more recent research has analyzed pooled census cross sections or longitudinal data sets. For example, the 1970 and 1980 U.S. Censuses have been used to "track" immigrant cohorts through the decade. In contrast to the results from single cross-sectional data sets, this research shows that the earnings growth experienced by specific immigrant cohorts from 1970 to 1980 did not greatly exceed that experienced by the native labor force (*36*). Another finding is that (for many immigrant groups) the more recent waves earned less at every point of their life cycle than earlier cohorts. In other words, the more recent cohorts of immigrants are substantially less productive than earlier cohorts.

Research on immigrant earnings is summarized in Table 3 (*37*). Consider the cohort of immigrants who arrived between 1960 and 1969. The rate of assimilation (that is, the rate at which the earnings of the cohort grew in comparison with the native work force) of this immigrant cohort between 1969 and 1979 (*38*) shows that, for most (statistically similar) immigrant groups (the exception being non-Hispanic white immigrants), earnings assimilation rates are "small" and perhaps even negative. The cohort effect, which is measured by the percentage wage advantage of the 1960–1969 cohort over the 1970–1979 cohort, shows that the earnings potential of the 1960s immigrant cohort was significantly greater than the earnings potential of the 1970s cohort (the exception, again, being non-Hispanic white immigrants). Finally, the wage gap between the foreign born who arrived from 1975 to 1979 and the native population in 1979 shows that most recent immigrant groups have a sizable disadvantage in the labor market upon arrival. Even if their earnings rose at rates equal to those experienced by the more skilled cohort of the 1960s, these immigrants would require many decades to reach parity with (let alone surpass) the earnings of comparable native workers.

These findings, which are based on a single study, must be qualified until alternative explanations are empirically disproven (*39*). Since Census enumeration rates improved substantially between 1970 and 1980, many individuals "missed" in 1970 were

likely to be counted in 1980. That underenumeration is correlated with low socioeconomic status would create the impression of a downward shift in the skill level of immigrants. Finally, part of the observed between-cohort differences may result from an increasing proportion of undocumented migrants in successive cohorts, but the magnitude of this effect cannot be estimated with any confidence.

Immigrants' Use of Transfer Income

As in the past, looming large in the recent policy debates is the question of whether immigrants become public dependents. The data here are spotty. Available studies, diverse in their methodologies, data, and subgroup comparisons (Table 4), are inconclusive about immigrants' use of transfer payments. Comparisons among statistically similar native- and foreign-born families show that the likelihood of receipt of welfare income is lower for the latter, and more so for recent immigrants than it is for earlier arrivals (*40, 41*). However, these standardized comparisons are somewhat misleading. Data from the 1980 Census (which are nationally representative) show that Hispanic and Asian immigrant families were marginally more likely to have received means-tested transfer income (public assistance) in 1979, but this was not the case for non-Hispanic white or black families (Table 5); also, average payment levels, conditioned upon receipt in 1979 show no clear pattern according to either nativity or to national origin (Table 5) (*40–44*).

Because of the diverse estimates of the extent to which various groups of immigrants use transfer income (Table 4), some caution must be exercised in making inferences about economic consequences. If future immigration waves consist largely of individuals with low skill levels and limited income prospects, then the aggregate public dependency burden of immigrants potentially could increase because the share of families eligible for transfer income and their average benefit levels could rise. Higher poverty rates among immigrant Hispanic and Asian families in comparison with their native counterparts (Table 5) support this interpretation. Furthermore, the residential concentration of immigrants means that the tax burdens are not evenly shared by political and administrative units; hence the assessment of net average impacts, while accurate at the national level, may not adequately portray the distribution of welfare costs across areas.

But this is only one side of the story. Assessing the impact of immigrants on social expenditures also involves factoring their tax contributions into the system of costs and benefits. Data on tax contributions of immigrants are not available, and efforts to derive them would be at least as imprecise as the estimates of illegal immigration. The economic contributions that immigrants make through their high rates of labor force participation (*10*), even at incomes below the national average, offset their impact on social expenditures, including medical, educational, and other publicly financed services. Available evidence on this question is even sparser than that about immigrants' participation in social entitlement programs.

Summary and Conclusion

In assessing the economic consequences of immigration, our review of empirical evidence about the size of contemporary flows, immigrants' impact on the labor market, and their use of transfer income led to the following conclusions.

1) Although the volume of immigration has increased appreciably in recent decades, there is no basis for concluding that it has exceeded the growth rate or absorptive capacity of the U.S. labor force.

2) The negative impacts of immigrants on the earnings of native workers are quite small.

3) Immigrants who arrived during the 1970s are, on average, less skilled than those who arrived earlier, and their earnings do not rise as rapidly as previously thought, but this generalization varies according to national origin. This finding is consistent with descriptive historical accounts about the changing socioeconomic and

Table 4. Immigrants' use of transfer payments—a summary of empirical evidence.

Data and sample	Methodology	Immigrants' use of transfers	Reference
1976 Survey of Income and Education: families headed by couples or single women	Maximum likelihood (probit) estimates of probability of receipt of public assistance and social security income	Relative use measures Welfare income: 20–40% lower use rate* Social security income: 6–30% lower use rate for recent cohorts, and 10–22% higher use rate for earlier immigrants*	(*40*)
1980 Census microdata files, 5:100 sample: families whose heads are black, white, Hispanic, Asian	Maximum likelihood (logit) estimates of probability of receipt of public assistance income	Asian immigrants: 2–4% higher use rate† White immigrants: 1–2% lower use rate† Hispanic immigrants: 6–9% lower use rate† Black immigrants: 9–18% lower use rate†	(*41*)
1976 Survey of Income and Education, households with foreign-born heads versus households with native heads	Estimation of average value of services used by successive cohorts from cross-sectional data	Lower use of all types of public services for first 12 years following entry, relative to natives	(*42*)
1975 survey of 793 apprehended aliens at 19 detention centers	Descriptive univariate tabulations	Ever use measures Welfare, <1% Food stamps, <2% Unemployment insurance, <4%	(*43*)
Random survey of four Mexican communities, former and current migrants, both legal and illegal	Descriptive tabulations by legal status and length of U.S. residence	Documented migrants Food stamps and welfare, 10–13% Unemployment insurance, 55% Social security, 14% Undocumented migrants Food stamps and welfare, 2–3% Unemployment insurance, 14% Social security, 2%	(*44*)

*Comparisons to native whites. †Comparisons to natives of like ethnicity.

Table 5. Poverty status, receipt of public assistance, and mean public assistance payments by nativity and race or ethnicity of the heads of households in 1979 (*41*).

Status	White	Black	Hispanic	Asian
Percentage of immigrants	7.2	4.4	54.4	75.6
Percentage below poverty level				
Native	6.2	26.1	19.4	5.4
Immigrant*	6.0	16.0	22.9	11.8
All	6.2	25.7	21.3	10.3
Percentage receiving public assistance				
Native	6.0	24.8	15.8	5.5
Immigrant*	4.6	10.1	16.7	9.5
All	5.9	24.2	16.2	8.5
Mean public assistance income($)†				
Native	2,514	2,721	2,951	3,068
Immigrant	2,856	2,850	3,313	3,067
All	2,529	2,723	3,142	3,068

*If either the head, the spouse, or both are foreign born. †Conditioned upon receipt in 1979.

demographic composition of immigrants admitted since 1968, when the 1965 Amendments to the Immigration and Nationality Act went into effect. Two qualifications must be reiterated. First, the labor market experiences of recent immigrants, if judged to be different from those of earlier arrivals, may also reflect the sluggish character of the U.S. economy during the 1970s, particularly during the mid-period recession. Second, the observed cohort effects may reflect selective emigration or improved enumeration practices.

4) Finally, Hispanic and Asian immigrants as a group are more likely to receive transfer income than are natives. This result reflects the greater pervasiveness of poverty among the foreign born rather than a higher propensity of foreign-born persons to participate in public assistance programs compared to (statistically) comparable natives.

Contemplation of the policy implications of these findings brings us full circle to our opening quotations. Contemporary worries about immigrants taking jobs away from native workers, about their potential drain on social expenditures, and about their prospects for becoming fully assimilated into the U.S. labor market are reminiscent of those that were pervasive at the turn of the century, and before.

It is unlikely that any reforms—whether sweeping or superficial—will resolve the irreconcilable conflicts inherent in an immigration policy that strives to balance political, economic, social, humanitarian, and philosophical considerations. The policy dilemma does not admit simple solutions, as Abrams and Abrams note, ". . . (I)f we emphasize the economic role of immigration and admit more and more skilled workers, we sacrifice the goal of reuniting families; if we stress (as is now the case) the admission of relatives, we lose control of the effect of immigration on our labor markets. If we admit highly skilled immigrants, we may be hurting their home countries and our own less privileged citizens; if we fail to admit the highly skilled applicants, we deprive our country of their badly needed talents" (*35*). How these conflicts will be resolved in the next round of legislative reforms remains to be seen, but the evidence we have presented provides some basis for concern. That the volume of immigration has grown and changed in fundamental ways at a minimum suggests a need to reconsider the economic implications of the existing admission criteria.

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8. U.S. Department of Justice, *1984 Statistical Yearbook of the Immigration and Naturalization Service* (Government Printing Office, Washington, DC, 1986), table 1.2, pp. 3–5.
9. C. B. Keely, *Demography* **8**, 157 (1971); *ibid.* **12**, 179 (1975). Between 1970 and 1980, the share of persons admitted under third or sixth preference categories—that is, with labor certification—hovered between 4 and 8% (*3, 4*).
10. D. S. Massey, *Annu. Rev. Sociol.* 7, 57 (1981); M. Tienda, L. I. Jensen, R. L. Bach, *Int. Migr. Rev.* **18**, 1021 (1984). Refugees from Southeast Asia who arrived after 1975 are an exception to this generalization in that they are less positively selected on skill level compared to pre-1975 refugees.
11. For review of estimation procedures, see F. D. Bean, A. G. King, J. F. Passel, in *Mexican Immigrants and Mexican Americans: An Evolving Relation*, H. Browning and R. O. de la Garza, Eds. (CMAS Publications, Austin, TX, 1986), pp. 13–36.
12. U.S. General Accounting Office, *Illegal Aliens: Limited Research Suggests Illegal Aliens May Displace Native Workers* (briefing report, Washington, DC, April 1986).
13. M. Teitlebaum, *Foreign Affairs* **59**, 21 (1980).
14. U.S. Department of Labor, *Economic Report of the President* (Government Printing Office, Washington, DC, February 1986), table B-31, p. 288. Aggregate statistics on the unemployment rate differential between immigrants and natives are not available. Tabulations by the authors from the 1980 Census indicate that immigrants, if anything, have significantly lower unemployment rates, but the differential is numerically small (less than one percentage point).
15. L. F. Bouvier, *Pop. Bull.* **35** (April 1980); L. J. Waite, *ibid.* **36** (May 1981).
16. J. Singelmann and M. Tienda, in *New Approaches to Economic Life: Economic Restructuring, Unemployment and the Social Division of Labor*, B. Roberts, R. Finnegan, D. Gallie, Eds. (Univ. of Manchester Press, Manchester, England, 1985), pp. 48–67. See also M. Tienda, L. Jensen, R. L. Bach, in (*10*).
17. For a current summary of this debate, see M. J. Greenwood and J. M. McDowell [*J. Econ. Lit.* **24**, 1738 (1986)].
18. This assertion violates one of the most fundamental tenets of economic theory: the level of employment in a competitive economy is determined by the interaction of the supply of and the demand for labor. Hence, the observed level of employment depends on such factors as output prices, worker productivity and skills, the state of technology, the value of the worker's alternative uses of time, and the size of the immigrant flow itself.
19. M. Piore, *Birds of Passage: Migrant Labor and Industrial Societies* (Cambridge Univ. Press, Cambridge, 1979), p. 3.
20. For a critical review of the "segmented labor market" argument, see G. Cain, *J. Econ. Lit.* **14**, 1215 (1976). See also W. T. Dickens and K. Lang, *Am. Econ. Rev.* **75**, 792 (1985).
21. A. Portes and R. L. Bach, *Latin Journey: Cuban and Mexican Immigrants in the United States* (Univ. of California Press, Berkeley, 1985), chap. 6; I. Light, *Ethnic Enterprise in America: Business and Welfare Among Chinese, Japanese, and Blacks* (Univ. of California Press, Berkeley, 1972).
22. See D. S. Hamermesh, in *Handbook of Labor Economics*, O. Ashenfelter and R. Layard, Eds. (North-Holland, Amsterdam, in press).
23. G. Borjas, *Rev. Econ. Stat.* **68**, 58 (1986).
24. J. B. Grossman, *ibid.* **64**, 596 (1982).
25. G. DeFreitas and A. Marshall, "Immigration and wage growth in U.S. manufacturing in the 1970s" (Industrial Relations Research Association Series, Madison, WI, 1984), pp. 148–156.
26. T. Muller and T. J. Espenshade, *The Fourth Wave: California's Newest Immigrants* (Urban Institute, Washington, DC, 1985).
27. For a recent summary of the literature, see A. Portes and R. L. Bach in (*21*), chap. 1. See also M. J. Greenwood and J. M. McDowell (*17*).
28. This is a narrow economic definition of assimilation. The classic formulation is much broader and richer [M. Gordon, *Assimilation and American Life* (Oxford Univ. Press, New York, 1964)].
29. B. R. Chiswick, *J. Polit. Econ.* **86**, 897 (1978); G. Carliner, *Econ. Inq.* **18**, 87 (January 1980); G. DeFreitas, thesis, Columbia University, New York (1980).
30. B. R. Chiswick (*29*) and others who have written about earnings assimilation have inferred temporal growth in earnings and crossover dates from cross-sectional data showing that the earnings of foreign workers exceed those of the native born. Conclusive evidence, however, requires either longitudinal data or synthetic cohort analyses.
31. For a recent technical discussion of this problem, see J. J. Heckman and R. Robb, in *Analyzing Longitudinal Data for Age, Period, and Cohort Effects*, H. Winsborough and O. Duncan, Eds. (Academic Press, New York, 1983), pp. 137–150, and various other authors.
32. R. Warren and J. Marks Peck, *Demography* **17**, 71 (1980).
33. G. J. Borjas, *J. Labor Econ.* **3**, 463 (1985). See also C. B. Keely in (*9*) and D. S. Massey in (*10*).
34. However, D. S. Massey [*Int. Migr. Rev.* **17**, 212 (1983)] found no strong trends showing a decline in skill level among different immigrant cohorts during the 1970s. G. J. Borjas (*33*) holds the opposite view and maintains that because income inequality in the countries now providing immigrants may be greater than that in

the dominant countries in the past, persons from the high part of the income distribution (who presumably are the most able and highly motivated) have less incentive to emigrate, whereas the persons in the bottom part of the income distribution have increased incentives to emigrate [G. J. Borjas, "Immigration and self-selection: An analysis of intercountry differences" (Univ. of California, Santa Barbara, 1986), mimeograph].
35. Several persons have asserted but have not shown that persons coming in through family visas do worse in the labor market than persons who come in through occupational visas [E. Abrams and F. S. Abrams, *Public Interest* **38**, 3 (1975)].
36. See Borjas in (*33*).
37. Computed from G. J. Borjas (*33*), tables 1, 4, 5, and 6.
38. The base referred to in Table 3 is the native group of like national origin as the immigrant group. For example, Mexican immigrants are compared to persons of Mexican origin born in the United States, black immigrants are compared to black native persons, and so on. The differentials reported control for differences in socioeconomic characteristics between immigrants and natives.
39. D. S. Massey, personal communication.
40. F. D. Blau, *Ind. Labor Relat. Rev.* **37**, 222 (1984).
41. M. Tienda and L. I. Jensen, *Soc. Sci. Res.*, in press.
42. J. Simon, *Pop. Dev. Rev.* **10**, 55 (1984).
43. D. S. North and M. F. Houston, *The Characteristics and Role of Illegal Aliens in the U.S. Labor Market: An Exploratory Study* (Linton and Company, Washington, DC, 1976). Report prepared for the Employment and Training Administration of the U.S. Department of Labor.
44. D. S. Massey, *Am. Soc. Rev.* **51**, 670 (1986).
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New Strong Cement Materials: Chemically Bonded Ceramics

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New cements developed in recent years have strengths that are greater by an order of magnitude than those of conventional hydraulic cements. These low-temperature materials, whose strengths approach those of many traditional high-temperature ceramics, are termed chemically bonded ceramics. The different routes to generating strong cementitious materials, including warm pressing, chemical modification, high-shear mixing with polymer additions, and the making of fiber and particulate composites, are reviewed. Strength, toughness, durability, impermeability, and abrasion resistance of these new materials have been greatly improved, as have certain electrical and acoustical properties.

NEW DEVELOPMENTS IN THE MAKING OF VERY STRONG cements have resulted from (i) modifying cement compositions (and the associated hydration, consolidation, and densification processes) and (ii) manipulating the microstructures. Together, these developments have produced about tenfold enhancements in their properties which approach those of many traditional ceramics or modern composites. These materials are called chemically bonded ceramics (CBCs) which refers to the bonding that takes place in a chemical reaction at low temperature, as opposed to fusion or sintering at elevated temperature. The bonding in such CBCs is a mixture of ionic, covalent, and van der Waals bonding, with the ionic and covalent dominating; in traditional cement hydration products, van der Waals and hydrogen bonding dominate. In this article I discuss first conventional cements and then different types of CBCs and the new brittle matrix composites. Finally, a brief perspective on the future of these materials is presented.

Portland and other cements—and the concretes made by combining them with different kinds of aggregates—are used in larger quantities than any other man-made materials (*1, 2*). Such cements offer modest strength and stiffness in compression but are weak in tension and severely lacking in toughness. Yet even with the extremely primitive cement technology that prevailed in ancient times, Greek cisterns and the remarkable Colosseum and Pantheon in Rome have lasted for 2000 to 3000 years (*3*).

Normal hydraulic (or portland) cement powder has four major components: tricalcium silicate (Ca_3SiO_5), dicalcium silicate (Ca_2SiO_4), tricalcium aluminate ($Ca_3Al_2O_6$), and calcium aluminoferrite solid solution ($Ca_2Fe_xAl_{2-x}O_5$). Small amounts of gypsum ($CaSO_4 \cdot 2H_2O$) and other minor components, such as alkali sulfates, are also present. When mixed with water, cement undergoes an exothermic hydration-hydrolysis reaction. Immediately after the paste is formed, there is a period of time—several hours—in which to finish shaping the desired object in a simple fashion at room temperature, before the setting reaction precludes further handling.

The reaction rate and consequent rate of heat evolution are a function of the total chemical composition, the crystal chemistry of the cement minerals, the fineness of the powder, and the temperature of setting. Setting and hardening are the result of a complex sequence of processes (Fig. 1). Hardened cement paste has a finely intergrown microstructure dominated by the major binding component, a very high surface area, and submicrometer-sized noncrystalline fibers or particles of calcium silicate hydrate (CSH). These grow between and link together larger crystallites and residual anhydrous cement grain cores and their perimeters, leaving a microporous material with minimal interconnected capillaries.

The solidification of cement paste is a constant-volume process. When high-density cement particles are mixed with low-density water, they react to form a solid hydration product consisting of solids of intermediate density and interspersed residual porosity.

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